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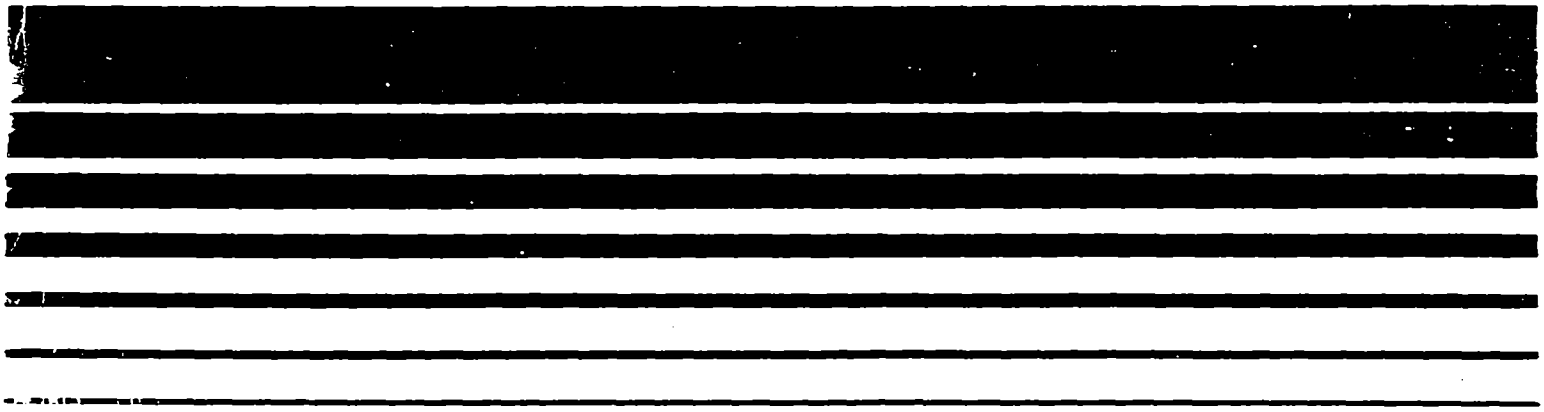
# Progress In The Prevention And Control Of Air Pollution In 1988

## Report To Congress



# PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1988

## ANNUAL REPORT OF THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY TO THE CONGRESS OF THE UNITED STATES IN COMPLIANCE WITH SECTIONS 313, 202(b)(4), AND 306 OF 42 U.S.C. 7401 ET SEQ. THE CLEAN AIR ACT, AS AMENDED

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# PREFACE

The Clean Air Act, as amended, authorizes a national program of air pollution research, regulation, and enforcement activities. This program is directed at the Federal level by the U.S. Environmental Protection Agency (EPA). However, primary responsibility for the prevention and control of air pollution continues to rest with State and local governments. The EPA's role is to conduct research and development programs, set national standards and regulations, provide technical and financial assistance to the States, and, where necessary, supplement State implementation programs.

Section 313 of the Clean Air Act requires the Administrator to report on measures taken toward implementing the purpose and intent of the Act. This report covers the period January 1 to December 31, 1988 and describes the issues involved in the prevention and control of air pollution and the major elements of progress toward that goal that have been made during that time. In addition, this report also includes two other EPA reports to Congress required under the Clean Air Act, as amended:

1. Section 306 report on Federal procurement and violating facilities (Chapter VIII); and,

2. Section 202(b)(4) report on measures taken in relation to motor vehicle emissions control (Chapter IX).

# I. INTRODUCTION AND SUMMARY

## A. INTRODUCTION

This report, which has been prepared in order to satisfy the requirements of sections 313, 202(b)(4), and 306 of the Clean Air Act (Act), describes the progress that the Environmental Protection Agency (EPA) has made in the prevention and control of air pollution during calendar year 1988. The following paragraphs summarize the contents of the remaining chapters of this report, especially insofar as those chapters illuminate current understanding of air quality problems, controls, and administrative apparatus.

## B. AIR QUALITY TRENDS, MONITORING, AND MODELING

Since it takes approximately 1 year to assemble, analyze, and report air quality and emissions data on a national basis, the latest air quality and emissions data available for this report are for the year 1987.

All of the criteria pollutants showed improvements in air quality and emissions between 1978 and 1987. Specific details on air quality and emissions levels, for each of the pollutants to which national ambient air quality standards (NAAQS) applied in 1987, are as follows:

- Annual average ambient total suspended particulate (TSP) levels decreased 21 percent between 1978 and 1987, while TSP emissions decreased 23 percent. Between 1986 and 1987, ambient TSP levels increased 2 percent, and TSP emissions increased 3 percent. On July 1, 1987, EPA promulgated new standards for particles nominally 10 micrometers and smaller in diameter ($PM_{10}$), rather than TSP. $PM_{10}$ monitoring networks are now reporting nationally but do not have sufficient data history for trends.

- Annual average ambient sulfur dioxide levels decreased 35 percent between 1978 and 1987, while total sulfur oxide emissions decreased 17 percent. Between 1986 and 1987, ambient sulfur dioxide levels declined 3 percent, while total sulfur oxide emissions declined 1 percent.

- Ambient carbon monoxide levels decreased 32 percent between 1978 and 1987, while total carbon monoxide emissions decreased 25 percent. Ambient carbon monoxide

levels decreased 6 percent between 1986 and 1987. The long term progress reflects the continuing reductions in carbon monoxide emissions brought about by the Federal Motor Vehicle Control Program.

- Annual average ambient nitrogen dioxide levels decreased 12 percent between 1978 and 1987. During this time, total nitrogen oxide emissions decreased by 8 percent, and highway vehicle emissions, the source category likely impacting the majority of nitrogen dioxide monitoring sites, decreased by 15 percent. Between 1986 and 1987, ambient nitrogen dioxide levels were unchanged, while total nitrogen oxide emissions increased 1 percent.

- The composite average of the second highest daily maximum 1-hour ambient ozone values decreased 16 percent between 1978 and 1987, while volatile organic compound (VOC) emissions decreased 17 percent. The decrease in ambient ozone levels is complicated by the change in the ozone calibration procedure that occurred in the 1978-79 time period. In the post-calibration period (1979-1987), ambient ozone levels decreased 9 percent. The ozone trend in the 1980's shows that the 1980 and 1983 values were higher than those in 1981, 1982, 1984, 1985, 1986, and 1987. However, 1987 levels were 5 percent higher than 1986 and 1988 levels are expected to be even higher likely due to the hot summer weather.

- Ambient lead levels decreased 88 percent between 1978 and 1987, while lead emissions decreased 94 percent. Between 1986 and 1987, ambient lead levels declined 19 percent, while lead emissions declined 6 percent. This extremely large long-term decrease in both air quality levels and estimated emissions is largely due to the reduction of the lead content of leaded gasoline.

The EPA promulgated regulations in 1979 which requires States to establish and operate air monitoring networks and to report the data to EPA. Two types of permanent stations are provided for in the regulations - State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS). The SLAMS, which were designed to meet the overall monitoring requirements of State Implementation Plan (SIP) activities, were required to meet all provisions of the regulations by January 1, 1983. Through December 1988, 3967 SLAMS monitors were operating

in accordance with the requirements of the regulation. The NAMS, which are a subset of the SLAMS network, are designed to provide a national monitoring network as required by section 319 of the Act. Through December 1988, 957 NAMS monitors were operating in accordance with the requirements of the regulations.

Ambient hydrocarbon data were collected at 45 sites in 30 cities in 1988 in order to measure nonmethane organic compounds. Results from this activity are used in estimating the amount of source control needed to attain the ozone ambient air quality standard.

During 1988, efforts to improve guidance on air quality models and to ensure consistency in their use continued. An air quality model clearinghouse was maintained to ensure that use of nonguideline techniques does not lead to inconsistent regulatory decisions. Regulatory action to update the "Guidance on Air Quality Models (Revised)" continued with a notice of rulemaking published in January 1988. As required by section 320 of the Act, EPA held the Fourth Conference on Air Quality Modeling in October 1988. To foster consensus on the use of models in air quality control programs, the Standing Air Simulation Work Group (SASWG) was initiated by EPA in May 1988. Working group discussions with the Federal Highway Administration (FHWA) continued in 1988 in an effort to resolve requirements and procedures for modeling highway intersections and preliminary studies to compare the emissions and traffic components of a number of intersection models were completed. In addition, a joint project with the National Park Service, funded through an Interagency Agreement, was successfully concluded and resulted in the publication of the "Workbook for Plume Visual Impact Screening and Analysis." During 1988, an updated version of the Urban Airshed Model (UAM) was installed at EPA and a study was initiated in which potential usefulness of the UAM for SIP applications is being explored in five cities.

Efforts continued during 1988 to strengthen EPA's capabilities for modeling potential releases of toxic chemicals into the atmosphere. A screening model to assess whether a release is likely to behave as a dense or buoyant (Relief Valve Discharge Model--RVD) was documented and published. A refined model for elevated, high momentum dense gases and its accompanying user's manual was also made available to the public. As a technology transfer activity, three workshops on air toxic modeling were presented for Regional Office, State and local control agency modelers in 1988. Also during 1988, a plan for air toxics modeling activities over the next three years was developed.

During 1988, EPA continued its three year program to apply the EPA Regional Oxidant Model (ROM) for selected emissions control strategies in the Northeast States. During 1988, a series of past ozone episodes were reviewed and a subset was selected for subsequent modeling. A sequence of control strategy types was also identified for subsequent simulation with ROM and procedures were developed to adjust emission inventories provided by the National Acid Precipitation Assessment Program (NAPAP) 1985 data base to be episode specific. In addition, ROM was used to simulate several control strategies specified by the Vice President's Task Force on Alternative Fuels as well as to address several strategy issues involving control of volatile organic compounds, nitrogen oxides, or both.

The Aerometric Information Reporting System (AIRS) is an integrated data system being developed by EPA to entirely replace the existing data bases, files, and software now used by EPA for storing and retrieving ambient air quality data, stationary source emissions, and compliance data. Full implementation in 28 States of the air quality component of AIRS was accomplished by October 1988 with training, user manuals, and troubleshooting services being provided to the user community.

Also in 1988, EPA continued to publish revisions to emission factors for use by States and others to estimate source emissions and to compile emission inventories. Most of the revisions involve additions of size-specific emission factors, with emphasis on $PM_{10}$, for use in implementing the new $PM_{10}$ ambient air quality standard promulgated in 1987.

## C. AIR POLLUTION RESEARCH PROGRAMS

The EPA conducted a number of research activities in 1988 to support various air pollution control programs. Research was conducted to support the development and review of national ambient air quality standards, to develop new source performance standards and State implementation plans, and to support regulations for hazardous air pollutants. Research was also conducted to support the EPA mobile source regulatory program, the indoor air pollution program, the radon program, the stratospheric ozone program, and the Agency's global warming program. Considerable research was also conducted by EPA in 1988 in the area of acid deposition.

In the area of research support to the national ambient air quality standards process in 1988, EPA drafted revisions to the criteria document for carbon monoxide and continued work on revisions of the criteria documents for oxides of nitrogen (NOx). An issue paper on the health effects of acid aerosols was reviewed by both the public and the Clean Air Scientific Advisory Committee. The third in a series of highly successful international symposia under a U.S.-Dutch memorandum of understanding was held in the Netherlands and addressed ozone research and policy development aspects, including coverage of both tropospheric ozone and stratospheric ozone depletion. Five additional monitoring methods for criteria pollutants (two for carbon monoxide, three for lead) were designated as reference or equivalent methods and an EPA committee evaluated the issue of uncertainty in measurement data produced by $PM_{10}$ samplers. Two reports describing wind tunnel testing of $PM_{10}$ samplers were prepared and a test site for the evaluation of continuous or automated $PM_{10}$ samplers was established in Birmingham, Alabama. Nonmethane organic compound (NMOC) monitoring was carried out at 45 sites during the summer of 1988 (fifth year) to assist States in meeting the national ambient air quality standards for ozone. The EPA national ambient air audit program was expanded by the addition of mailable and rugged audit devices for ozone, nitrogen dioxide, and dichotomous flow (in $PM_{10}$ samplers). During 1988, the Eastern Fine Particle Visibility Monitoring Network established a five site network to study the relationships between fine particle composition and regional haze. A chronic (18 month) inhalation study in which rats breathed $O_3$ or $NO_2$ in a diurnal pattern which simulated urban smog profiles in polluted cities was in process in 1988. In addition, in response to findings that ozone levels in the air of major cities usually follow a pattern of 4-8 hour peak values, studies were initiated to address the adequacy of the 1 hour national ambient air quality standard for ozone.

The EPA conducted several research programs in 1988 related to assisting in the development of new source performance standards and State implementation plans. The second generation Regional Oxidant Model (ROM2), under development and testing over the last few years, became operational in 1988 and applications were begun for the northeastern United States. Work continued on the development of the Regional Particulate Model which will be used to assist in the formation of revised standards for inhal-

able particulate matter, visibility, and acid aerosols. The user's guide for the Complex Terrain Dispersion Model (CTDM) was published and an examination and assessment was conducted of the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP) in order to improve the transfer of air quality models to the user community. A study was prepared that summarized all available published and unpublished results on the source apportionment of ambient fine particle extractable organic matter and related mutagenicity from measurements made in three U.S. cities under the Integrated Air Cancer Project. Research was conducted to demonstrate the effectiveness of using the low NOx burner designed for heavy oil to applications involving the incineration of nitrogenated wastes.

The EPA also conducted numerous research activities in 1988 related to the control of hazardous air pollutants. Several health assessment documents and Tier I health assessment summaries were in various stages of completion during the year. Also initiated were an updated risk assessment for both carcinogenic and non-carcinogenic effects of diesel emissions, and an evaluation of health risks associated with incineration of hospital wastes. The first year's monitoring for 36 toxic compounds was completed in support of EPA's Urban Air Toxic Monitoring Program. As part of a joint US-USSR air pollution study, EPA scientists in September 1988 measured the levels of volatile organic compounds, polynuclear aromatic hydrocarbons, nitrogen dioxide, formaldehyde, and several trace elements along the Kiev Highway in Leningrad, USSR. Development and validation of stationary source emission methods for butadiene, ethylene oxide, and methylene chloride were completed and published and studies to develop methods for acrylonitrile, carbon tetrachloride, chloroform, and formaldehyde were also conducted. Five new peer-reviewed sampling and analytical methods for various toxic organic pollutants were added to the compendium of methods for toxic organic pollutants in ambient air. Ambient air quality measurements for a variety of volatile organic compounds of interest were collected through the Toxic Air Monitoring Stations (TAMS) program. The National Ambient Volatile Organic Compounds Data Base has been updated as the result of an ongoing effort to gather, evaluate, and compile the measured concentrations of a large variety of volatile organic compounds (VOC's) including hazardous compounds. A VOC commuter exposure study was performed during late 1988 in Raleigh, North Carolina, in order to determine exposure levels to selected organic and inorganic

pollutants during automobile driving and to evaluate sources for these chemicals within the automobile interior. The first full scale Integrated Air Cancer Project conducted in Boise, Idaho, was completed in 1988; the impact of woodsmoke and mobile sources on the organicist and mutagenicity of the airshed were characterized and assessed. Environmental engineering studies and field tests were conducted to support development of air emission regulations for municipal waste combustion facilities.

Numerous EPA research activities were related to mobile source emissions in 1988. The EPA continued to assess human exposure to automobile-related pollutants and to compile a baseline of ambient formaldehyde and other aldehydes as part of monitoring studies for reference to judge the possible impact of changing fuel mixture. Research was conducted to examine the sensitivity of tailpipe emissions from late model gasoline motor vehicles to variations in ambient temperature; the data indicate significant increases of total hydrocarbons (THC) and CO emissions as ambient temperature decreased. Extensive research was conducted to determine the threshold levels of carboxyhemoglobin that produce health effects in susceptible populations.

In 1988, EPA continued to support research related to indoor air quality. Research related to monitoring and exposure activities on an advanced indoor air quality model developed by EPA and the National Bureau of Standards, a compendium of standard indoor air monitoring methods to be used widely in the indoor air research and diagnostic community, the development of advanced monitoring and analytical methods, and a demonstration building investigation study at the Library of Congress. Exposure-dosimetry studies of environmental tobacco smoke were conducted in the normal indoor exposure environments (day care and home) and controlled chamber environments of preschool children. Research studies were conducted on human response to gas phase organic compounds found in the indoor environment, children exposed to environmental tobacco smoke, the mutagenic potency of the emissions from unvented kerosene heaters, and animal testing procedures to better study a range of health effects such as reproductive and developmental effects, obstructive lung disease, and general respiratory irritation.

In 1988, radon mitigation research focused on field testing of reduction measures in existing houses; initial testing of reduction measures in schools; and testing of features incor-

porated into new homes during construction to prevent radon entry. Technical guidance manuals describing the radon reduction measures investigated for both existing houses and new construction were issued for use by home owners, builders, and state/local officials.

In the area of stratospheric ozone, the largest part of the EPA's stratospheric ozone research program in 1988 consisted of research on the effects of radiation in the 290-320 nanometer waveband (UV-B radiation) on ecological systems, including agroecosystems and silvaculture systems. In an effort to reduce the amount of stratospheric ozone depleting chlorofluorocarbons (CFC's) released during the servicing of auto air conditioners, a project was initiated in the summer of 1988 to determine the acceptability of recovering and reusing the CFC refrigerant. A cooperative study with the Electric Power Research Institute was initiated in 1988 to evaluate new chemicals thought to have good potential for replacing existing ozone depleting CFC's and halons.

The EPA's research program related to global warming is aimed at evaluating potential changes in the environment associated with changes in the climate system. A major report published by EPA in 1988 described the possible interactions between climate change and atmospheric chemistry that need investigation on both local and/or regional and global scales. In addition, the EPA co-sponsored an international workshop in Paris in June 1988 to solicit research efforts to further characterize direct nitrogen dioxide (N2O) emissions from fossil fuel combustion and studies were conducted to characterize the direct emissions of N2O from stationary combustion sources.

The EPA also conducted numerous research activities in 1988 related to acid deposition. The 1985 National Acid Precipitation Assessment Program (NAPAP) emissions inventory was compiled and distributed for use by atmospheric chemists and policy analysts; these data supplant the 1980 data for use in acid deposition and oxidant scientific and regulatory studies. Emission projection models were also advanced in 1988 to forecast emissions into the future given various energy, economic, and societal assumptions.

In 1988, work continued on development of the ADVACATE process, an EPA-conceived technology designed for removal of SOx from either new or existing coal-fired boilers. The National Stream Survey-Phase I (NSS-I) was conducted in the Mid-Atlantic

and Southeast regions of the United States as part of the National Surface Water Survey; the NSS-I focused on regions of the United States where, on a national scale, acidic deposition rates are relatively high. The Episodic Response Project was initiated in 1988 to examine episodic acidification and associated biological effects in streams of the Northern Appalachian Plateau of Pennsylvania and the Catskills and Adirondacks of New York. Sampling strategies for the detection of long-term trends in surface water acidification were analyzed as part of the Temporally Integrated Monitoring of Ecosystems Project. Forty-nine lakes in the Upper Peninsula of Michigan were surveyed to evaluate the status of fish communities in the region relative to potential effects from acidic deposition. The EPA continued its Direct/Delayed Response Project in 1988 which focuses on chronic sulfate deposition effects to determine the rate at which average annual surface water acid neutralizing capacity might be expected to reach zero, given various rates of sulfate deposition. The joint US EPA/USDA Forest Service Forest Response Program continued to research the effects of acidic deposition on Southern commercial pine forests, spruce/fir forests, western coniferous forests, and eastern hardwood forests.

## D. DEVELOPMENT OF NATIONAL AMBIENT AIR QUALITY STANDARDS

The 1977 Clean Air Act Amendments require EPA regularly to review, and where necessary revise, the national ambient air quality standards. During 1988 all six air quality standards were under active review along with a candidate new standard, acid aerosols.

On April 26, 1988, EPA announced its proposed decision not to revise the national ambient air quality standards for sulfur oxides (sulfur dioxide). In that same notice, EPA also sought public comment on the alternative of establishing a new 1-hour standard of 0.4 ppm and making certain revisions to the existing standards. The notice also proposed revisions to the 24-hour significant harm level and proposed a new short-term significant harm level. The comment period on the proposals closed in November 1988.

At a meeting held in December 1988, the Clean Air Scientific Advisory Committee (CASAC) recommended a more stringent welfare air quality standard for ozone but was split on whether to retain or tighten the health standard. Most CASAC members also indi-

cated it was premature to set a longer-term health standard. The EPA will consider modifications to the ozone air quality standards after receiving written recommendations from the CASAC.

Activities in 1988 related to the review of the NAAQS for lead focused on completion and review of a draft report detailing methodologies for multi-media lead exposure analyses and their validation. A CASAC subcommittee completed its review of the draft report in October 1988. Results of exposure analyses using these methodologies will be incorporated into the lead staff paper as part of the overall risk assessment on alternative lead standards. It is anticipated that CASAC will review a revised draft of the lead staff paper in early 1989.

On July 1, 1987, EPA published an advance notice of proposed rulemaking soliciting public comment regarding the development of a new secondary ambient air quality standard for fine particles (those particles less than 2.5 micrometers in aerodynamic diameter). In 1988, EPA reviewed the comments received from the notice. In a related area, the EPA also held the first meeting of the CASAC visibility research subcommittee in 1988. This subcommittee will review current scientific knowledge related to visibility as well as related ongoing research activities in order to advise EPA on future research priorities.

With regard to reviews of the carbon monoxide and nitrogen dioxide air quality standards, EPA began the process of preparing a new criteria document for carbon monoxide in 1987. An external review draft of the revised criteria document is scheduled to be available for public review in 1989. An external review draft of the revised nitrogen dioxide criteria document is scheduled to be available for public review in 1990.

Also during 1988, EPA completed and released for public review a draft document entitled "Acid Aerosols Issue Paper." The document, prepared in response to CASAC recommendations, evaluates emerging health effects literature to assist Committee deliberations on whether or not acid aerosols warrant listing as a criteria pollutant. After reviewing the document and research needs at a June meeting, a CASAC subcommittee made a recommendation that EPA consider listing acid aerosols. On October 6 the full CASAC met to discuss the subcommittee's recommendations. The full committee did not recommend EPA consider listing at that time. Instead, CASAC recommended proceeding on several fronts to fill critical information gaps.

## E. ASSESSMENT AND CONTROL OF TOXIC AIR POLLUTANTS

In 1988, EPA continued to implement an active program to screen and assess potentially toxic air pollutants for possible regulation under the Clean Air Act or other environmental authorities.

The EPA initiated a shift in the emphasis of the air toxics assessment program from a pollutant basis to a source category basis. The objectives of the change were to provide a broader focus on source category emissions, to focus assessments on the most likely regulatory candidates (source categories), and to accelerate the assessment process. During 1988, a comprehensive list of stationary source categories and an accompanying ranking methodology were developed. With the development of the source category ranking system, decisions on several pollutants in preliminary assessment were deferred pending consideration as constituents of source category emissions. A decision not to pursue Federal regulation of naphthalene was published and 10 pollutants remained in various stages of assessment.

In July 1987, the Circuit Court of Appeals for the District of Columbia vacated EPA's 1985 withdrawal of a proposed revision of the NESHAP for vinyl chloride. During 1988, EPA worked on preparing a NESHAP policy that would be consistent with the Court's decision. In June 1984, the EPA promulgated a NESHAP for benzene equipment leaks and withdraw proposed NESHAP's for benzene emissions from maleic anhydride plants, ethylbenzene/ styrene plants, and benzene storage tanks. Following the above mentioned vinyl chloride decision, EPA requested and was granted a voluntary remand of the benzene NESHAP to reconsider the three withdrawn proposals and the benzene fugitive NESHAP. The EPA's proposed response to the remand was published on July 28, 1988. The final response, scheduled to be published in 1989, will form the policy basis for NESHAP for other source categories.

Work on a comprehensive asbestos NESHAP revision was delayed in 1988 pending a decision on how to implement the court's ruling on vinyl chloride. The EPA proposed rules related to improved enforceability of the asbestos NESHAP in January 1989. During 1988, NESHAP development continued for chromium emissions from electroplating and industrial cooling towers, and a proposed regulation to prohibit the use of chromium in comfort cooling towers was published under the authority of the Toxic Substances Control Act.

In 1988, EPA accepted a voluntary remand of all radionuclide NESHAP. Work continued to repropose regulatory decisions for 12 radionuclide source categories: Nuclear Regulatory Commission (NRC) licenses, Department of Energy (DOE) facilities, radon emissions from DOE facilities, high-level waste facilities, uranium fuel cycle facilities, elemental phosphorus plants, coal-fired boilers, underground uranium mines, open pit uranium mines, phosphogypsum piles, active mill tailing piles, and disposed mill tailings.

Decisions on which source categories of cadmium warrant regulation were still under consideration by EPA in 1988. Work continued in 1988 on a rule to regulate emissions from new and modified municipal waste combustion (MWC) units using new source performance standards. Similarly, work continued on a rule to regulate emissions from new and modified municipal landfills using new source performance standards.

The Resource Conservation and Recovery Act (RCRA) requires EPA to promulgate such regulations for the monitoring and control of air emissions at hazardous waste treatment, storage, and disposal facilities (TSDF's) as may be necessary to protect human health and the environment. Current EPA plans call for development of regulations for these facilities in three phases. The first group of standards addresses sources for which EPA can develop standards relatively quickly because similar sources have already been regulated under the Clean Air Act. These standards address air emission vent and fugitive emissions from some of the treatment devices that will be used to meet the RCRA land disposal restrictions. These standards were proposed in 1987 and are scheduled to be promulgated in 1989. The second group of standards, which addresses the bulk of the sources, is scheduled for proposal in 1989. The third group of regulations will cover certain subsets of the source categories for which EPA will likely be unable to develop rules during the second round.

In 1988, EPA continued to pursue that portion of its overall strategy to control emissions of air toxics that provides State and local air pollution control agencies with funding and technical support to evaluate specific point sources. Sources that are candidates for this program include those that have been identified through the Federal toxic air pollutant assessment program as well as those certified by State and local air

pollution control agencies. Funding was provided for 17 State and local evaluations of potential high risk point sources in a variety of source categories in 1988.

In 1986, EPA initiated planning activities to encourage States to undertake new efforts toward assessing the scope and seriousness of current exposures to the mixtures of air toxic compounds which are believed commonplace in large metropolitan areas. The EPA continued in 1988 to provide funds under section 105 of the Clean Air Act and technical assistance to States to encourage them to undertake such assessment efforts in a number of areas.

The EPA has established a goal to have quality programs in every State and major local agency that are adequate to carry out certain roles envisioned within the national air toxics strategy. During 1988, progress continued to be made toward meeting this goal. The progress was in part due to EPA's program to enhance State and local program development. This program uses available grant funds to promote multi-year planning on the part of State and local agencies and subsequent implementation of these plans for building their air toxics capabilities and programs. To assist in implementation of multi-year development plan activities, EPA expanded its program of technical support in 1988. First, EPA continued its practice of developing and distributing technical assistance documents for assisting State and local agencies to estimate air toxics emissions. Next, EPA's Control Technology Center (CTC) continued in full operation in 1988 and activities of the National Air Toxics Information Clearinghouse (NATICH) were also continued.

Another information center, the Air Risk Information Center (Air RISC) became operational in 1988. In addition, a series of national workshops in three subject areas were conducted in partnership with the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) to assist State and local agencies in program development and implementation.

## F. STATUS OF AIR QUALITY MANAGEMENT PROGRAMS

In 1987, EPA developed a proposed policy on how to treat areas which had not attained the ozone and carbon monoxide air quality standards by December 31, 1987. The proposed policy was

published in the Federal Register in November 1987 and work to complete the policy continued during 1988. In a related area, because of concerns that EPA might act to impose sanctions on States for nonattainment of air quality standards and uncertainty whether the Clean Air Act required EPA to do so, Congress enacted the Mitchell-Conte Amendment to the Budget Reconciliation Act of 1987 which postponed EPA implementation of sanctions until August 31, 1988. When the Mitchell-Conte deferral of sanctions expired, construction sanctions were imposed in Los Angeles, CA; Ventura County, CA; Sacramento, CA; and both the Illinois and Indiana portions of the Chicago metropolitan area as a result of litigation against EPA. The construction moratorium in these areas applies to major volatile organic compounds (VOC) sources plus major carbon monoxide (CO) sources in Los Angeles. These areas were some of the ones for which EPA proposed sanctions in a Federal Register notice dated July 14, 1987.

The Clean Air Act requires EPA to develop Federal Implementation Plans (FIP's) when a State fails to submit a SIP, if the SIP is inadequate, or if the State fails to revise its SIP when required by EPA to do so. In 1988, because of litigation by interested parties, EPA was working on FIP's in several areas. These areas include the South Coast Air Basin (Los Angeles), CA; Ventura County, CA; Sacramento, CA; and Chicago, IL (including the Indiana portion of the Chicago metropolitan area).

Section 110(a)(2)(H) of the Clean Air Act allows EPA to notify a State whenever the SIP is deemed "substantially inadequate" to provide for attainment of the NAAQS. On May 26, 1988, the EPA Regional Administrators sent letters to the Governors of 42 States and the Mayor of the District of Columbia notifying them that their air pollution control plans for achieving the ozone and/or carbon monoxide standards were found to be substantially inadequate and that revisions were necessary. The inadequacy of the SIP's was based upon failure to attain these standards by December 31, 1987, as specified in the Clean Air Act and was based upon ozone and carbon monoxide air quality data through 1987.

The EPA published revised implementation regulations and guidance for particulate matter on July 1, 1987 in conjunction with revisions to the national ambient air quality standards (NAAQS) for particulate matter ($PM_{10}$). As States began revising

their particulate matter SIP's, it became apparent that some areas with sources which are very difficult to control or those sources whose controls would be potentially disruptive to present lifestyles would not be able to attain the standards in three to five years, as required by the Clean Air Act. Therefore, in 1988, EPA developed a long-term nonattainment policy to provide general guidance for reviewing those SIP's which will not be able to persuasively demonstrate attainment of the NAAQS within three-five years. In addition, EPA began developing policies in 1988 for addressing attainment issues for specific particulate matter source categories. The first in a series of guidance documents on the control of open fugitive dust sources was issued and development of a similar document for residential wood combustion was begun. On July 1, 1987, EPA solicited comments on alternative SIP requirements for rural fugitive dust areas and on the adequacy of the criteria used to identify such areas. In 1988, EPA formed an interagency work group to address the issues related to revising the rural fugitive dust policy as it pertains to $PM_{10}$. The work group made progress in 1988 toward defining the criteria for a rural fugitive dust area and identifying control requirements appropriate for these areas.

The EPA's $PM_{10}$ implementation regulations do not require States to develop a full attainment demonstration and control strategy for every area of the country since an analysis of ambient particulate matter data for 1984-1986 indicated that less than 5 percent of the 3141 counties in the United States may have $PM_{10}$ concentrations above the NAAQS. Consequently, EPA placed all areas of the country into one of three groups to prioritize the review and revision of existing SIP requirements for particulate matter. The grouping was based upon the probability of violating the $PM_{10}$ air quality standards. Group I areas are those having a very high probability of violating the $PM_{10}$ standards. Group II areas have a moderate probability of violating the standards, and Group III areas are those EPA believes are already attaining and can maintain the standards. Completed SIP's were submitted to EPA for two Group I areas by the end of 1988 and draft SIP's were submitted for 20 additional areas. A total of 59 Group I areas were identified initially. Final SIP's for 95 of the 112 Group II areas were submitted to EPA in 1988. There are 56 Group III areas each of which requires revisions to State regulations to facilitate implementation of the $PM_{10}$ NAAQS. Revisions were completed by 18 States and the territory of Puerto Rico in 1988. Draft SIP revisions were submitted to EPA for 13 additional States in 1988.

Starting in July 1985 and ending in 1986, EPA promulgated FIP's for new source review and monitoring for those States which had not submitted SIP's for visibility protection in Class I prevention of significant deterioration (PSD) areas in accordance with EPA regulations promulgated in 1980 to implement section 169A of the Clean Air Act. To implement the monitoring program, EPA, the National Park Service (NPS), the Bureau of Land Management, the Fish and Wildlife Service, and the U.S. Forest Service established the IMPROVE (Interagency Monitoring of Protected Visual Environments) network. Since many of the Class I areas are national parks or monuments, NPS accepted the responsibility for operating the network and has provided the major funding for it since its inception in 1987. Implementation of the planned monitoring network continued during 1987 and 1988, and all sites will be operational in 1989. Also with regard to visibility protection, on September 15, 1988, EPA proposed to find that controls were not necessary to remedy plume-blight-type visibility impairment in 4 Class I areas.

The EPA issued regulations in 1982 and in 1985 restricting the use of tall stacks and other dispersion techniques which otherwise might be used to avoid constant emission controls. These regulations implement section 123 of the 1977 Clean Air Act Amendments. In January 1988, the U.S. Court of Appeals issued its opinion upholding EPA's regulations except for three provisions, which were remanded for further consideration and rulemaking. The EPA continued to work on a response to this remand during 1988. In March 1988, 5 petitions for rehearing were filed with the U.S. Court of Appeals, but were denied in April 1988. In June and July 1988, several industrial petitioners sought review by the U.S. Supreme Court of the Court of Appeals decision. In October 1988, the U.S. Supreme Court declined to review the case.

In July 1982, the Natural Resources Defense Council (NRDC) filed suit to require EPA to approve, or disapprove and promulgate, SIP's for lead for States that had not submitted adequate plans. The EPA negotiated a settlement with NRDC giving States and EPA additional time for completing the SIP's. In 1988, EPA approved SIP's for lead for 5 States. At the end of 1988, only 1 lead SIP included in the NRDC agreement was still outstanding.

In 1986, the Sierra Club and other environmental groups filed suit to force EPA to develop PSD regulations for NOx, as required by section 166 of the Clean Air Act Amendments of 1977.

In April 1987, the court ordered EPA to develop PSD regulations for NOx on an expedited schedule. The final rules were published in the Federal Register on October 17, 1988. The rules become effective on October 17, 1989, one year after promulgation, as required by the Clean Air Act.

Prompted by concern for SIP processing delays and the negative effect of these delays on EPA's relationship with State and local control agencies, EPA established a task group in 1987 to identify problems in, and recommend changes to, the SIP review process. An intra-Agency task force was formed to implement the recommendations contained in the task group report. As a result of the recommendations and implementation discussions, EPA undertook two actions in 1988 to improve the general SIP review process. In the first, guidance on "completeness criteria" was issued in March 1988 to the EPA Regional Offices. The objective of this guidance is to ensure that SIP packages submitted by the State are complete from the perspective of EPA review. In a second action, EPA issued a policy in June 1988 permitting the grandfathering of certain SIP actions from meeting the requirements of recently issued EPA policies. Where approval of such action has no significant or lasting environmental impact, grandfathering the action may better serve EPA-State relations and avoid additional, but unnecessary, work by the States.

## G. CONTROL OF STATIONARY SOURCE EMISSIONS

In 1988, work progressed on the development of emissions standards for those major source categories not yet regulated under new source performance standards (NSPS) and on the revision of various NSPS as appropriate. During 1988, NSPS were promulgated for emissions of volatile organic compounds from magnetic tape manufacturing, petroleum refinery wastewater systems, plastic business machinery, and residential wood combustion. The existing NSPS for portland cement plants and sewage sludge incineration were revised.

The EPA established the Best Available Control Technology/ Lowest Achievable Emission Rate (BACT/LAER) Clearinghouse several years ago in order to assist State and local air pollution control agencies by promoting the sharing of air pollution control technology information. The primary output of the Clearinghouse is an annual report of information about BACT/LAER determinations made by the various control agencies. The report published in 1988 contains over 1700 BACT/LAER determinations.

The Control Technology Center (CTC) completed its second full year of operation in 1988. The CTC supports the implementation of State and local air pollution programs by providing technical assistance and support on assessing and controlling emissions from stationary sources. While the major portion of the CTC's assistance efforts in 1988 was related to air toxics, the CTC responded to a significant number of requests for volatile organic compounds and other criteria pollutants as well.

## H. STATIONARY SOURCE COMPLIANCE

The EPA conducted a number of activities in 1988 to assure that stationary sources of air pollution comply with emission standards. To do this, EPA currently monitors the compliance status of approximately 35,000 stationary sources of air pollution. At the end of 1988, compliance rates were 85.7 percent for Class A SIP sources, 88.3 percent for NSPS sources, and 89.4 percent for NESHAP sources.

States conducted 34,263 inspections and source tests in 1988 and source owners conducted an additional 1157 State-observed source tests. In addition, EPA conducted 2296 inspections and source tests in 1988. During 1988, EPA and States issued immediate compliance orders under section 113(a) of the Act (or a State equivalent) to 1272 stationary sources. One delayed compliance order under section 113(d) was issued. In addition, a total of 119 noncompliance penalty cases were initiated under section 120 or its State equivalent in 1988. A total of 133 Federal and State civil actions were filed in 1988 against stationary sources for violations of the Act and EPA filed 10 criminal actions in 1988, all against violators of asbestos emission standards.

In 1988, EPA continued a high level of activity in regulating the demolition and removal of asbestos-containing material from buildings under the asbestos NESHAP. In fiscal year 1988, EPA and the States received 52,571 asbestos demolition and renovation notifications (an increase of 21 percent over 1987), conducted 20,275 inspections, and discovered 3,799 violations.

A number of significant judicial actions related to stationary source compliance occurred in 1988. In United States v. Alcan Foil Products, the district court ruled on the issue of

whether EPA can use section 223 of the Clean Air Act to enforce the currently approved State implementation plan while a State is trying to change the regulation. The court barred enforcement when the notice of violation was served more than 4 months after the proposal. In United States v. Arkwright, Inc., the court held that the Agency's failure to meet the four month deadline to act on a proposed SIP revision does not bar enforcement using section 113 of the Clean Air Act if the notice of violation was issued before the four-month period had expired. Numerous other judicial decisions were rendered in 1988 relating to EPA's asbestos NESHAP, Best Available Control Technology (BACT) determinations, noncompliance penalties, and violations of the Clean Air Act by defense contractors.

In March 1988, EPA issued two new strategies related to conducting source inspections. Those strategies, the Compliance Monitoring Strategy and the Revised Asbestos Strategy, are to be implemented during fiscal year 1989. In addition in 1988, EPA provided technical information related to source compliance with VOC regulations and initiated numerous studies dealing with VOC rule effectiveness. In addition, EPA has continued to support the use of Continuous Emission Monitoring Systems (CEMS) in 1988 as an important tool to promote continuous compliance of sources. On March 31, 1988, the "OAQPS CEMS Policy" was reissued to promote and encourage the utilization of CEMS data as a compliance assessment method. Also on March 31, 1988, EPA issued an interim control policy for sources that are under order to replace or upgrade existing control equipment. A fundamental principle of this policy is that the source must maintain continuous compliance after the new or rebuilt equipment becomes operational.

A total of 414 Class A SIP, NSPS, and NESHAP Federal facilities are tracked in the air program. As of January 1989, 329 (79 percent) were in compliance.

Section 306 of the Clean Air Act and Executive Order 11738 authorize EPA to bar facilities which deliberately or repeatedly violate the Clean Air Act from receiving future contracts, grants, or loans from any Federal agency or branch of the military services. During 1988, 5 facilities were recommended for inclusion on EPA's list of violating facilities for Clean Air Act violations. Two of these facilities are demolition and renovation companies with a long history of asbestos standard violations.

## I. CONTROL OF MOBILE SOURCE EMISSIONS

The EPA made significant progress in 1988 in implementing its mobile source control program. With the increased focus on reducing ozone levels, EPA has continued work on several areas directly aimed at this goal. One of the key actions is conrolling excess evaporative emissions through regulation of in-use gasoline volatility. In 1988, EPA continued work to complete a rule proposed in 1987 on gasoline volatility; a final rule is expected in 1989. In addition, EPA continued work on the rule establishing refueling emission standards for automobiles Another ozone-related action taken by EPA in 1988 was the development of a notice of proposed rulemaking which will tighten the light-duty truck exhaust hydrocarbon and carbon monoxide standards. Publi- cation of the proposal is expected in 1989.

Several EPA initiatives were related to vehicle fuels in 1988. One of these was the continued development of a notice of proposed rulemaking to control sulfur and aromatics content of diesel fuel. Another was the continued investigation of the roles of all sources of formaldehyde exposure, as well as the need for control.

The lead phasedown program required by EPA continues to achieve significant reductions in the use of lead in gasoline, from six billion grams in 1987 to two billion in 1988. This represents a 99% decrease from the 206 billion grams of lead which were used in gasoline in 1973. In 1988, EPA issued a report to the President and Congress on the use of low-leaded gasoline (0.10 gram per leaded gallon) and unleaded gasoline in agricultural equipment designed for leaded gasoline, as required by the 1985 Farm Bill. EPA also held a public workshop to discuss valve protection for agricultural equipment and certain other equipment designed for leaded gasoline.

The EPA pursued several other mobile source regulatory activities in 1988. In anticipation of the development of methanol as motor vehicle fuel, EPA moved forward in the development of emission standards for methanol-fueled vehicles. The EPA developed a proposed rulemaking to permit the banking and trading of oxides of nitrogen and particulate matter emission credits among heavy-duty gasoline, methanol and petroleum-fueled diesel engine manufacturers. The EPA continued to promulgate

nonconformance penalties for those heavy-duty engine families unable to meet certain standards applicable to a given model year. A proposal to increase the stringency of the 1991 light-duty diesel truck particulate standard for light-duty trucks with heavy-duty engines and to propose nonconformance penalties was published in 1988.

One of EPA's key techniques for assuring the compliance of vehicles with the motor vehicle emissions standards is the preproduction certification program. Initiated in 1968, the program involves the engineering review and testing by EPA staff of engine families representing new vehicles which are to be sold in the United States. The EPA's National Motor Vehicle Emission Laboratory performed over 950 emission tests on 500 preproduction prototype vehicles in 1988.

An effective strategy for dealing with in-use emissions problems is the establishment of motor vehicle inspection and maintenance (I/M) programs. In 1988, EPA continued to promote the implementation of I/M programs in each locality where they were needed. By the end of the year, 64 areas had initiated programs. To assure that operating I/M and antitampering programs actually achieve the planned emission reductions, EPA has initiated a systematic I/M auditing plan. EPA conducted 14 audits during 1988. In addition to I/M programs, EPA has promoted the implementation of State and local antitampering and anti-fuel switching enforcement programs. By the end of 1988, 42 programs were operational.

The EPA mobile source enforcement program is directed primarily toward achieving compliance with motor vehicle emissions standards and fuel regulations as required by the Clean Air Act. In order to assure that production vehicles and heavy-duty engines are built in accordance with emissions standards, EPA conducts Selective Enforcement Audit (SEA) test programs at manufacturers' facilities. In 1988, EPA conducted 20 SEA'S, including three light-duty audits at foreign manufacturer's facilities located in the U.S., and four heavy-duty engine audits. Section 207(c) of the Clean Air Act authorizes EPA to order the recall of vehicles if a substantial number of any class of vehicles do not conform to emissions standards during their useful lives. During 1988, a total of 2,364,200 vehicles were recalled as a result of EPA investigations. In the same period,

manufacturers voluntarily recalled an additional 904,100 vehicles to correct emissions problems. The EPA has continued its aggressive lead phasedown enforcement activities. In 1988, 34 Notices of Violation (NOV) were issued against refiners/importers under the lead phasedown program, with penalties of over $9.5 million.

The EPA is also responsible for carrying out programs designed to deter tampering with vehicle emissions control systems or using leaded fuel in vehicles which require unleaded fuel. Surveys undertaken by EPA in 1988 show that tampering and fuel switching are continuing serious problems which undermine the emissions control performance of many in-use vehicles. EPA also continued tampering and fuel-switching enforcement. In 1988, 215 NOV's were issued with penalties of over $2 million. EPA also continued a "traffic ticket" program for single instances of equipping a leaded pump with a smaller nozzle that facilitates misfueling of unleaded vehicles. Forty-nine such tickets were issued in 1988.

In addition, EPA is responsible for assessing whether the Federal emission warranty requirements of sections 207(a) and (b) of the Act are implemented. While EPA continued to respond to inquiries from the public, it also issued a Notice of Violation to Ford Motor Company for violations of warranty provisions.

The control of emissions from imported vehicles that are not built to meet United States standards has become a major issue in recent years. In 1988, EPA received 15,000 applications and 31,000 inquiries concerning these automobiles. Also in 1988, EPA implemented new regulations controlling these automobiles. The goal of these rules is to streamline the process for demonstrating compliance with Federal emission requirements. The EPA has also been investigating various laboratories and Independent Commercial Importers to ensure that nonconforming vehicles have been properly imported and demonstrate conformity with Federal emission requirements. In 1988, EPA successfully prosecuted two laboratories resulting in 10 individual convictions and one corporate conviction for falsifying test results.

## J. STRATOSPHERIC OZONE PROTECTION AND GLOBAL CLIMATE CHANGE

The EPA has been responding to growing scientific evidence linking increased levels of chlorine and bromine to depletion of the stratospheric ozone layer. If substantial stratospheric ozone depletion occurs, increased levels of harmful ultraviolet

radiation would penetrate to the earth's surface, resulting in substantial damage to human health and the environment. On August 12, 1988, EPA issued final regulations pursuant to section 157(b) of the Clean Air Act to implement the Montreal Protocol on Substances that Deplete the Ozone Layer. By the end of January 1989, this landmark international agreement had been ratified by 26 nations representing about 90 percent of global consumption of chlorofluorocarbons (CFC's) and halons. The Protocol entered into force on January 1, 1989 and calls for a 50 percent reduction in CFC production from 1986 levels phased-in over the next 10 years and a phased-in freeze in halons beginning in 1992.

The EPA also initiated a series of studies in 1988 related to global warming. These studies examine the efforts to achieve air quality (e.g., ground level ozone and acid rain) under global warming scenarios. They also include studies related to future growth in methane (a greenhouse gas) and possible technological changes to reduce emissions of this gas.

## K. INDOOR AIR QUALITY

Activities undertaken by EPA in 1988 to resolve issues about the long-term Federal role with regard to indoor air quality included submittal of a report to Congress, as required by SARA Title IV, that outlined the EPA program on indoor air quality for the next two years, and preparation of another report to Congress, also required by SARA Title IV, that describes the activities that EPA has carried out under SARA and that makes recommendations regarding the Federal role in indoor air quality. In addition, several actions were taken by EPA in 1988 to coordinate indoor air activities by governmental and private sector organizations, including publication of a compilation of the indoor air activities under way across the Federal government, conducting a survey of the private sector firms offering indoor air quality diagnostic and mitigation services to the public to begin to identify and evaluate the capability of the private sector to address indoor air problems in a variety of buildings, and publication of a directory of State indoor air contacts, under a cooperative agreement with the Public Health Foundation, that lists State agency contacts for up to 16 different indoor air quality issues. In addition, EPA produced a number of information documents in 1988 related to indoor air quality.

## L. ACID DEPOSITION

In 1988, EPA completed two reports on implementation issues associated with potential acid deposition control programs. The two projects are important in that they examine the issues that will be faced by State agencies in trying to implement control strategies before a control program (either legislative or statutory) is in place. The two reports are "Final Report of the State Acid Rain (STAR) Program," and "Acid Rain Legislation and Utility Commission Regulation." The final STAR report documents the results and findings of a four-year, $3 million effort in which States identified and explored potential issues associated with the implementation of any major effort to control acid deposition. The second report, relating to utility commissions, was motivated by a recognition on the part of EPA of the importance of electric utilities in controlling acid deposition precursors, the complexity of the utility regulatory process, and the potential impact that Federal acid deposition legislation could have on the electric utility industry and its regulation.

In the area of research, EPA continued to fund work being carried out under the auspices of the National Acid Precipitation Assessment Program (NAPAP). A draft plan for the final NAPAP Integrated Assessment was completed in October 1988, and a public review and comment meeting was held on the plan in November. In addition, in 1988, EPA continued to participate in the Department of Energy (DOE)-led Clean Coal Technology (CCT) program through the Agency's membership on the Innovative Control Technology Advisory Panel.

Also in 1988, EPA received two petitions asking the Agency to initiate rulemaking under section 115 of the Clean Air Act, which deals with international air pollution. The petitions are aimed at achieving emission reductions in the U.S. that would benefit Canada by reducing damage to Canada's environment from air pollution that presumably originates in the U.S. By the end of 1988, EPA had not reached a final decision on granting or denying the petitions.

## M. RADON ASSESSMENT AND REMEDIATION

In September 1988, EPA and the Public Health Service issued a National Health Advisory on radon and recommended that most homes be tested. This recommendation was based on findings of

EPA's 1988 State Radon Survey, which identified radon screening levels above 4 picocuries per liter, the level at which EPA recommends corrective action, in nearly one of every three homes in the seven States surveyed. As a result of the strong public interest generated by the Health Advisory, an estimated one million additional homes were tested for radon in the period immediately following EPA's announcement.

In addition, in 1988 EPA updated and revised the document entitled "Indoor Radon and Radon Decay Product Measurement Protocols" to include four additional measurement methods. Assistance was provided to seven States and Indian Lands in three States in designing and conducting surveys to identify areas where indoor radon may be a problem. A National Residential Radon Survey, designed to provide a scientifically sound estimate of the distribution of the annual average radon concentrations and exposures in houses across the country, was initiated by EPA in 1988. Also, EPA initiated a feasibility study of radon in the workplace. In 1989, EPA will investigate radon screening levels in a variety of Federal buildings representative of typical work environments. The results of this study will enable EPA to provide guidance for radon testing in the workplace. Work also continued on developing interim school guidelines, based on studies of radon in Fairfax County, Virginia schools. These guidelines will provide options for schools considering initiating radon measurements.

The House Evaluation Program (HEP), established in 1986 in order to assist States in evaluating and mitigating radon exposure in houses discovered to have elevated radon levels, was continued in 1988. Also, EPA continued to cooperate with the National Association of Homebuilders and private homebuilders in 1988 to develop, demonstrate, and release interim guidance for preventing radon in new construction. In 1988, EPA continued to provide a technical training course on radon diagnostics and mitigation techniques to States and private contractors. Nine courses were conducted and over 700 participants from over 40 States were trained. The National Radon Measurement Proficiency (RMP) Program was established by EPA in 1986 in order to allow private firms and other organizations to demonstrate their proficiency in measuring radon. When the program began, 35 companies participated; by the end of 1988, the list of participants had grown to over 900. In addition, in 1988, EPA planned for the establishment of at least three Regional Radon Training Centers, as required by the Indoor Radon Abatement Act.

## N. LITIGATION

In 1988, several judicial decisions were rendered that pertained to either setting or implementing national ambient air quality standards. On May 3, 1988, the D.C. Circuit decided Natural Resources Defense Council, Inc. v. Thomas, which involved a challenge to the legality of two Agency memoranda concerning the appropriate averaging method to be used in implementing the sulfur dioxide national ambient air quality standards. The court dismissed NRDC's petition for review finding that the case was not ripe for review because EPA "has had no chance to crystallize its own decision in a proper rulemaking, and the petitioners have demonstrated no impact on their conduct of their day-to-day affairs." An attempt to force EPA to revise the 15-year old national ambient air quality standard for sulfur dioxide in order to consider acid rain effects was blunted by a decision in April 1988 by a district court in New York. The district court held it did not have jurisdiction because while section 109 imposed a duty to "review" the standards every five years, there is no duty to revise the standard because revision involves an exercise of discretion and expert judgment by the Administrator. In Abramowitz v. EPA, the Ninth Circuit invalidated EPA's approval of control measures in California's South Coast ozone SIP, on the ground that EPA had improperly deferred determining whether those measures would result in attainment by December 31, 1987. In Riverside Cement Co. v. EPA, the Ninth Circuit invalidated EPA's approval of a rule establishing a NOx emission limitation for cement plants as part of California's South Coast SIP. The Court reasoned that the rule was the "bureaucratic equivalent of an illusory contract," insofar as the South Coast Air Quality Management District could alter the emission limit after hearing and without EPA's approval.

In a decision construing the term "modification" under section 111(a)(4) of the Clean Air Act, the Sixth Circuit upheld EPA's determination that a Kentucky SIP revision authorizing a source to cease operation of scrubbers previously required to control fluoride emissions would subject the source to new source performance standard requirements.

On the question of the scope of EPA's nondiscretionary duty under section 112, the U.S. District Court for the District of Columbia held in NRDC v. EPA that EPA has a nondiscretionary duty to either issue emission standards or a final determination not to regulate for each source category of a listed hazardous air

pollutant. NRDC v. EPA concerned a long-standing citizen's suit to compel EPA to act on all source categories of benzene. In another action related to hazardous air pollutants, in NRDC v. Thomas, the court held that it did not have jurisdiction to order EPA list certain pollutants as "hazardous air pollutants" under section 112 of the Clean Air Act.

On January 22, 1988, the D.C. Circuit decided the "stack height" case, Natural Resources Defense Council, Inc. v. Thomas. The suit involved eleven consolidated challenges to EPA's 1985 revised stack height regulations. The court affirmed the regulations in large part, and remanded three provisions to the Agency for further action. In July 1988, a panel of the D.C. Circuit dismissed a challenge to EPA's denial of interstate air pollution petitions under section 126. The States of New York, Pennsylvania, and Maine had petitioned EPA in 1981 for relief from midwestern State sulfur dioxide emissions, which were alleged to cause violations of national ambient air quality standards, or visibility impairment in the petitioning States. Two decisions in 1988 upheld EPA's position on regional haze problems under the visibility impairment provisions of the Act, section 169A. In June, the Second Circuit upheld EPA's refusal to approve portions of Vermont's SIP for visibility and EPA's rejection of Vermont's petition that EPA require emission reductions in upwind SIP's. In a second decision rendered in July, a district court judge in Maine refused to order EPA to promulgate national visibility regulations governing regional haze. The court held that plaintiffs were barred from bringing a citizen suit to force EPA action because EPA's promulgation of visibility regulations in 1980 constituted "final action," which could only be reviewed by the U.S. Court of Appeals.

In a pair of decisions in Atlantic Terminal Urban Renewal Area Coalition v. New York City Department of Environmental Protection, et.al., the U.S. District Court for the Southern District of New York issued opinions construing EPA's obligations under the nonattainment provisions of the Clean Air Act. In the first decision, the court was faced with the question of whether plaintiffs' allegation of failures to implement measures to attain the carbon monoxide air quality standard by December 31, 1987 was sufficient to confer subject matter jurisdiction in a citizens suit. The court denied the defendants' motion to

dismiss. In the second decision, the court construed the Department of Housing and Urban Development's (HUD's) obligations under the section 176(c) prohibition of support for any activity which does not conform to a SIP. At issue was whether HUD had properly assured compliance with New York's carbon monoxide SIP require- ments in the funding of a twenty-four acre redevelopment project in Brooklyn, NY. In a separate case, NRDC brought a citizen suit to force EPA to require New York to revise its ozone nonattain- ment SIP. The court ruled that EPA does have a duty, enforceable in a citizen suit, to require New York to submit a revised SIP by a date certain.

In Anderson Shipping Company, the D.C. Circuit upheld EPA's new regulations governing importation of uncertified motor vehicles and rejected certain importers claim that EPA has no authority over vehicles that are at least five years or 50,000 miles only when imported. The court agreed with EPA that the Clean Air Act provisions limiting the regulatory "useful life" of U.S.-certified vehicles to five years or 50,000 miles does not apply to importation of uncertified vehicles.

Also in 1988, the Third Circuit upheld the authority of a district court in a citizens suit to hold the City of Philadelphia in civil contempt for failure to comply with the terms of its previously issued injunction. The issue arose in a citizens suit filed to compel the city to comply with odor regulations in the Pennsylvania SIP in operating a sewage treatment plant. In a case construing "finality" for purposes of judicial review, the Third Circuit held that it was deprived of jurisdiction over a petition for review of an EPA disapproval of a redesignation request due to the pendency of an adminis- trative petition for reconsideration before the Agency. As a result, the court held that it had no jurisdiction to decide the substantive issue of the applicability of EPA's 1985 stack height regulations to West Penn's Armstrong power plant.

Three district courts ruled in 1988 on the issue of whether EPA can use section 113 to enforce the currently approved State implementation plan while a State is trying to change the regulation. All three courts said that there is a four-month deadline for EPA to act on a proposed SIP revision, but they disagreed on the implications of that deadline. In another action related to implementation plans, United States v. Vanguard Corp reaffirmed the principle that economic or technical infeasibility is not a defense under the Clean Air Act.

Two significant actions related to hazardous air pollutants were decided by the courts in 1988. In United States v. Dow Chemical Co., the U.S. District Court for the Middle District of Louisiana upheld EPA's interpretation of its standards for vinyl chloride against a challenge in an enforceable action. In United States v. Tzavah Urban Renewal Corp., et.al., the district court granted EPA's motion for a preliminary injunction against Tzavah and four other defendants who were charged with violations of EPA's asbestos removal regulations.

In a decision pertaining to administrative noncompliance penalties, the Sixth Circuit affirmed the Administrator's decision finding Navistar International Transportation Corp. liable for exceeding volatile organic compound emission limits at its Springfield, Ohio truck-painting operation. In a case involving preconstruction review requirements, the district court in United States v. Louisiana-Pacific Corp. thoroughly analyzed the term "potential to emit" and found the defendant liable for violating the prevention of significant deterioration (PSD) regulations at its plant.

In another case decided in 1988, United States v. Wheeling-Pittsburgh Steel Corp. reaffirmed that economic considerations do not justify postponement of compliance deadlines established by the Clean Air Act. In still another action, a district court in 1988 held that a government contractor operating the nation's only facility manufacturing the F-16 fighter airplane is subject to the Texas SIP limitations on volatile organic compound emissions, even though the plant is owned by the Air Force. The court refused to adopt a construction of the Defense Production Act (DPA) that would immunize defense contractors from liability under the Clean Air Act so long as they were attempting to fulfill their government contracts.

# II. AIR QUALITY TRENDS, MONITORING, AND MODELING

This chapter describes current trends in ambient air quality levels (the concentration of a given pollutant in the atmosphere), as well as trends in estimated emissions into the air of various pollutants. In addition, the chapter discusses the topics of air quality monitoring, air quality modeling, and other related topics. Data on ambient air quality levels and emissions are through 1987, the latest year for which EPA has complete statistics.

## A. NATIONAL AIR QUALITY AND EMISSION TRENDS

Although considerable progress has been made controlling air pollution, it still remains a serious public health problem. In 1987, 88.6 million people were living in counties with measured air quality levels that violated the national ambient air quality standard for ozone. This compares with 29.4 million people for carbon monoxide, 21.5 million people for particulate matter ($PM_{10}$), 7.5 million people for nitrogen dioxide, 1.7 million people for lead and 1.6 million people for sulfur dioxide. Overall, 107 million people lived in counties where one of these standards was exceeded in 1987.

Nationally, long-term 10-year (1978 through 1987) improvements can be seen for total suspended particulates (TSP), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. The trend in ozone is complicated by a major drop in measured concentration levels which occurred between 1978 and 1979, largely due to a change in the ozone measurement calibration procedure. Therefore, special attention is given to the period after 1978, because the change in the calibration procedure is not an influence during this time.

All of the long-term ambient air quality trend analyses described below are based on monitoring sites which recorded at least 8 of the 10 years of data in the period 1977 to 1986. Each year had to satisfy an annual data completeness criterion. The 1986-87 comparisons are based upon sites that had complete data for 4 of the 5 years in the 1983-87 time period.

Total Suspended Particulate (TSP) - Annual average TSP air quality levels, measured at 1,726 sites, decreased 21 percent between 1978 and 1987. This corresponds to a 23 percent decrease in estimated particulate emissions for the same period from 9.1

to 7.0 million metric tons (teragrams) per year. Air quality levels for TSP generally do not improve in direct proportion to estimated emission reductions, however, because air quality levels are influenced by factors such as natural dust, reentrained street dust, and construction activity which are not included in the emissions estimates. The EPA has also found that the TSP data collected during the years 1979-1981 may be biased high due to the glass fiber filter used during these years, and that most of the large apparent 2-year decrease in pollutant concentrations between 1981 and 1982 can be attributed to a change in these filters. The more recent TSP data show a leveling off with 1986-87 showing a 2 percent increase in air quality and a 3 percent increase in emissions. The emission increase is attributable to increased forest fires while the air quality changes are also affected by differences in annual precipitation. Some minor year-to-year fluctuations may in part be attributable to changes in meteorological conditions such as precipitation.

On July 1, 1987, EPA promulgated new standards for particulate matter using a new air quality indicator, particles nominally 10 micrometers and smaller in diameter ($PM_{10}$). These standards focus on those particles with aerodynamic diameters smaller than 10 micrometers, which are likely to be responsible for adverse health effects because of their ability to reach the thoracic or lower regions of the respiratory tract. Monitoring networks for $PM_{10}$ are now beginning to report data nationally but do not yet have sufficient data for trends.

Sulfur Dioxide - Annual average sulfur dioxide air quality levels measured at 347 sites with continuous sulfur dioxide monitors decreased 35 percent from 1978 to 1987, improving at a rate of approximately 4 percent per year. A comparable decrease of 41 percent was observed in the trend in the composite average of the second maximum 24-hour averages. An even greater improvement was observed in the estimated number of exceedances of the 24-hour standard, which decreased 94 percent. However, most of the exceedances as well as the bulk of the improvements occurred at source-oriented sites. There was a 17 percent drop in sulfur oxide emissions during this 10-year period from 24.6 to 20.4 teragrams/year. The difference between emissions and air quality trends can be attributed to several factors. Sulfur dioxide monitors with sufficient historical data for trends are mostly

urban population-oriented and as such do not monitor many of the major emitters which tend to be located in more rural areas. The residential and commercial areas, where most monitors are located, have shown sulfur oxide emission decreases comparable to the sulfur dioxide air quality improvements. Between 1986 and 1987, ambient sulfur dioxide levels declined 3 percent while total sulfur oxide emissions declined 1 percent.

Carbon Monoxide - Nationally, the second highest non-overlapping 8-hour average carbon monoxide air quality levels at 198 sites decreased 32 percent between 1978 and 1987. The median rate of improvement has been about 4 percent per year. The estimated number of exceedances of the 8-hour national ambient air quality standard decreased 91 percent between 1978 and 1987. Emissions of carbon monoxide decreased 25 percent during the same period from 82.4 to 61.4 teragrams/year. Ambient carbon monoxide levels decreased 6 percent between 1986 and 1987. Because carbon monoxide monitors are typically located to identify potential problems, they are likely to be placed in traffic-saturated areas that may not experience significant increases in vehicle miles of travel. As a result, the air quality levels at these locations generally improve at a rate faster than the nationwide reduction in emissions. The long-term progress in this area reflects the continuing reductions in carbon monoxide emissions brought about by the Federal Motor Vehicle Control Program.

Nitrogen Dioxide - Annual average nitrogen dioxide air quality levels, averaged over 84 sites, increased from 1978 to 1979 and decreased through 1987, except for a slight increase in 1984. The 1987 composite nitrogen dioxide air quality average, however, is 12 percent lower than the 1978 level indicating a downward trend during the overall period. The trend in the estimated nationwide emissions of nitrogen oxides is similar to the nitrogen dioxide air quality trend. Between 1978 and 1987, total nitrogen oxide emissions decreased by 8 percent from 21.2 to 19.5 teragrams/year, and highway vehicle emissions, the source category likely impacting the majority of nitrogen dioxide monitoring sites, decreased by 15 percent. Between 1986 and 1987, the nitrogen dioxide composite air quality average remained constant while the estimated emissions of nitrogen oxides increased by 1 percent.

Ozone - Nationally, the composite average of the second highest daily maximum 1-hour ozone air quality values, recorded at 274 sites, decreased 16 percent between 1978 and 1987.

However, this comparison is affected by a calibration change for ozone measurements that occurred in the 1978-79 time period. In the post-calibration period (1979-1986), ozone levels decreased 9 percent. Volatile organic compound (VOC) emissions decreased 17 percent for the 1978-87 10-year period and 17 percent also for the post-calibration 1979-87 period. The 10-year change was from 23.7 to 19.6 teragrams/year. The estimated number of exceedances of the ozone air quality standard decreased 38 percent between 1979 and 1987. The ozone trend in the post-calibration period shows 1979, 1980, and 1983 being higher than the other years. Meteorological conditions likely contributed to the higher 1983 air quality levels and, in part, to the 1986-87 increase of 5 percent.

Lead - The composite maximum quarterly average of ambient lead levels, recorded at 97 urban sites, decreased 88 percent between 1978 and 1987. Lead emissions declined 94 percent during the same period from 127.9 to 8.1 thousand metric tons (gigagrams) per year. Between 1986 and 1987 ambient lead levels declined 19 percent, while lead emissions are estimated to have declined 6 percent. This extremely large long-term improvement in both air quality levels and estimated emissions is largely due to the reduction of the lead content of leaded gasoline.

## B. AMBIENT AIR MONITORING

### General

Section 110(a)(2)(C) of the Clean Air Act requires State implementation plans to include provisions for the establishment and operation of systems for monitoring ambient air quality. In addition, section 319 of the Act requires the development of uniform air quality monitoring criteria and methods and the establishment of an air quality monitoring system throughout the United States which uses uniform monitoring criteria and methods. To satisfy these requirements, EPA promulgated regulations in 1979 which required States to establish and operate air monitoring stations and report the data to EPA.[1] The two principal types of stations in the State networks are State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS). The monitoring stations of the SLAMS and NAMS must adhere to the uniform monitoring criteria described in the regulations. These criteria cover quality assurance, monitoring

methods, network design, and probe siting. January 1, 1981, was the deadline by which all NAMS were to meet all of the requirements in the regulations. The SLAMS had until January 1, 1983, to meet all of the provisions in the regulations. Based on six years of operating experience with the NAMS and SLAMS networks, some relatively minor modifications of the 1979 regulations were promulgated in the Federal Register in 1986[2]. These modifications were intended to simplify and improve the overall monitoring program required by the Act.

Overall, State and local progress in meeting the requirements of the regulations continues to be excellent. Table II-1 shows the status of the SLAMS network at the end of 1988. There are a total of 3967 operating monitors in the network meeting requirements of the regulations. Table II-2 shows that 957 NAMS were in operation and meeting the requirements of the regulations through December 1988. Table II-3 lists, by pollutant, the number of SLAMS and NAMS.

Table II-1. SLAMS Status Through December 1988

| | Number of Monitors |
|---|---|
| Monitors operational through 12/88 | 3967 |
| Total planned network for 1989 | 3987 |

Table II-2. NAMS Status Through December 1988

| | Number of Monitors |
|---|---|
| Monitors operational through 12/88 | 957 |
| Total planned network for 1989 | 1003 |

Table II-3. National Summary of Operating Air Monitoring Stations (as of 12/88)

| Pollutant | SLAMS (including NAMS) | NAMS |
|---|---|---|
| TSP | 1052 | 6 |
| $PM_{10}$ | 795 | 271 |
| $SO_2$ | 506 | 175 |

| | | |
|---|---|---|
| $NO_2$ | 228 | 55 |
| CO | 437 | 115 |
| $O_3$ | 630 | 226 |
| PB | 319 | 109 |
| TOTAL | 3967 | 957 |

Nonmethane Organic Compounds Monitoring

Ambient hydrocarbon data were again collected during 1988 for use by the States in their continuing efforts to reduce ozone pollution. Samples from 45 sites in 30 cities were analyzed during the period mid-April through September. This was the fifth consecutive summer of field studies to measure nonmethane organic compounds (NMOC). These data are needed to derive NMOC/oxides of nitrogen ratios, an important factor in predicting the effect of control programs to reduce ozone. As in past years, data capture was high (greater than 93 percent) and results were reproducible using different measurement techniques. The program will be repeated during the summer of 1989, and probably into the foreseeable future, since it is a very cost-effective method of obtaining data needed by the States.

C. AIR QUALITY MODELING

An air quality model is a set of mathematical equations that describes the atmospheric transport, dispersion, and transformation of pollutant emissions. By means of these equations, a model can be used to calculate or predict the air quality impact of emissions from proposed new sources, emissions from existing sources, or changes in emissions from either of these source categories. These models are of great utility because they provide a means whereby the effectiveness of air pollution controls can be estimated before action is taken.

Regulatory Applications

During 1988 efforts to improve guidance on air quality models and to ensure consistency in their use continued. This included regulatory actions to update EPA's modeling guideline entitled "Guideline on Air Quality Models (Revised),"[3] operation of the Model Clearinghouse, a variety of workshops on various aspects of air quality models, and guidance on new or revised calculation techniques and codes.

Supplement A to EPA's modeling guideline was issued in January 1988 and is included by reference in the Code of Federal Regulations through a Federal Register notice.[4] This supplement incorporates the Rough Terrain Diffusion Model (RTDM) as a new screening technique, adds a revised version of the Industrial Source Complex (ISC) model, and lists the Offshore Coastal Dispersion (OCD) model as a preferred model for specific applications. To consider additional new techniques, the Fourth Conference on Air Quality Modeling was held in October 1988.[5] This conference is required by Section 320 of the Clean Air Act at three year intervals to help standardize modeling techniques used in regulatory programs. At the fourth conference a variety of new models, procedures and related modeling issues were presented for comment. The public was invited to respond in a way that guides EPA in preparing a proposed rulemaking for further updates of the modeling guideline. As a result of this public comment process, formal revisions to the guideline will be drafted for regulatory review within EPA in 1989.

In 1988, EPA maintained and enhanced the Model Clearinghouse to ensure that use of nonguideline techniques does not lead to inconsistent regulatory decisions. Particularly noteworthy is the expansion of the clearinghouse to include all criteria pollutants. This resulted in substantial coordination among headquarters and Regional Office staffs to consider the greater breadth of regulatory issues. Also, past clearinghouse decisions have been computerized to facilitate reference to precedents and to minimize the possibility of inconsistent technical approaches.

To foster consensus on the use of models in air quality control programs, the Standing Air Simulation Work Group (SASWG) was initiated by EPA in May 1988. SASWG is made up of management representatives from EPA and State and local air pollution control agencies. Initial issues concern decision-making based on models, computational techniques and training available to agencies, and the interface between modeling and regulatory programs for ozone. In the future SASWG will consider a wide range of policies and procedures involving air quality modeling for criteria and toxic pollutants resulting from point, area and mobile sources. In addition, a workshop was held with modeling contacts in EPA's ten Regional Offices and six representatives of State and local agencies. The workshop dealt with the resolution of common problems among the agencies and the preparation of more user-friendly computer systems for operating models and accessing

data bases. Follow-up workshops were subsequently held in many Regional Offices to ensure involvement and access to information by interested State/local agencies.

To facilitate implementation of guidance for processing on-site meteorological data, the document "Meteorological Processor for Regulatory Models (MPRM-1.1) Users Guide" was published.[6] MPRM was developed with a modular design to facilitate updates in guidance or data requirements of new models. MPRM accepts a wide range of meteorological data to create input for running a large number of regulatory models.

Enhancement of computer systems was addressed in several ways. All systems for air quality models and meteorological data bases were converted to EPA's IBM 3090 computer which is now available to the Regional Offices and to many State agencies. In addition, several widely used models were converted for personal computers which are available to most State/local agencies. In 1989 an electronic bulletin board will be initiated to directly serve personal computers and make modeling information readily accessible. Also an interactive system that allows users to directly create needed meteorological data sets will be released for use on the IBM mainframe computer.

Working group discussions with the Federal Highway Administration (FHWA) continued in an effort to resolve requirements and procedures for modeling highway intersections. Preliminary studies to compare the emissions and traffic components of a number of intersection models were completed. As a result, FHWA and EPA have independently proposed alternative state-of-the-art techniques for a revised intersection modeling procedure. Further analyses of candidate procedures using measured field data will be used to guide both agencies to a consensus recommendation and a proposal for revised guidance.

A joint project with the National Park Service, funded through an Interagency Agreement, was successfully concluded and resulted in the publication of the "Workbook for Plume Visual Impact Screening and Analysis."[7] This document updates and replaces a similar workbook issued in 1980. The revised procedures are intended for screening level analyses of visibility impairment from specific point sources. The procedures were programmed into a model named VISCREEN that is available on a personal computer diskette.

During 1988, an updated version of the Urban Airshed Model (UAM) was installed at EPA. The Urban Airshed Model is a photochemical grid model which is likely to be used increasingly in attainment demonstrations required in ozone State implementation plans (SIP's). A study was initiated in which potential usefulness of the UAM for SIP applications is being explored in five cities. The study compares predicted ozone/precursor relationships obtained with intensive data bases typical of research studies versus relationships derived using typically available data bases. In addition, simulation of different types of strategies (volatile organic compounds only, volatile organic compounds and oxides of nitrogen, uniform emission reductions vs. reductions in specific source categories) is anticipated. During 1989, the UAM will be installed on the computer systems of States participating in the study. Also during 1989, results of the above-mentioned 5-city study will be used to help develop guidance for other States wishing to use UAM in their SIP's.

Air Toxics

Efforts were continued during 1988 to strengthen EPA's capabilities for modeling potential releases of toxic chemicals into the atmosphere. A screening model to assess whether a release is likely to behave as a dense or buoyant gas (Relief Valve Discharge Model -- RVD) was documented and made available.[8] A refined model for elevated, high momentum dense gases and its accompanying user's manual was also made available to the public.[9] A protocol and underlying techniques were developed for conducting detailed air quality impact assessments near sources of potentially hazardous pollutants. The techniques estimate frequency with which a health effects threshold is likely to be exceeded at receptor sites near a source and, for a given set of meteorological conditions, the spatial extent of concentrations greater than a specified health effects threshold.

As a technology transfer activity, three workshops on air toxic modeling were presented for Regional Office, State and local control agency modelers in 1988. About 85 modelers attended the workshops which featured a combination of lectures, model demonstrations and hands-on personal computer modeling exercises. A session was devoted to presenting for use and comment prior to publication a document entitled "A Workbook of Screening Techniques for Assessing Impacts Toxic Air pollutants."[10] A personal computer version of the workbook on diskette that will have several features of an expert system capable of execution by relatively inexperienced professionals will be released in 1989.

Also during 1988, a plan for air toxics modeling activities over the next three years was developed. Major objectives include: (1) develop additional in-house expertise in executing a variety of air toxics models, (2) provide modeling guidance on intermittent and continuous releases of air toxics models, (3) integrate air toxics modeling guidance into the Guideline on Air Quality Models, (4) evaluate the performance of selected air toxics models, and (5) expand the purview of the Model Clearinghouse to cover air toxics modeling.

Regional Scale Modeling for Northeast Transport

Regional Scale Modeling for Northeast Transport (ROMNET) is a three year program to apply the EPA Regional Oxidant Model (ROM) for selected emissions control strategies in the Northeast States. The program began in October 1987 and is designed to provide States, EPA and other planning organizations with information on the effectiveness of such strategies in reducing ozone concentrations in this region and also the data bases to support urban scale modeling for use in the development of SIP's. During 1988, management and technical committees were established to ensure technical issues are resolved and project direction is proceeding according to the consensus of State and EPA Regional Office participants. During 1988, a series of past ozone episodes were reviewed and a subset was selected for subsequent modeling. A sequence of control strategy types was also identified for subsequent simulation with ROM. Procedures were developed to adjust emission inventories provided by the National Acid Precipitation Assessment Program (NAPAP) 1985 data base to be episode-specific. This will allow inventories to reflect high episodic temperatures. During 1989, detailed control strategies will be used to simulate several of the earlier control strategies identified in 1988.

In addition, ROM was used to simulate several control strategies specified by the Vice President's Task Force on Alternative Fuels as well as to address several strategy issues involving control of volatile organic compounds, nitrogen oxides or both. Strategies included uniform emission reductions as well as restrictions which were specific to selected large coal-burning utilities. A limited number of uniform control strategies was also simulated for the Southeastern U. S. Studies in the Northeast and Southeast used 1980 NAPAP emissions estimates.

Model Evaluation

During 1988, EPA continued its program to evaluate air quality models. This program was developed in response to recommendations of the American Meteorological Society (AMS) under its cooperative agreement with EPA. Further evaluation of the accuracy and uncertainty of the model commonly used in the regulation of major point sources has made it possible to make a precise assessment. That is, the model has a slight tendency to overestimate by less than 10% for 3-hour averages and a tendency to underestimate by about 15% for daily averages. With this lack of significant bias it is not necessary to use techniques designed to calculate the probability that a given emission limit could result in a violation of the air quality standards; model calculations will continue to be used as "best estimates."

A statistical technique for intercomparing the performance of multiple air quality models was completed. With this method it is possible to combine results from different averaging periods and different data bases into a probabalistic framework. An example demonstrating the technique was also completed. EPA is considering formally adopting this approach which is both flexible and definitive in determining the best performing model.

In addition, the program to evaluate air toxics models was continued. Five data bases were prepared for model comparisons and the participation of a large number of model developers has been sought. The evaluation of models for dense gas releases will be completed in 1989; the evaluation of models for evaporative spills, jet releases, and instantaneous puffs will be initiated.

D. INTEGRATION OF AIR DATA SYSTEMS

The Aerometric Information Reporting System (AIRS) is an integrated data system being developed by EPA to entirely replace the existing data bases, files, and software now used by EPA for storing and retrieving ambient air quality data, stationary source emissions, and compliance data. The AIRS is composed of two relatively separate components (air quality and facility data) but will use common sets of geographical and other codes and draw upon a state-of-the-art data base management system.

In July 1987 the air quality component of AIRS went into full production within the Agency and was also installed in six pilot State agencies. Full implementation in 28 States was accomplished by October 1988 with training, user manuals, and trouble-shooting services being provided. Software development of a system to store and retrieve emissions and compliance data continued on schedule during 1988.

## E. EMISSION FACTOR AND INVENTORY GUIDANCE DEVELOPMENT

Emission factor information on criteria pollutants is published and distributed in Compilation Of Air Pollutant Emission Factors, AP-42.[11] In 1987, EPA published major revisions to emission factors for use by States and others to estimate source emissions and to compile emission inventories. The revisions are contained in AP-42 Supplement A[12], and most recently, Supplement B[13], issued in September 1988. Most of the revisions involve additions of size-specific emission factors, with emphasis on $PM_{10}$, for use in implementing the $PM_{10}$ ambient air quality standard promulgated in 1987. Additional criteria pollutant emission factors are being prepared for publication in another AP-42 supplement in 1989.

Emission inventory guidance and requirements for ozone and carbon monoxide State implementation plans were developed and presented at four workshops held in Atlanta, San Francisco, Chicago, and Philadelphia in October and November, 1988. About 330 attendees participated in the workshops, representing EPA Regional Offices, State/local agencies and metropolitan planning organizations.

## F. REFERENCES


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6. Meteorological Processor for Regulatory Models (MPRM-1.1), EPA-600/8-88-094, 1988.

7. Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-015, 1988.

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11. Compilation Of Air Pollutant Emission Factors, Volume I: Stationary Point And Area Sources, AP-42, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1985.

12. Supplement A to Compilation Of Air Pollutant Emission Factors, Volume I: Stationary Point And Area Sources, AP-42, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1986.

13. Supplement B to Compilation Of Air Pollutant Emission Factors, Volume I: Stationary Point And Area Sources, AP-42, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1988.

# III. AIR POLLUTION RESEARCH PROGRAMS

## A. INTRODUCTION

In support of the Clean Air Act, EPA's Office of Research and Development (ORD) provides health and ecological effects data bases, monitoring and modeling methods, risk assessments, emission reduction and mitigation technologies, and the corresponding quality assurance and technical assistance to develop air pollution control regulations. In addition, ORD assists States in developing State implementation plans (SIP's) by providing improved monitoring, modeling, and control technologies as they become available. In areas where EPA's responsibility is limited to providing technical and public assistance, such as indoor air quality and radon, ORD research provides essential information on risks, prevention, and mitigation.

## B. GENERAL AIR POLLUTION RESEARCH ACTIVITIES

### Scientific Support to Develop and Review National Ambient Air Quality Standards

Air Quality Criteria Documents - Revisions to the criteria document for carbon monoxide were drafted for chapters pertaining to analytical methodology, status and trends and population exposure. This is the first criteria document which will benefit from results of total human exposure studies. The health chapters will be written in Fy 89 and an extramural review draft of the criteria document will be available in FY 90.

Work continued on revision of the criteria documents for oxides of nitrogen (NOx). An issue paper on the health effects of acid aerosols was reviewed by both the public and the Clean Air Scientific Advisory Committee (CASAC) in June 1988, and subsequently revised into final form. The CASAC also reviewed the report entitled "Summary of Selected New Information on Effects of Ozone on Health and Vegetation: Draft supplement to the Air Quality Criteria Document for Ozone and other Photochemical Oxidants" in December 1988. Finally, the third in a series of highly successful international symposia under a U.S.-Dutch memorandum of understanding was held in the Netherlands in May 1988 and addressed ozone research and policy development aspects, including coverage of both tropospheric ozone and stratospheric ozone depletion. The published proceedings of the conference will provide inputs for future ozone criteria documents and other types of assessment reports. (1,2)

Ambient Monitoring - Five additional monitoring methods for criteria pollutants (two for carbon monoxide, three for lead) were designated as reference or equivalent methods. (3,4,5,6,7,) An EPA committee evaluated the issue of uncertainty in measurement data produced by PM-10 samplers. The committee's issue paper (8) formed the basis for EPA's revised policy on the use of PM-10 air quality data for purposes of determining compliance with the air quality standards for particulate matter. The EPA wind tunnel test facility at Research Triangle Park, NC has undergone extensive modification and can now be utilized for the testing of particulate matter samplers over a wide range of wind speeds. Two reports describing wind tunnel testing of PM-10 samplers were prepared. (9,10) A test site for the evaluation of continuous or automated PM-10 samplers was established in Birmingham, Alabama. Several manufacturers of commercially available instruments participated in a two-week field test, comparing their instruments to the designated PM-10 reference methods. The manufacturers were encouraged to pursue further testing and to seek formal designation of their instruments as equivalent methods for PM-10. Non-methane organic compound (NMOC) monitoring was carried out at 45 sites during the summer of 1988 (fifth year) to assist states in meeting the national ambient air quality standards for ozone.(11)

Quality Assurance - The EPA national ambient air audit program was expanded by the addition of mailable and rugged audit devices for ozone, nitrogen dioxide, and dichotomous PM10 sampler flow rate. This program was also modified to provide increased response to the needs of the State and Local Monitoring Stations (SLAMS) network agencies. The 1987 SLAMS quality assessment data base contained over 100,000 data quality assessment values from some 5500 analyzers and samplers. This data base provided statistical means to evaluate and control air monitoring data quality at the Regional, state or agency, and individual site level. A report was issued describing results from this effort and indicating ways for further improving this data quality assessment and control program. An eighth site was added to EPA's Standards Reference Photometer (SRP) network, which provides regional access to ozone concentration standards traceable to the National Institute for Standards and Technology (NIST, formerly the National bureau of Standards). These SRP's are recertified annually and allow monitoring agencies to verify or certify their local ozone standards.

Visibility Research - National Weather Service Human Observer Visibility Data from 137 stations in the United States for the period of 1948 to 1983 were examined to determine if

geographical patterns of haze could be identified. It was found necessary to analyze the data on a seasonal basis. When this was done, regions of the size of several states were identified in which the level of haze and the trend patterns were similar. Eight regions, each containing 6 to 12 observation sites, were identified in the Northeast United States. This information will have use in designing future monitoring networks for visibility or fine particles and for comparing haze and emission trends.(12)

During 1988 The Eastern Fine Particle Visibility Monitoring Network established a five site network to study the relation-relationships between fine particle composition and regional haze.(13) Cooperative efforts were made with the National Park Service and the Northeast States for Coordinated Air Use Management for interchange and collaboration of data. The data can be used in the evaluation and development of potential fine particle standards and in the regional haze models. Preliminary results indicate that sulfate accounts for 50 percent to 60 percent of the pollutant species important to visibility degradation.(14) This is more than double the amount shown in western visibility studies. Total carbon's contribution ranged from 10 percent to 20 percent with elemental carbon remaining consistent while the organic carbon compounds varied considerably.

Materials Damage Research - A theoretical damage function for predicting the corrosion of galvanized steel structures by wet and dry deposition has been developed from thermodynamics and kinetics of atmospheric corrosion chemistry.(15) The function mathematically expresses the competing reactions for the accumulation and dissolution of the basic zinc carbonate corrosion film with exposure time. Major scientific findings are as follows: During periods of surface wetness $SO_2$ reaching the surface reacts stoichiometrically with the zinc; rain acidity reacts stoichiometrically with the zinc; the corrosion film of basic zinc carbonate is soluble in clean rain. The dissolution depends on the residence time of rain on the galvanized steel surface; and deposition velocity controls the rate of corrosion of galvanized steel structures by gaseous $SO_2$ during periods of wetness.

Health Effects: Non-Clinical Studies - A chronic (18 month) inhalation study in which rats breathed ozone or nitrogen dioxide in a diurnal pattern which simulated urban smog profiles in polluted cities was in process in 1988. Structural, biochemical, and physiological changes were detected in the rats which were

greatest at early times but which persisted for the entire exposure. The types of effects observed with nitrogen dioxide appeared to be similar to ozone, however, the latter was more toxic. Many of the changes observed are believed to represent adaptive responses. However, there is indication that some types of damage accumulate with time, leading to early senescence or chronic lung disease. An internal report on the ozone findings was prepared in 1988. (16)

In response to findings that ozone levels in the air of major cities usually follow a pattern of 4-8 hour peak values, studies were initiated to address the adequacy of the 1 hour national ambient air quality standard for ozone. A matrix exposure design in which both concentration and time of exposure were altered was used to generate a mathematical response model. The model predicts that effects of ozone are not linearly related to the concentration time product, especially at lower ozone concentrations, and that the effects of concentration become progressively greater as the time of exposure is increased.

Studies have been completed which describe the uptake of ozone in rats and human subjects. Results indicate that the dose to the critical pulmonary site in the rat is not radically different from that in man. Pending additional information from tissue sensitivity studies, this would suggest that animal data can be used with greater confidence in risk assessments. (17)

Health Effects: Clinical Studies - Researchers in EPA's Clinical Laboratory recently completed a follow-up study to their demonstration of significant pulmonary function and symptom response in normal subjects exposed to 0.1 parts per million (ppm) ozone during a six and three-quarter hour exposure. This new study examined pulmonary function decrements, symptoms and nonspecific airway reactivity during 6.6 hours of chamber exposure to 0.0, 0.08, 0.10 and 0.12 ppm ozone with moderate exercise. The level of intensity, duration and metabolic requirements of the exercise performed was roughly equivalent to the performance of a typical day of moderate to heavy exercise or play. When compared with exposures to 0.0 ppm ozone (clean air), substantial pulmonary function decrements, respiratory symptoms and increases in nonspecific airway reactivity were observed at all three concentrations of ozone. From this study it was concluded that exercise representative of a typical day of moderate to heavy work or play performed during exposures to ozone at levels and patterns often found in ambient air, induced clinically meaningful pulmonary responses. (18)

Work continued on several epidemiologic studies of the effects of long and short term exposures to a variety of air pollutants. The first phase of a study of multiple indoor and outdoor pollution effects in Tucson, Arizona, has been completed. Acid aerosol measurements are continuing at three sites in the Netherlands and planning is currently underway to incorporate these measurements in three additional European studies.

In the Xuan Wei China lung cancer project, comparative analyses were conducted of raw coal from 15 mines throughout Xuan Wei and of coal combustion products. An on-site pilot for a study to develop dose-response relationships between lung cancer rates and exposure to coal smoke and its constituents was initiated. Analysis of human placental tissue for DNA adducts has been conducted. An article was published on the epidemiology of lung cancer in Xuan Wei. (19) In planning for a children's lung function study, Chinese and U.S. representatives developed a detailed plan for a pilot study, division of responsibilities between the Chinese and U.S. sides, and a preliminary plan for a subsequent full-scale study.

Scientific Support to Develop New Source Performance Standards (NSPS) and State Implementations Plans (SIPS)

Modeling Support Activities - The second generation Regional Oxidant Model (ROM2), under development and testing over the last few years, is now operational. It is successful in predicting the frequency distributions and spatial pattern of observed ozone concentrations (20). Applications have begun for the northeastern United States (21). Results of the preliminary effort show that in all areas where the maximum daily ozone concentration exceeds 120 parts per billion the ozone is generated anew each day from imported and locally emitted precursor species. An examination was made of the effect of hydrocarbon emissions from treatment, storage and disposal facilities on ambient ozone levels using ROM (22). The study showed the effects to be minimal, except for areas of high emission concentrations such as the Houston area and the Louisiana Gulf Coast. Critical reviews and research continue to evaluate and improve the model (23). The model is currently being used to evaluate the air quality impacts of ozone control strategies in the northeastern U.S.

A cloud processes module has been developed for the Regional Particulate Model to reflect a key step in the production of secondary aerosol in clouds, where aqueous phase chemical reactions convert gas to aerosol particles, which remain after the

droplet evaporates (24). The Regional Particulate Model will be used to assist in the formation of revised standards for inhalable particulate matter, visibility, and acid aerosols.

The user's guide for the Complex Terrain Dispersion Model (CTDM) was published and disseminated (25). Training classes were also conducted. CTDM is a refined air quality dispersion model for use in predicting pollutant behavior from sources located in hilly or mountainous terrain during stable atmospheric conditions. The CTDM model is being expanded to also treat complex terrain dispersion under unstable atmospheric conditions. The combined stable/unstable model, CTDMPLUS, has been coded and is now undergoing evaluation.

An examination and assessment was conducted of the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP) in order to improve the transfer of air quality models to the user community.(26) UNAMAP is the mechanism used by EPA to release available air quality simulation models to both the public and private sector user community, through the National Technical Information Service (NTIS) and availability of the National Computer Center computer system. The recommendations of the report to set up an electronic bulletin board to expedite the dissemination of models and model improvements, as well as permit rapid replies to user inquiries, has been initiated.

The EPA's Fluid Modeling Facility was used to investigate a wide range of dispersion problems in various atmospheric and surface conditions. This includes studies of the dispersion in complex terrain, flow around natural and man-made obstacles, and dense gas dispersion.

Source Apportionment - A study (27) was prepared that summarizes all available published and unpublished results on the source apportionment of ambient fine particle extractable organic matter and related mutagenicity from measurements made in three U.S. cities under the Integrated Air Cancer Project (IACP). The manuscript demonstrates the continuing success of a simple multiple linear regression method using lead and potassium-based tracers for apportioning the impacts of motor vehicle emissions and woodsmoke. There is general consistency of the results between the three cities, and with earlier mutagenic potency measurements from direct source testing. This suggests the characteristics found in these cities have a universality which will be useful in judging impacts in other wintertime airsheds in the U.S.

Monitoring Support Activities - Research on two source emission PM-10 sampling procedures has been completed and final draft reports delivered to the program office for consideration in regulatory development. Inhouse support for opacity monitoring has provided calibration services for numerous State and Regional compliance programs. In addition, a guidance document on continuous emission monitoring of hydrogen chloride at municipal incinerators was prepared.(28)

Reburning - Under the reburning contract, a host site agreement between the contractor, Combustion Engineering and Ohio Edison was signed for the program to be conducted at the Niles Station on a 108 megawatt (MW) cyclone boiler. A Memorandum of Agreement with the USSR for a joint project on reburning was signed in Moscow. The project will be conducted on a Soviet 300 MW wet-bottom boiler.

NOx Control Activities - An in-house research project has demonstrated the effectiveness of using the low NOx burner designed for heavy oil to applications involving the incineration of nitrogenated wastes. A bench-scale boiler simulator equipped with a low NOx burner was used to incinerate a nitrogenated pesticide (dinoseb). Results indicate that high NOx reductions (4500 ppm to 150 ppm) and high destruction efficiencies (>99.99 percent) were achieved. New refractory materials are being examined to improve load following and turn down ratios. A draft design of the burner scaled to 50,000,000 British thermal units per hour (Btu/hr) is in review. (29)

Sulfur Oxides (SOx) - In 1988, work continued on development of the ADVACATE process, a technology conceived by EPA for removal of SOx from either new or existing coal-fired boilers. Pilot results indicate the process is capable of greater than 95 percent removal of sulfur dioxide ($SO_2$) in conjunction with a baghouse.(30) Development of the E-SOx process continued during 1988 with construction of a 5 megawatt field pilot plant nearing completion. The E-SOx process is also an EPA-developed concept which provides combined particulate and SOx removal in a modified existing electrostatic precipitator applied to a coal-fired boiler. (31)

Particulate Control - An advanced, multi-stage electrostatic precipitator (ESP) has been developed by EPA. Allowing the removal of more than 99 percent of incoming particles, the advanced ESP provides almost an order of magnitude improvement

in performance compared to conventional ESP technology. A computer model of the advanced ESP has been developed which will facilitate the application of electrostatic precipitators to both new and existing installations, thereby contributing to the achievement of the national ambient air quality standard for PM-10. The advanced ESP and the computer model were discussed recently at the Seventh International Symposium on the Transfer and Utilization of Particulate Control Technology. The Symposium was co-sponsored by EPA/ORD and the Electric Power Research Institute. Those attending to learn of the latest advances in particulate control included regulatory authorities, users, vendors, and university scientists and engineers. (32,33,34)

Residential Woodstove Advanced Secondary Combustion - This project is directed at reducing emissions from residential wood stoves. Two-stage flame combustion is the modification method chosen for this investigation as an alternative to catalysts. Experiments using an ignition source (gas flames or glow-plug ignitors) added to the secondary combustion chamber were successful in reducing CO, total gaseous hydrocarbons, and particulate emissions by over 90 percent at high, medium, and low wood burning rates in a dual-combustion chamber woodstove Forcing preheated air into the second stage was necessary for this reduction level at low burn rates. A systematic evaluation of the parameters (second stage ignitor intensity, secondary air volume rate, and secondary air temperature) controlling the second stage combustion process was undertaken to provide successful design information for applying this technology to new and retrofit woodstoves. (35)

Woodstove Research - In EPA field tests, new technology stoves, particularly the catalytics, did not achieve the level of emission reduction anticipated. Three major woodstove field studies produced very similar results, and the results were disappointing. Conventional stoves had average particulate emissions of 22 grams per hour (g/hr). Catalytic stoves averaged 16 g/hr for a reduction of only 27 percent, low emission non-catalytic stoves averaged 12.3 g/hr (44 percent reduction), and add-on/retrofits averaged 16.3 g/hr (26 percent reduction). Extensive analyses of data, inspections of field study stoves after use, and bench tests of catalysts have led to the tentative conclusion that much of the poor performance is probably due to user misoperation relative to the design operational mode used in certification testing. Most of the users fired their stoves much more frequently than conventional wisdom indicated. Frequent

firing of a catalytic stove could easily have led to long periods of time when the catalyst stoves averaged 16 g/hr for a reduction of only 27 percent and low emission noncatalytic stoves averaged lower than expected emission reduction results. (36,37,38)

In order to evaluate catalysts used in woodstoves, the activity of various catalysts (from new to very used) will be measured on a bench scale catalyst tester fabricated in 1988. This device will allow testing of various catalysts without conducting a much more expensive full scale stove test for each catalyst. The bench test results will be used to identify and eliminate inferior catalysts and stove designs which prematurely age catalysts. This information will be used to recommend "hybrid" stove designs (best catalysts in best stoves) which can effectively ensure long-term woodstove emissions control in the field compatible with 1990 NSPS requirements.

Scientific Support to Develop Regulations for Hazardous Air Pollutants (HAPs)

Health Assessment Documents - During 1988, three health assessment documents (mineral fibers, toluene diisocyante, and methyl isocyanate) were reviewed at public workshops and the health assessment document for phosgene was reviewed by the CASAC. Final Tier I health assessment summaries were completed and printed for propylene, monochloroethane, and sodium hydroxide and clearance for final publication of the documents for hydrogen fluoride and bromine was initiated. The health summary for mercuric chloride was transmitted to EPA's Office of Air and Radiation for their use in decision making regarding possible listing as a hazardous air pollutant. Also initiated were an updated risk assessment for both carcinogenic and non-carcinogenic effects of diesel emissions, and an evaluation of health risks associated with incineration of hospital wastes. Work was initiated on the development of inhalation reference dose values for 25-40 chemicals. Also, a new Air Risk Information Support Center (Air RISC) was established to facilitate provision of technical assistance to State and local agencies in dealing with health risks associated with local air toxics problems. (39,40, 41,42,43,44,45,46,47,48) (Additional discussion of the Air RISC Program can be found in Chapter V of this report.)

Monitoring, Measurement Development, and Quality Assurance - The first year's monitoring for 36 organic compounds was completed in support of EPA's Urban Air Toxic Monitoring Program. Bi-weekly 24 hour whole-air samples from 19 sites were analyzed by multi-detector gas chromatography (GC), with confirmatory

analysis of representative samples from each site by GC/mass spectrometry. Concurrent formaldehyde and other aldehyde concentrations were also determined from solid absorbent cartridge samples. Ambient air quality measurements for a variety of volatile organic compounds were also obtained in the Toxic Air Monitoring Stations (TAMS) program, where various sample collection techniques have been operated in parallel at a selected site in Houston to evaluate method comparability. In addition, a new type of analytical instrument (a gas chromatography/matrix isolation spectrometer) for the determination of organic pollutants in a variety of samples was put into operation in EPA. (49) It can be used to identify toxic pollutants in indoor air samples, woodsmoke, and other environmental samples. The information will be helpful in identifying specific pollutants which are of potential risk to human health.

As part of a joint US-USSR air pollution study, EPA scientists in September, 1988 measured the levels of volatile organic compounds, polynuclear aromatic hydrocarbons, nitrogen dioxide, formaldehyde, and several trace elements along the Kiev Highway in Leningrad, USSR.(50) Both canister collection of volatile organic pollutants and a portable gas chromatograph for real time measurements were used. The purpose of the study is to intercompare air monitoring methodologies for air pollutants and to develop a pollutant data base for testing and refining dispersion models. The results of this study will be used to design a more comprehensive air monitoring study along a major highway in Vilnius, Lithuania, to further refine dispersion models and to improve air monitoring methodologies.

Development and validation of stationary source emission methods for butadiene, ethylene oxide, and methylene chloride were completed and published.(51,52,53) Studies to develop methods for acrylonitrile, carbon tetrachloride, chloroform, and formaldehyde were also conducted. A procedure was found to correct a problem in the dioxin method, which occurs when high concentrations of particulate are present. Three draft quality assurance reports were completed for use by EPA's air compliance office to support recent regulations on residential wood stoves. New techniques were investigated for use as continuous emission monitors of benzene emissions from gasoline bulk storage facilities.

Five new peer-reviewed sampling and analytical methods for various toxic organic pollutants were added to the compendium of methods for toxic organic pollutants in ambient air.(54) A new

section was added to the quality assurance handbook providing guidance on the use of EPA Method 18 (compound specific organics by gas chromatography) during NSPS compliance testing at surface coating operations.(55)

The National Ambient Volatile Organic Compounds Data Base has been updated as the result of an ongoing effort to gather, evaluate, and compile the measured concentrations of a large variety of volatile organic compounds (VOC) including hazardous compounds.(56) Data on the observed concentrations of 320 VOC's were compiled, critically evaluated, and assembled into a regional data base. Ambient (outdoor) measurements, indoor data, and data collected with personal monitors are included. The data are primarily from the period 1970-1987 and for locations within the United States.

Several recent Total Exposure Assessment Methodology (TEAM) studies have investigated multiple VOC exposure in air, drinking water, and breath samples. Studies in Baltimore, Los Angeles, and New Jersey have utilized improved techniques to reexamine and extend the results of previous exposure research. Results of the Baltimore TEAM Study were presented at the 1988 Air Pollution Control Association/EPA International Symposium in Raleigh, NC, (57,58,59) and at the Air Pollution Control Association 1988 Annual Meeting in Dallas, TX.(34) The five chemicals with the highest personal air concentrations were limonene, 1,1,1-trichloromethane, xylene, benzene, and p-dichlorobenzene. The same chemicals, together with tetrachloroethylene, were found at the highest concentrations in exhaled breath. Correlations between breath levels and previous 12-hour personal air exposures were significant for most chemicals, with the exception of styrene, chloroform, and limonene, which have important routes of exposure other than air. In general, Baltimore findings were consistent with previous results; e.g., indoor concentrations for most pollutants measured exceeded outdoor levels. (61) The study also confirmed that specific activities were associated with VOC exposures; for example, cigarette smoke with benzene and styrene, hot shower use with chloroform, recently dry-cleaned clothing with tetrachloroethylene, and moth crystals and room deodorizers with p-dichlorobenzene.

The Los Angeles TEAM Study provided an opportunity to reexamine 50 homes and residents from an earlier study and to estimate seasonal differences between the February and July sampling periods.

In New Jersey, twenty-two homes, selected from previously sampled Bayonne and Elizabeth residences on the basis of their VOC profiles, were screened for their current VOC concentrations. Eleven homes and their residents were chosen for a targeted study of benzene, p-dichlorobenzene and tetrachloroethylene. In addition to revealing source strength data for these VOC's, this study, which involved sampling for three to five days instead of the previously utilized single day period, will provide valuable estimates of temporal variability in VOC exposure.

A VOC commuter exposure study was performed during late 1988 in Raleigh, NC. Principal study objectives were to determine exposure levels to selected organic and inorganic pollutants during automobile driving and to evaluate sources for these chemicals within the automobile interior. This study will provide new information on the relative concentration and significance of VOC mobile source exposure and will be an important asset for enhanced model development and evaluation.

Extensive methodology development and preliminary protocol design have been completed for conducting a particle exposure field study next year.

Integrated Air Cancer Program - Residential oil combustion was selected as the third source to be added in the next field study which will be initiated in 1989. Urban areas were evaluated by selection criteria and ranked for suitability. The five highest ranking locations were evaluated further by a site visitation team. Roanoke, Virginia was selected and pilot studies of the three sources in this airshed (automotive emissions, woodsmoke, and residential distillate oil combustion) were initiated. Nearly 15,000 samples were collected including airborne particles, semivolatile and volatile organics, acid gases and particles, and aldehydes. These samples are currently being chemically characterized and studied in other mutagenesis bioassays and whole animal tests.

The first full scale Integrated Air Cancer Project conducted in Boise, Idaho, was completed in 1988. The impact of woodsmoke and mobile sources on the organics and mutagenicity of the airshed were characterized and assessed. Source apportionment methods were used to select samples which were composited for animal tumor bioassays for comparative mutagenicity and carcinogenicity assessment. Micrometerology and source impact studies provided new data on the dispersion of woodsmoke plumes in urban areas. Bioassay directed fractionation studies combined with

chemical characterization were initiated using samples from the Boise airshed. The relative potency of the mutagenic compounds in the gas and aerosol phases changes as atmospheric transformations occur. (62,63)

Studies with animals focused on developing new indicators of toxic effect, determining the dose-response of previously detected changes, and establishing a more accurate extrapolation of effects to humans. Phosgene, p-xylene, toluene, epichlorohydrin, carbon disulfide, and styrene were examined as model HAP chemicals, and health studies on methanol were initiated. Dosimetry of phosgene suggested that animal studies are representative of the human in terms of dose to the lung tissue. Immuno-toxicological effects of phosgene were refined, showing increased susceptibility to bacterial lung infection and lung tumor metastases at levels of phosgene far below the industrially accepted "Threshold Limit Value". Phosgene was also shown to enhance and prolong influenza virus infection.

Neurotoxicological effects were observed following inhalation exposure to various HAP compounds. Changes in the neurophysiology of the rat visual system were observed following exposure to p-xylene, toluene, carbon disulfide, and styrene; while epichlorohydrin was without similar effects. P-xylene caused changes in motor activity in rats without affecting learning or memory processes. Repeated oral doses of styrene had little immediate effect on behavior but slowed learning in adult rats long after exposure had stopped.

Reproductive effects of methanol and epichlorohydrin were reevaluated and confirmed. Methanol altered plasma testosterone levels in rats and epichlorohydrin decreased sperm mobility and altered kidney measurements. Both compounds studied appeared to exert transient effects.

Cancer research, including both genotoxic and non-genotoxic agents, was targeted on complex mixtures of urban toxics. This research is identifying sources of urban toxics as well as specific compounds and classes of compounds that are present in complex mixtures of urban toxics. The complex mixture research program is also conducting comparative mutagenicity, DNA adduct dosimetry, and carcinogenicity studies of specific mixtures (e.g., woodstove emissions) and components of high potential cancer risk. These comparative mutagenicity and carcinogenicity

studies will provide the data base critical to providing both weight of evidence and quantitative cancer risk data on the carcinogenicity of complex sources contributing to urban air toxics.

Municipal Waste Combustion (MWC) - Environmental engineering studies and field tests were conducted to support development of air emission regulations for municipal waste combustion facilities. Combustion retrofits, designed to control emissions of hazardous organics (dioxins and furans), were developed for twelve different municipal waste combustion facilities. Field tests were performed to acquire environmental data on emission and control device performance at three MWC facilities. The field tests include the acquisition of combustion and flue gas cleaning process parameters and related emissions of particulate matter, trace metals, acid gases, and trace organics. Field tests were completed on a mass burn waterwall incinerator equipped with a spray dryer and an electrostatic precipitator; a refuse-derived fuel combustor equipped with a spray dryer and fabric filter and a mass burning refractory incinerator equipped with an electrostatic precipitator. (64,65,66,67,68,69,70,71,72, 73,74)

Carbon Adsorption - A pilot-scale laboratory for studying the control of volatile organic compounds by carbon adsorption was brought into operation during 1988. Testing of the effect of relative humidity on the adsorption of three different organic compounds has been completed. Test results indicate that relative humidity and temperature have significant effects on the capacity of the activated carbon beds. This finding is important because humidity effects can now be incorporated in the design of carbon absorbers, making them more efficient in the control of volatile organic compounds in contaminated waste gas streams. In addition, the laboratory findings are being incorporated in computer models of the carbon adsorption process. Access to the models is being provided to state and local environmental officials who must evaluate the efficacy of control approaches described in permit applications.

Scientific Support to the Mobile Source Program

Exposure Monitoring and Modeling - EPA has continued to assess human exposure to automotive-related pollutants (75) and compile a baseline of ambient formaldehyde and other aldehyde atmospheric concentrations to judge the possible impact of

changing fuel mixture. A pilot study of human exposure to selected aliphatic and aromatic VOCs during driving was conducted in 1988. Although only preliminary results are available, it appears that driving activities may be a significant contributor to VOC exposure. Modeling efforts continued to validate and test two existing exposure models -- Simulation of Human Air Pollutant Exposure (SHAPE) (76) and National Ambient Air Quality Standards Exposure Model (NEM) (77, 78). Both models have been modified based on these experiences. A modeling exposure workshop was held with over 30 modeling experts in attendance. The results of this effort will be reflected in the new modeling approach to total human exposure.

Research examined the sensitivity of tailpipe emissions from late model gasoline motor vehicles to variations in ambient temperature.(79) Tests were completed at a variety of operational temperatures (70°F, 40°F, and 20°F). Total hydrocarbons (THC), carbon monoxide (CO), NOx, detailed hydrocarbon and detailed aldehyde emissions were characterized. The data indicate significant increases of THC and CO emissions as ambient temperature decreased. NOx and formaldehyde emissions, in general, increased slightly as ambient temperature decreased. When idle operation preceded the transient driving cycle, THC and CO emissions decreased and NOx emissions were relatively unchanged. These studies will be used as base line studies to compare the results of future work examining the impact of alternative fuels such as methanol.

Health Effects - There has been extensive research conducted to determine the threshold levels of carboxyhemoglobin that produce health effects in susceptible populations. Previous studies relied on more subjective measurements to determine effects of carbon monoxide exposure on susceptible individuals. Two studies, completed at the clinical laboratory using direct measurements of cardiac function, suggest that 6 percent carboxyhemoglobin level is near the threshold necessary for adverse effects on exercise performance occurring after an acute exposure to carbon monoxide among a broad group of patients with heart disease. These studies suggest that there may be subsets of the population that may be more susceptible to car carboxyhemoglobin levels below 6 percent. (80,81)

Scientific Support to EPA's Indoor Air Program

The primary objective of EPA's Indoor Air Research Program is to be fully responsive to Title IV of Superfund and to support related policy objectives. Since 1986, the Indoor Air Research

Program has integrated the activities of four EPA research programs for health effects, monitoring, engineering, and risk assessment with the intent of delivering timely information to decision-makers and the public by which to better identify sources and concentrations of indoor air pollution and to predict adverse effects on human health.

Monitoring and Exposure Activities - EPA research in this area focuses on four areas: an advanced indoor air quality model; a compendium of standard indoor air monitoring methods to be used widely in the indoor air research and diagnostic community; the development of advanced monitoring and analytical methods; and a demonstration building investigation study at the Library of Congress. All of the monitoring and exposure assessment research is in direct response to Title IV of Superfund, particularly as the research relates to cooperating with other Federal agencies, developing instruments to measure and characterize indoor air quality, and providing useful information to the public in a timely manner.

Methods development activities include development of new methods for organics, (especially for polar organics), and for semi-volatile organics. A field demonstration study of indoor methodology was conducted in the EPA Building in Washington, DC in response to a request to apply indoor methodology to building related complaints. As part of this study 4-phenylcyclohexene was identified as an emission from carpets. In addition, EPA identified the ultrasonic humidifier as a potentially significant source of particles which may have a health impact.(82)

Exposure-dosimetry studies of environmental tobacco smoke were conducted in the normal indoor exposure environments (day care and home) and controlled chamber environments of preschool children. These studies indicate that urinary cotinine is a reliable and semi-quantitative biological marker of environmental tobacco smoke exposure in young children.

The program continues to develop a risk characterization methodology by which to assess different indoor air scenarios consistently. The risk assessment methodology is designed to assess the risks of specific categories of indoor pollutants such as radon, asbestos, biological contaminants, gas phase organic compounds, inorganic compounds, and non-ionizing radiation. The research objective is to develop a conceptual framework and systematic approach for analysis and presentation of risk

assessment studies. Also, in the area of assessing indoor air scenarios, special assessments studies are being conducted to identify and assess the effects of biological contaminants on the indoor environment, problems and benefits of cleaning and maintenance activities, and effects of odors on human stress levels and health.

Health Effects - Research has been designed to investigate specific health questions dealing with human response to indoor pollutants. The health program studies human response to gas phase organic compounds found in the indoor environment, children exposed to environmental tobacco smoke, the mutagenic potency of the emissions from unvented kerosene heaters, and, more recently, animal testing procedures to better study a range of health effects such as reproductive and developmental effects, obstructive lung disease, and general respiratory irritation.

A clinical study was underway in 1989 to investigate the health effects of exposure to a mixture of volatile organic compounds emitted from building materials and furnishings. This is a replication of a Danish study that associated memory impairment and exposure to low concentrations of this mixture.

Engineering - research has continued to focus on source characterization and control technology effectiveness. The source characterization work develops methods for emissions testing and has begun a program designed to rank sources of indoor air pollutants in terms of their contributions to adverse human exposure and health risks. The public continues to request information on the selection and use of products found indoors. These products range from building materials to consumer products of all types--pesticides, cleaners, hair sprays--to name a but a few. EPA's Indoor Air Research Program has actively worked with industry to develop advanced source testing methods and to begin to apply them on a wider scale.

Scientific Support for the Radon Program

The objective of EPA's radon research program is to conduct research, development, and demonstration activies aimed at assessing the full range of alternative mitigation techniques for reducing exposure to indoor radon. Techniques applicable to a range of building types (new and existing houses, schools, and other buildings), building design and construction methods, and geological conditions representative of the U.S. building stock

are under investigation. Specific activities include: field testing of radon reduction methods in existing and new houses, schools, and other buildings; laboratory testing of specific mitigation devices and materials; problem assessment studies; and data analysis. These research activities provide essential data to support EPA's Radon Action Program.

In 1988, radon mitigation research focused on field testing of reduction measures in existing houses; initial testing of reduction measures in schools; and testing of features incorporated into new homes during construction to prevent radon entry. Technical guidance manuals describing the radon reduction measures investigated for both existing houses and new construction were issued for use by home owners, builders, and state/local officials.

Scientific Support for the Stratospheric Ozone Program

The EPA must have adequate scientific information for cost-effective decision making to protect stratospheric ozone. In addition, it must be able to predict potential damage from unpreventable ozone depletion, and to undertake mitigative action. If current depletion trends continue, the possibility of serious environmental and health damage exists even were a complete phase-out of currently regulated chlorofluorocarbons (CFC's) to occur. This will occur in part because there are many unregulated chlorine- and bromine-containing substances that are expected to be produced in the near future. The EPA's highest priority in this research area is to provide scientific information for the 1990 and 1994 assessments in support of the Montreal Protocol which is discussed in more detail in Chapter X of this report.

The largest part of EPA's stratospheric ozone research program consisted of research on the effects of radiation in the 290-320 nanometer waveband (UV-B radiation) on ecological systems, including agroecosystems and silvaculture systems. (83,84,85,86,87) Major crop and forest species, such as soybean and pine, have shown measurable damage after prolonged exposure to UV-B radiation. Rsearch was also conducted on the effects of UV-B radiation on plant competition between a crop species (wheat) and common agricultural weeds. Results from studies also indicate that any increase in UV-B radiation may also indirectly affect global fisheries by altering production in marine food webs.

In an effort to reduce the amount of stratospheric ozone depleting CFC's released during the servicing of auto air conditioners, a project was initiated in the summer of 1988 to determine the acceptability of recovering and reusing the CFC refrigerant. This project was undertaken as a joint effort by the EPA, the Mobile Air Conditioning Society, and the Motor Vehicle Manufacturers Association. On the basis of the experimental findings, an industry ad hoc committee agreed that recycled auto air conditioner refrigerant would not have to meet specifications for new refrigerants. Instead, a refrigerant purity comparable to that in cars which have been in use for approximately 15,000 miles with properly working air conditioners would be adequate. The study determined the type and quantity of impurities and indicated that the CFC refrigerant can be cleansed of contaminants to an acceptable level for reuse by simple, portable equipment. This study therefore provides a basis for the auto and mobile air conditioner industries to promote the recovery and reuse of refrigerant in place of the present practice of venting used refrigerant directly to the atmosphere.

A cooperative study with the Electric Power Research Institute was initiated in 1988 to evaluate new chemicals thought to have good potential for replacing existing ozone depleting CFC's and halons. Small quantities of these chemicals are being prepared by research teams at Clemson University and at the University of Tennessee and relevant physical/chemical properties are being determined. This study is designed to fill in the substantial data gaps which now exist regarding the properties of new classes of potential replacement chemicals such as fluorinated ethers. For fire suppression agents, foam blowing agents, and refrigerants, in particular, the present slate of potential chemical substitutes is limited to a few candidates possibly possessing disadvantages with regard to energy penalties or application efficacy. Data on promising candidates will be available to the chemical industry for further evaluation and development.

Scientific Support for the Global Warming Program

ORD's Global Climate Change Program is aimed at evaluating potential changes in the environment associated with changes in the climate system. This effort includes: 1) the assessment of the likelihood, magnitude, and extent of global climate change,

and 2) the development of the capability to make regional evaluations. Such an assessment is essential to the development of alternative strategies to address the potential effects of climate change.

In February 1989, the EPA Science Advisory board review ORD's Global Climate Research Plan which was under development in 1988. The document is the result of a year-long effort of planning and climate-related research activities on the part of EPA staff and cooperators. The Global Climate Research Plan outlines a long-term research program to better characterize global emissions, atmospheric processes, and the impacts on ecological, biological and hydrological systems. The Plan also addresses in detail the problems inherent in managing an effective broad-scale, multidisciplinary, and geographically diffuse research program.

Under the Global Climate Protection Act of 1987, it is EPA's mandate to develop national policy and to conduct scientific assessments on issues related to climate change. In support of this mandate, ORD's Global Climate Change Program has made major contributions to two Congressionally-mandated reports: The Potential effects of Global Climate change on the United States, and a report concerning policy options for stabilizing current levels of greenhouse gas concentrations. These reports are scheduled for release in late 1989.

Climate Change - A major report (88) outlines and estimates the possible interactions between climate change and atmospheric chemistry that need investigation on both local and/or regional and global scales. This problem is enormously complex and is not simply one of estimating temperature change and running chemical models already in use. The changing climate influences many different factors such as precipitation, atmospheric transport, changes in budgets of species with biological sources, changes in UV light because of stratospheric ozone depletion, changes in deposition rates, etc. The single most significant finding in this study is that very little is known about the interactions of the above-cited effects with either climate or air pollution.

Nitrous Oxide (N2O) Workshop - The EPA co-sponsored an international workshop in Paris in June 1988 to solicit research efforts to further characterize direct N2O emissions from fossil fuel combustion. Over 50 researchers from Europe and the U.S. attended. The workshop was very successful in that it uncovered

a sampling artifact that puts much of the existing data under suspicion. Further, the workshop stimulated research efforts including commitments to investigate the artifact mechanisms.

N2O From Combustion - In-house and field studies have attempted to characterize the direct emissions of N2O from stationary combustion sources. Results indicate that these emissions are typically less than 5 ppm for pulverized coal-fired utility boilers. These analyses were performed using on-line techniques, unaffected by the sampling artifact described above. These data, however, only include a limited number of combustion sources. Other sources still need examination. (89)

Activities to Improve Understanding of Acid Deposition Precursor Emissions

The 1985 National Acid Precipitation Assessment Program (NAPAP) emissions inventory was compiled and distributed for use by atmospheric chemists and policy analysts. This data supplants the 1980 data for use in acid deposition and oxidant scientific and regulatory studies. Availability of the information culminates a five year program involving the sources, States, and EPA Headquarters and Regional Offices. This information will be the mainstay of research and regulatory activities until an updated emissions inventory becomes available. The results show national annual anthropogenic emissions in 1985 of 23 million tons of $SO_2$, 21 million tons of NOx, and 22 million tons of VOC. Coal-fired utilities were major source of SO2 and NOx emissions while transportation was the major contributor to NOx and VOC emissions. The petrochemical industry was also a major contributor to VOC emissions. The majority of emissions were in the northeastern portion of the United States. The emission inventory also contains information on Canadian and natural source emissions for the first integration of emissions from all sources in North America.(93)

Emission projection models were also advanced in 1988 to forecast emissions into the future given various energy, economic, and societal assumptions. The models also have the capability to project costs of various strategies to control emissions. The models released in 1988 include the Advanced Utility Simulation Model (AUSM Version 3.0) (94,95,96,97,100), the Industrial Combustion Emissions Model (ICE Version 6) (101-108), the Process Modeling Projection Technique (PROMPT

Version 3.0) (109,110,111,112), and the Volatile Organic compounds Model (VOCM Version 1.8). (113,114,115) These models significantly advance the state-of-the-art in emission projections and cost of control strategies.

C. Activities to Develop the Limestone Injection Multistage Burner (LIMB) for Control of SO2 and NOx

In 1988, a flue gas humidifier was added to the wall-fired LIMB demonstration and initial operation of the humidifier was begun. The humidifier is expected to improve LIMB SO2 capture from the present 55 percent removal to 65-70 percent removal. (116) NOx emissions are expected to remain about 50 percent of uncontrolled levels. On the tangentially-fired boiler LIMB demonstration, preliminary boiler characterization was completed, and engineering design for LIMB installation was initiated, and a Program Peer Review was held. (91,92,93)

In 1988, work continued on development of the ADVACATE process, an EPA conceived technology designed for removal of SOx from either new or existing coal-fired boilers. A major milestone was accomplished when EPA and Flakt signed the Agency's first Cooperative Research and Development Agreement under the Federal Technology Transfer Act of 1986. Pilot results indicate the process is capable of more than 95+percent SO2 removal in conjunction with a baghouse. (118)

Development of the E-SOx process continued during 1988 with construction of a 5 megawatt field pilot plant nearing comple-completion. The E-SOx process is also an EPA developed concept which provides combined particulate and SOx removal in a modified existing electrostatic precipitator applied to a coal-fired boiler. (119)

Activities to Improve the Scientific Understanding of the Aquatic Effects of Acid Deposition on Surface Waters, Watersheds, and Aquatic Biota

The National Stream Survey-Phase I (NSS-I) was conducted in the Mid-Atlantic and Southeast regions of the United States as part of the National Surface Water Survey. As did the National Lake Survey, the NSS-I focused on regions of the United States where, on a national scale, (120) acidic deposition rates are relatively high and given the current understanding of acidic

deposition effects on surface waters, the numbers of clearwater acidic streams and streams with low acid neutralizing capacity were expected to be highest. Water chemistry was measured in 504 stream reaches within nine subregions in the Mid-Atlantic and Southeast. Estimates were made regarding characteristics for the target population (64,300 reaches or 224,000 km total length). Acid neutralizing capacity is commonly used to examine the susceptibility of surface waters to acidification and was a key variable measured in the study. Although the survey can be used to provide estimates for any reference value, two previously used values and their definitions are as follows: stream reaches with ANC <0 are acidic; those with ANC <50 eq/L are generally agreed to be very sensitive to acidification.

Of the total estimated target length of eastern reaches, an estimated 11.7 percent (47,000 km) had ANC <50 eq/L. The results also indicate notable differences between the Mid-Atlantic and Southeast with respect to the percentage of stream reach length that was acidic and that had ANC <50 ueq/L. Less than 1 percent of the surveyed acidic streams were in the surveyed portions of the Southeast, except in Florida, where most streams (including acidic streams) also contained high concentrations of dissolved organic carbon. Nearly twice the percentage of stream length in the Mid-Atlantic (15.5 percent, 17,067 km) had ANC <50 ueq/L, compared to the Southeast where <7.1 percent (6,420 km) had ANC in this category.

Most of the acidic streams were in upland, forested drainages of less than 20 square kilometers within the interior subregions of the Mid-Atlantic region (Poconos/Catskills, Valley and Ridge, and Northern Appalachians) and in lowland reaches of the Mid-Atlantic Coastal Plain. An additional 4600 kilometers (km) of acidic streams with very high sulfate concentrations and evidence of mining activity were not included in further analyses. In the 2324 km of acidic streams estimated for the Interior Mid-Atlantic, sulfate is typically the dominant anion and organic acids comprise only a small fraction of their acidity. Acidic deposition, therefore, cannot be ruled out as the major source of acidity in most of the acidic stream length in these three Interior Mid-Atlantic subregions. Both naturally occurring organic acids and acids from acidic deposition appear to be contributors to stream water acidity in the acidic stream reaches (2527 km) of the Mid-Atlantic Coastal Plain. (121,122)

The Episodic Response Project was initiated to examine episodic acidification and associated biological effects in streams of the Northern Appalachian Plateau of Pennsylvania and the Catskills and Adirondacks of New York. A preliminary model was used together with regional chemistry and deposition data to estimate that acidic episodes are likely to be a chemically important regional phenomenon. Population estimates of the total proportion of acidic stream reaches would increase by 40-640 percent in six subregions of the eastern United States if episodes are taken into account. While 11 percent of the Adirondack lakes were estimated to be acidic based on National Lake Survey data, an linear regression model predicted that more than 35 percent would have been acidic during the spring of 1986.

Sampling strategies for the detection of long-term trends in surface water acidification were analyzed as part of the Temporally Integrated Monitoring of Ecosystems Project. Several statistical techniques were tested on the basis of their power of trend detection for data sets typical of long-term monitoring programs dealing with acidic deposition effects. These results reduce uncertainty in monitoring network design for surface water acidification, by providing the statistical basis for establishing establishing the number of sites and monitoring frequency.

Forty-nine lakes in the Upper Peninsula of Michigan (pH 4.4 to 8.2) were surveyed to evaluate the status of fish communities in the region relative to potential effects from acidic deposition. The sampled lakes are all greater than 4 hectares in size and greater than 1.5 meters deep and were a subset of those sampled for water chemistry in fall 1984 as part of Phase II of the Eastern Lake Survey. One or more species of fish were caught in 47 of the 49 lakes, which when extrapolated to the target population represents an estimated 99.4 percent of the lakes in the region. Yellow perch, which are quite acid tolerant and are commonly caught in waters with pH levels as low as 4.5, were the most common species caught in 31 of the target lakes. Fewer fish species were caught in lakes with lower pH and lower calcium levels, even after accounting for effects related to lake size or lake type, i.e., seepage or drainage. Several minnow and darter species were notably absent from lakes with low pH (5.7-6.0), perhaps reflecting an intolerance of acidic conditions. This study provides a comprehensive survey of the present-day status of fish communities in a region of the country with a relatively high frequency of acidic lakes (an estimated 9.8 percent of the lakes have ANC <0ueg) and with little existing data on fish community composition in lakes potentially sensitive to acidic deposition. (123)

Completion of a second year of exposure to pH 5.1 produced additional changes in the biota of artificially acidified Little Rock Lake, a seepage lake in north-central Wisconsin. (124) Laboratory exposure, in-situ field exposure, and field population data are providing a basis for comparisons of various approaches for estimating the effects of acidity on fish. (125) The effect of acidification on mercury accumulation in yellow perch inhabiting Little Rock Lake is being studied. Mercury concentrations in one-year old whole perch increased in response to whole-lake acidification from pH 6.1 to 5.6. (126) Mean body burdens of mercury in these yellow perch were greater in the lake's treatment basin than in the reference basin. Acidification of the treatment basin may have increased the net production of methylmercury, the form of mercury that is most readily accumulated by fish. The influence of a decrease in pH on the direct uptake of methylmercury by fish remains unclear.

The Direct/Delayed Response Project is focusing on chronic sulfate deposition effects to determine the rate at which average annual surface water ANC might be expected to reach zero, given various rates of sulfate deposition. Forecasts are being made with three watershed acidification models. As part of this project, relative contributions of in-lake alkalinity generation to total basin alkalinity budgets for drainage lakes in selected regions of the eastern United States were estimated and show that for most drainage lakes in the Northeast, Southern Blue Ridge Province, and Upper Midwest, in-lake alkalinity generation is a minor contributor to net basin alkalinity production. (127,128) An independent report was prepared which assessed model code formulations of forecasting models being applied in DDRP. (129) The report concludes that model forecasts may be useful in the development of national policy for limiting the emissions of acidic deposition precursors.

Regional-scale estimates of runoff are needed as input parameters in the watershed acidification models being used in the Direct/Delayed Response Project to forecast surface water acidification. Study results indicate that runoff contour maps can be used in regional studies to extrapolate runoff to study watersheds with quantifiable uncertainty. (130,131) The analysis of uncertainty in this component is one part of a more comprehensive uncertainty analysis now underway.

Chemical weathering of minerals is the major process that provides long-term neutralization of acidic deposition. Organic compounds have been hypothesized to control weathering rates of

primary minerals (and release rates of base cations) either by direct complexation reactions or indirectly by influencing solution pH. As part of the Watershed Manipulation Project in Maine, a series of laboratory studies have been completed demonstrating that neither pH nor concentration of oxalic acid (a metal-binding organic compound) influence the weathering rates of two primary minerals, oligoclase and tremolite, found in low weathering environments. Extrapolation of these results to the field is premature at this time, but the research suggests that acidic deposition may have minimal effects on the weathering rate of (and rate of base cation supply from) these pure minerals.

Activities to Improve the Scientific Understanding of the Terrestrial Effects of Acidic Deposition on Forests, Soil, and Watersheds

Acidic deposition and its associated pollutants have been implicated as contributors to the recent decline observed in forest health in some particular areas of the United States. Effects of acidic deposition may include acidification of forest soils, an increase in incidence of and possibly severity of winter injury to trees, and changes in growth rate of trees.

The joint US EPA/USDA Forest Service Forest Response Program(FRP) has been researching effects of acidic deposition on the following forest types: Southern commercial pine, spruce/fir, western coniferous, and eastern hardwood forests. Additional FRP research has been conducted by the Atmospheric Exposure Cooperative.

Southern commercial pine, northeastern spruce/fir, western conifer, and eastern hardwood forests. Research in each forest type was the basis for four separate research cooperatives. All research programs were strongly supported by Quality Assurance (QA) and Synthesis and integration (S&I) Projects. Based on a critical analysis of information on soils in conjunction with simulated model runs of soil chemistry, it is expected that a portion (perhaps as much as 30 percent) of southern forest soils may show major changes in soil chemistry within 50 years if deposition continues at current levels. (132) Direct toxicity to mycorrhizae (symbiotic fungi of tree roots) by nitrogen deposition is unlikely, even at the highest level of deposition evaluated, 35 kilograms per hectare per year. (133)

Spruce-Fir Research Cooperative - A regional survey of forest condition in the high elevations of the Northeast was conducted in 1988. Preliminary results indicate a west-to-east

gradient in forest damage, with more dead red spruce occurring in the Adirondacks and Green Mountains and less in the White Mountains and in western Maine. (134) . About 50 percent of red spruce with diameter greater than 5 cm are dead on Whiteface Mountain, NY. Spruce mortality is highest in larger size classes, and above 1000 meters elevation. Using diameter distributions as a measure of age distribution, spruce appear to be a stable population below 1000 meters, and a declining population above 1000 meters. No other species shows unexplained levels of recent mortality. Insect and pathogen surveys have not detected any biotic factors which could explain the high levels of spruce mortality. (137)

In the Southern Appalachians, the percent standing dead red spruce range from 5 percent to 13 percent, well within natural conditions. In the Great Smoky Mountains, the percent red spruce classified as healthy (less than 10 percent needle loss) went from approximately 85 percent in 1985 to about 60 percent in 1988. The Black Mountains showed a similar trend, but leveled off between 1987 and 1988 with about 70 percent of the trees classified as healthy. Crown condition at Mt. Rogers has remained constant, with about 87 percent of the red spruce classified as healthy. It should be noted that 1986 and 1987 were very dry years in the Southern Appalachians. (135) Another study in the spruce/fir region has found that the balsam woolly adelgid, an insect pest of true firs native to Europe, has caused extensive mortality of Fraser fir in the Black Mountains and in the Great Smoky Mountains. (136)

Western Conifers Research Cooperative - Atmospheric scientists with the WCRC found that clouds in the West are much more acidic than precipitation, and are an important source of pollutants. Forests in the central Cascades of Washington intercept summer clouds with pHs 3.0 - 4.8, similar to cloud pHs in the northeast.(138) Other western forests exposed to acidic clouds include the southern Sierra Nevada (pHs 4.0 - 5.5) and Mt. Werner, Colorado (mean pH 3.7). In contrast, deposition of Hydrogen ion and sulfate in precipitation is low, averaging 1/10-1/4 of eastern values. Precipitation pHs as low as 4.0 are rare, while pHs around 5.0 are common.

Ozone occurs at potentially damaging concentrations in many forested areas in the West. Hourly ozone concentrations in the San Bernarding Mountains of southern California consistently exceed 120 pp$^{b}$ (the Federal standard) during the growing season.

Hourly averages for the southern Sierra Nevada often exceed 60 ppb during the growing season, while forests in the Puget sound (WA) region and Front Range (CO) also experience elevated ozone concentrations.

Field surveys of forest condition were conducted in four forested regions with increased air pollution and deposition: Puget Sound region (WA), southern Sierra Nevada, central Arizona, and front Range (CO). Foliar damage and needle loss from ponderosa pine occurs over large areas in the Sierra Nevada and in the San Bernardino Mountains (CA). This canopy damage has not yet translated into a regional growth decline of ponderosa pine in the Sierra Nevada.(139) However, abnormal reductions in growth rate have occurred in some of the areas with foliar damage. Ponderosa pine and Douglas fir in the southern Arizona mountains, where exposure to S02 and ozone is estimated to be highest, show more instances of recent growth declines than do stands in less polluted areas of central Arizona. Surveys in northwest Washington and the Front Range, Colorado showed no evidence of forest damage or growth changes due to air pollution.

National Vegetation Survey - Research studies have identified definite decline since 1960 in the basal area growth rate of second-growth stands (age 60-75 years) of northeastern red spruce and balsam fir. These stands were growing at elevations less than 700 meters throughout New England and New York. Although these studies have not completely eliminated the possible role of atmospheric pollutants, they have demonstrated that the decrease in basal area increment is explicable at least in part by natural factors that affect growth.

Scientists at EPA are integrating the results of several studies across the Forest Response Program into internal reports referred to as Major Program Outputs (MPO's). One preliminary MPO includes the following findings: Recent changes in the growth rates of red spruce have occurred in both high and low elevation forests. It appears that red spruce is responding differently to climate since 1960 in the north and 1965 in the south. Although it has not been possible to correlate growth and pollutant exposure, it does appear that the decline increases with a concomitant increase in elevation. Many pollutants are known to be present at higher concentrations and for greater duration as elevation increases. (140-144)

Major Program Output #3 in the Forest Response Program is an internal report which summarizes air pollutant effects on important tree species from seedling exposure studies. One of

the mechanisms through which it is hypothesized that acid precipitation can cause effects, is leaching of important cations from foliage. One of the studies shows that foliar leaching of potassium,calcium, and magnesium was significantly increased with acid fog with pH as low as 3.1. However, the amounts of cations leached were relatively small compared to the estimated increase in daily uptake rates for these seedlings. (145)

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# IV. DEVELOPMENT OF NATIONAL AMBIENT AIR QUALITY STANDARDS

## A. DESCRIPTION OF ACTIVITIES

The 1977 Clean Air Act Amendments require EPA regularly to review, and where necessary, to revise the national ambient air quality standards. During 1988 all six air quality standards were under active review along with a candidate for a new air quality standard, acid aerosols.

On April 26, 1988, EPA announced its proposed decision not to revise the national ambient air quality standards for sulfur oxides (measured as sulfur dioxide)[1]. In that same notice, EPA also sought public comment on the alternative of establishing a new 1-hour sulfur oxides standard of 0.4 parts per million (ppm) and making certain revisions to the existing standards. The notice also proposed revisions to the 24-hour significant harm level and proposed a new short-term significant harm level. The comment period on the proposals closed in November, 1988. It is anticipated that final action on the proposals will be taken in 1990.

In April 1986, the Clean Air Act Scientific Advisory Committee (CASAC) reviewed a revised draft of the ozone criteria document and the first draft of the ozone staff paper. The CASAC completed its review of the criteria document in October 1986. At a December 1987 meeting, CASAC reviewed a revised staff paper and a research summary of more recent studies. Issues were discussed regarding the existing 1-hour standard and the possible need for new longer-term standards to protect against chronic health and welfare effects. At the conclusion of this session, CASAC did not feel the group had reached a point where it was adequately prepared to articulate and communicate its recommendations to the EPA Administrator and thus it called for an additional meeting. This meeting was held December 14-15, 1988, and CASAC recommended a more stringent welfare standard but was split on whether to retain or tighten the health standard. At this meeting, CASAC also indicated that it was premature to set a longer-term health standard. EPA will consider modifications to the ozone air quality standards after receiving written recommendations from the CASAC in 1989.

Activities in 1988 related to the review of the national ambient air quality standard for lead focused on completion and review of a draft report detailing methodologies for multi-media lead exposure analyses and their validation. A CASAC subcommittee completed its review of the draft report in October 1988. The document is expected to be printed in final form early in

1989. Results of exposure analyses using these methodologies will be incorporated into the lead staff paper as part of the overall risk assessment on alternative lead standards. It is anticipated that CASAC will review a revised draft of the lead staff paper in early 1989.

Reviews of the carbon monoxide and nitrogen dioxide air quality standards were completed in 1985. The EPA began the process of preparing a new criteria document for carbon monoxide in 1987. The EPA is in the process of reviewing the results from several ongoing studies of the health effects of carbon monoxide, including a major study which better identifies the relationship between carbon monoxide and possible aggravation of pre-existing cardiovascular disease. A public workshop on the revised carbon monoxide criteria document is planned for the fall of 1989. Development of the criteria document for nitrogen dioxide was initiated in 1987 and work continued on its development in 1988. An external review draft of the revised nitrogen dioxide criteria document is scheduled to be available for public review in 1990.

Also during 1988, EPA completed and released for public review the draft document entitled "Acid Aerosols Issue Paper." The document, prepared in response to CASAC recommendations, evaluates emerging health effects literature to assist CASAC deliberations on whether or not acid aerosols warrant listing as a criteria pollutant. After reviewing the document and research needs at a June meeting, a CASAC subcommittee made a recommendation that EPA consider listing acid aerosols. On October 6 the full CASAC met to discuss the subcommittee's recommendations. While expressing its substantial concern that the issue of the potential health effects of acid aerosols warrants additional attention by EPA, the full Committee did not recommend that the EPA consider listing at this time. Instead, CASAC recommended proceeding on several fronts to fill critical information gaps. This is to assure timely action by EPA including a determination of whether the potential health effects of acid aerosols warrant additional action to protect public health either through modification of existing national ambient air quality standards or through developing a separate standard for acid aerosols at such time that sufficient scientific technical information becomes available.

On July 1, 1987, EPA published an advance notice of proposed rulemaking soliciting public comment regarding the development of a new secondary ambient air quality standard for fine particles

(those particles less than 2.5 micrometers in aerodynamic diameter)[2]. In 1988, EPA reviewed the comments received on the notice. Comments were received on the regional character of visibility, determination of adverse effects, pollutant/visibility/source-receptor relationships, and timing of standards development with respect to acid deposition strategies.

On November 28-29, 1988 EPA held the first meeting of the visibility research subcommittee of the Clean Air Scientific Advisory Committee. This subcommittee is chartered to review current scientific knowledge related to visibility as well as related ongoing research activities in order to advise EPA on future research priorities. Meetings of the subcommittee will continue in 1989.

The EPA is still in the review process for secondary standards for particulate matter to address regional haze conditions associated with elevated levels of fine particles. For related information on visibility protection, see Chapter VI, Section D, Visibility Protection in Federal Class I Areas.).

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# V. ASSESSMENT AND CONTROL OF TOXIC AIR POLLUTANTS

## A. INTRODUCTION

In 1985, EPA announced its strategy for the control of both routine and accidental releases of toxic air pollutants.[1] The following sections discuss the activities and progress made in 1988 to implement this strategy.

## B. ASSESSMENT AND REGULATORY DECISIONS

In 1988, EPA initiated a shift in the emphasis of the air toxics assessment program from a pollutant basis to a source category basis. The objectives of the change were to provide a broader focus on source category emissions, to focus assessments on the most likely regulatory candidates (source categories), and to accelerate the assessment process. During 1988, a comprehensive list of stationary source categories and an accompanying ranking methodology were developed. During 1989, the first group of assessment candidates will be selected.

With the development of the source category ranking system, decisions on several pollutants in preliminary assessment were deferred pending consideration as constituents of source category emissions. A decision not to pursue Federal regulation of naphthalene was published[2]. Ten pollutants remained in various stages of assessment.

The EPA released a characterization study of the hospital waste combustion industry[3]. A decision on possible regulation of this source category under the Clean Air Act is scheduled for 1989.

## C. FEDERAL REGULATORY PROGRAM - STATIONARY SOURCES

### 1. National Emission Standards for Hazardous Air Pollutants (NESHAP)

o Vinyl Chloride - In July 1987, the Circuit Court of Appeals for the District of Columbia vacated EPA's 1985 withdrawal of a proposed revision of the NESHAP for vinyl chloride. In remanding the standard to EPA for reconsideration, the court held that EPA had not shown that the vinyl chloride standard adequately protects public health within the meaning of

Section 112 of the Clean Air Act. During 1988, EPA worked on preparing a NESHAP policy that would be consistent with the Court's decision.

o Benzene - In June 1984, the EPA promulgated a NESHAP for benzene equipment leaks and withdrew proposed NESHAPs for benzene emissions from maleic anhydride plants, ethylbenzene/ styrene plants, and benzene storage tanks. Following the vinyl chloride decision, EPA requested and was granted a voluntary remand of the benzene NESHAP to reconsider the three withdrawn benzene proposals and the benzene fugitive NESHAP. The response to the benzene remand will convey the Agency's response to the vinyl chloride decision and set the precedent for how air toxics will be regulated under Section 112. The EPA's proposed response to the remand was published on July 28, 1988.[4] The proposal also included a reassessment and reproposal of the benzene standard proposed in 1984 for coke by-product recovery plants. Final action on the remand is expected to be published in 1989 and will form the policy basis for NESHAP for other source categories.

Following promulgation of the benzene remand, the Agency will set priorities for assessing other benzene source categories and for publication of other NESHAP that have been delayed pending resolution of issues raised by the vinyl chloride ruling.

o Asbestos - Work on the asbestos NESHAP revision has been delayed pending a decision on how to implement the court's ruling on vinyl chloride. Because of this delay, the asbestos revision has been split into two separate rules: (1) an accelerated rule which will address needed corrections to the standard to improve enforceability, and (2) a comprehensive rule revision that will deal with changes in the stringency of the standard and the public health issues raised by the vinyl chloride remand. The accelerated rule was proposed in January 1989.[5]

o Chromium - During 1988, NESHAP development continued for chromium emissions from electroplating and industrial cooling towers. A proposed regulation to prohibit the use of chromium in comfort cooling towers was published under the authority of the Toxic Substances Control Act.[6] Other chromium sources still under consideration for NESHAP include utility boilers, industrial boilers, chromium chemical manufacturing, steel production, refractory manufacturing, sewage sludge incinerators, municipal incinerators, cement manufacturing, chromite ore refining, and ferrochromium production.

o Coke oven emissions - A proposed NESHAP for coke oven emissions was published in 1987. A supplemental proposal will be required to reevaluate the proposed standard consistent with the court decision on vinyl chloride. The supplemental proposal has been delayed pending resolution of the benzene remand.

o Ethylene Oxide - Work on a NESHAP for commercial sterilization chambers was delayed in 1988 pending resolution of the benzene remand.

o Hazardous Organic NESHAP (HON) - The HON is an integrated NESHAP development effort that will cover eight organic compounds (ethylene oxide, methylene chloride, ethylene dichloride, perchloroethylene, trichloroethylene, butadiene, chloroform, and carbon tetrachloride) for which an intent to list under either section 112 of the Clean Air Act or section 4(f) of the Toxics Substances Control Act has been published. The HON will cover 13 source categories in the organic chemicals industry. Work on a proposed rule was delayed in 1988 pending resolution of the benzene remand.

o Perchloroethylene - A decision to propose a NESHAP for control of perchloroethylene emissions from drycleaning industry sources resulted from an EPA precedent-setting effort to integrate cross-media analyses of health and environmental exposure risks associated with chlorinated solvents. This analysis was conducted as part of an Interagency Chlorinated Solvents investigation in which EPA decided to first look at the total risk potential and then to consider what regulatory controls would be appropriate and under what statutory authority. The EPA is proceeding with development of a NESHAP for control of perchloroethylene emissions from drycleaning industry sources; however, work was delayed in 1988 pending resolution of the benzene remand.

o Radionuclides - EPA voluntarily remanded all radionuclide NESHAP and in 1988, continued working to repropose regulatory decisions for 12 source categories: Nuclear Regulatory Commission (NRC)-licenses, Department of Energy (DOE) facilities, radon emissions from DOE facilities, high-level waste facilities, uranium fuel cycle facilities, elemental phosphorus plants, coal fired boilers, underground uranium mines, open pit uranium mines, phosphogypsum piles, active mill tailing piles and disposed mill tailings. The EPA, in the past, decided not to promulgate NESHAP for high-level waste facilities, uranium fuel cycle facilities, or open pit uranium mines. As part of the repromulgation process, EPA will reconsider whether NESHAP are necessary for all or some of these source categories.

o Solvent Degreasing - The Interagency Chlorinated Solvents investigation (see above discussion of perchloroethylene activities) led to a decision to develop a NESHAP for solvent decreasing equipment. The NESHAP will address emissions of perchloroethylene, trichloroethylene, and methylene chloride. Work on the proposal was delayed in 1988 pending resolution of the benzene remand.

o Cadmium - Decisions on which source categories of cadmium warrant regulation were still under consideration in 1988. The categories under consideration are primary cadmium smelters, lead smelters, copper smelters, pigments manufacturing, stabilizers manufacturing, and zinc and zinc oxides production.

o Municipal Waste Combustors - Work continued in 1988 on a rule to regulate emissions from new and modified municipal waste combustion (MWC) units using new source performance standards. Pollutants to be regulated will include one or more designated pollutants (pollutants not regulated under Sections 108-110 or 112) thus invoking Section 111(d) of the Clean Air Act which will require States to develop additional emissions standards for existing MWC units.

o Municipal Landfills - Work continued in 1988 on a rule to regulate emissions from new and modified municipal landfills using new source performance standards. As in the case of municipal waste combustors, pollutants to be regulated will include one or more designated pollutants thus invoking Section 111(d) of the Clean Air Act. Section 111(d) will require States to develop emission standards for existing landfills. Pollutants of concern include volatile organic compounds and a number of toxic compounds (e.g. methylene chloride, vinyl chloride, and benzene).

2. Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)

In November 1984, the Resource Conservation and Recovery Act (RCRA) was reauthorized. Section 3004(n) of the reauthorization states that the Administrator of EPA promulgate such regulations for the monitoring and control of air emissions at hazardous waste TSDF's as may be necessary to protect human health and the environment. Air emission sources of concern include surface impoundments, landfills, land treatment units,

waste piles, wastewater treatment systems, pretreatment units, and transfer, storage and handling operations. The number of TSDF facilities in the United States is currently estimated at over 5000.

Preliminary assessments of the industry show that emissions to the air from TSDF's may pose significant health and environmental risks. Emissions of volatile organic compounds (VOC's), which lead to ozone formation, may be as high as 10 percent of total nationwide VOC emissions. In addition, cancer incidence from toxic compounds is estimated at about 140 cases per year. There is a great deal of uncertainty in these estimates, and a better understanding will be gained over the course of the regulatory development process.

Current EPA plans call for development of TSDF regulations in three phases:

o The first group of standards addresses sources for which EPA can develop standards relatively quickly because similar sources have already been regulated under the Clean Air Act. These standards address air emission vent and fugitive emissions from some of the treatment devices that will be used to meet the RCRA land disposal restrictions. The standards were proposed in 1987 and are scheduled to be promulgated in 1989.

o The second group of standards, which addresses the bulk of the TSDF sources, is scheduled for proposal in 1989. Regulations will cover organic emissions from storage tanks, treatment tanks, containers, and surface impoundments.

o The third group of regulations will be developed as necessary to address specific toxics that may not be addressed adequately by the first two groups of standards. These regulations are scheduled to be proposed along with the promulgation of the second group of standards.

Rules for additional TSDF units may be needed in the future as hazardous waste technology evolves and new emission sources become evident.

## D. MOBILE SOURCES

(Mobile source activities related to air toxics are described in Chapter IX of this report.)

## E. SPECIFIC POINT SOURCES

In 1988, EPA continued to pursue that portion of its overall air toxics strategy that provides State and local air pollution control agencies with funding and technical support to evaluate specific point sources. Sources that are candidates for this program include those that have been identified through the Federal toxic air pollutant assessment program as well as those selected by State and local air pollution control agencies. This program was initiated in 1984 with a pilot program involving sources which emit the chemical acrylonitrile, a carcinogen for which the public health risks are limited and which is emitted in significant amounts from only a few industrial facilities. Evaluations involving all 26 acrylonitrile facilities in 14 States were completed and the reports were accepted by the appropriate State and local agencies. Additional control was achieved at 15 of the 26 facilities, with total acrylonitrile emissions being reduced by 50 percent after all controls were implemented. In addition, maximum risk to the most exposed individual was reduced by 60 percent, and the predicted cancer incidence decreased by 66 percent.

Since 1986, EPA has been provided funding for 48 State and local agency evaluations of potential high risk point sources in a variety of source categories. Of the 48, 17 were funded in 1988. This program has proceeded like the one for acrylonitrile, but in a less formal way. In selecting facilities for inclusion in this program, a variety of factors are considered, including the magnitude of the perceived risk from the source, the benefits of air toxics program development within the State or local agency, the need for supplemental resources, the potential for overlap with other control programs, and the national utility of the reported findings. Preference is given to selecting facilities identified by State and local agencies. Preliminary results are encouraging. Emission reductions have occurred or are likely in about half the situations which have been evaluated and the technical and program capabilities have been enhanced significantly in those State and local agencies participating in this activity.

Additional guidance is under development to provide States and local agencies some advice on how to identify and evaluate high risk point sources. The guidance will incorporate knowledge gained from the acrylonitrile efforts and the additional source evaluations begun in 1987 and 1988. State and local agencies are encouraged to screen a reasonable number of candidate high risk point sources in order to take appropriate follow-up action.

## F. ASSESSING URBAN RISK

In 1986, EPA initiated a program under the Agency's Air Toxics Strategy to encourage States to undertake new efforts toward assessing the scope and seriousness of current exposures to mixtures of air toxic compounds which are believed commonplace in large metropolitan areas. The EPA provided funds under section 105 of the Clean Air Act and technical assistance to States to encourage them to undertake such assessment efforts in a number of areas. State-initiated efforts included ambient monitoring, source/emission inventory analyses, and risk assessment activities to help determine whether such problems indeed exist and, if so, how serious they are. In 1988, funding was continued to support urban air toxics assessments. In addition, technical reports were developed by EPA and distributed to assist State and local agencies estimate the air toxics emissions from various sources, to provide additional assistance and documentation of the existence and magnitude of the problem, and to encourage State and local agencies to undertake assessment and mitigation activities. A monitoring program managed by EPA but funded by State and local agencies was continued. A total of nineteen air quality monitoring sites for air toxics were made possible through this program in 1988. Other tools were also made available, such as computerized data analysis systems, and compilations of emission factors and questionnaires.

Activity on two Integrated Environmental Management Projects (IEMP) was also continued in 1988. These projects in Denver and the Kanawha Valley, West Virginia, focus on the air toxics aspects of the urban environment. Studies such as these, and separate efforts in areas such as Staten Island, New York, will provide further data with which to evaluate urban environmental problems. Such work is expected to result in a determination of what mitigation activities might be warranted and feasible. A large local program was also completed in the Los Angeles, California area. It is now focusing on control measures that would be possible there, having completed their assessment studies. Such control measures could also assist in a positive way in reducing the ozone problem.

## G. BUILDING STATE AND LOCAL AIR TOXICS CONTROL PROGRAMS

The EPA has established a goal to establish in every State and major local agency quality air toxics programs that are adequate to carry out certain roles envisioned within the national air toxics strategy. These roles are: (1) accepting delegation and enforcing NESHAP, (2) identifying, evaluating,

and mitigating (as necessary) point sources of local concern not addressed by NESHAP, (3) addressing urban problems arising from complex multisource, multipollutant interactions, and (4) enhancing program capabilities to conduct applicable activities in the first three areas and to facilitate implementation of other programs specific to the needs of each State or community.

During 1988, progress was made toward meeting this goal. EPA's program to enhance State and local program development uses available grant funds to promote multiyear planning on the part of State and local agencies and subsequent implementation of these plans for building their air toxics capabilities and programs. Within a multiyear development plan, State and local agencies were encouraged to develop and implement activities related to EPA's national strategy. The EPA has now received 71 multiyear development plans from 49 States and 22 local agencies. The major emphasis of the current State and local plans varies. Most, however, focus on development of toxic emissions inventories and modifying existing new source review permit systems to incorporate consideration of air toxic concerns. More that 60 agencies have programs to review new sources for air toxics by regulations or policy. Approximately 20 agencies address one or more existing source categories of air toxics and a number of agencies are currently working on more comprehensive regulations. In all, the amount of State and local program development has about doubled since 1983.

To assist in implementation of multiyear development plan activities, EPA continued its program of technical support in 1988. EPA developed and distributed several technical documents for assisting State and local agencies in estimating air toxics emissions. A series of documents on locating and estimating emissions of various air toxic pollutants (or sources) now covers 17 different pollutants or source categories with the release of reports on benzene and toxic emissions from storage tanks in 1988. Emission documents on municipal incinerators, perchloroethylene and trichloroethylene, chromium (update), and metals from combustion sources are now in final peer review and will be distributed in 1989. A preliminary compilation of toxic air pollutant emission factors was distributed in 1987 and was greatly expanded, improved, and released in 1988. Other documents designed to assist State and local agencies, including a guide for associating source categories with various potentially toxic pollutants and a compilation of air toxics questionnaires, were also released in 1988. As explained in Chapter VII, EPA's Control Technology Center (CTC) continued full operation in 1988

and activities of the National Air Toxics Information Clearinghouse were also continued. The Air Risk Information Support Center, as explained below, became operational and began providing information on air toxics risk information. A series of national workshops on three topics were conducted to assist State and local agencies in program development and implementation. The three subject areas were (1) air toxics modeling, (2) hospital waste incinerators and ethylene oxide sterilizers, and (3) air toxics control technology/permitting. These workshops were conducted by EPA in conjunction with the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO). The workshops were well attended and were cited by State and local agencies as a successful example of how they were able to work cooperatively with EPA. Finally, EPA has established a strong working relationship with State and local agencies, principally with representatives of STAPPA/ALAPCO, which has been extremely valuable in determining outstanding State and local policy and technical needs in implementing the national air toxics strategy. As a result of this relationship, several joint projects are currently underway. In addition to cosponsoring specialty air toxics workshops in 1988, EPA is working with STAPPA/ALAPCO to develop specific guidance materials and to document progress and status of State and local air toxics programs.

In 1988, EPA initiated a new mechanism for assisting State and local agencies, the Air Risk Information Support Center (Air RISC). As State and local agencies implement programs for the control of toxic air pollutants, they are faced with the need to evaluate many pollutants and source types. The Air RISC supports the development and implementation of State and local programs by providing technical guidance and information relative to health, exposure, and risk analysis. The Air RISC provides three levels of assistance to State and local agencies and EPA Regional Offices:

1. Hotline. The Air RISC Hotline provides initial quick response based upon available health and exposure data and the expertise of EPA and its contractors. The Air RISC opened the Hotline in March 1988, and responded to over 400 calls in 1988.

2. Detailed Technical Assistance. In some cases, an in-depth evaluation and/or retrieval of information may be more appropriate than a rapid response. Detailed technical assistance projects were initiated in 1988 on the health effects of open

burning of tires, and on the mutagenicity of emissions from burning of agricultural plastics. These products will be available in 1989.

3. General Technical Guidance. The third level of assistance offered by Air RISC addresses topics involving health, exposure, and risk assessment issues that have broad national interest. Projects initiated in 1988 included a glossary of terms related to health, exposure, and risk assessment and a directory of information sources. These products will be available in early 1989. In addition, planning was begun for a series of workshops on risk assessment and risk communication which will be offered to State and local agency personnel in mid-1989.

In 1988, EPA continued to operate and improve the National Air Toxics Information Clearinghouse (NATICH). The most significant improvement was the addition of facility specific information on air toxics emissions, exposure and cancer risks developed by the Federal air toxics program. Data on over 3500 facilities are now included in this data file. Other changes to the database include the ability to better characterize the dynamic nature of the development of State and local air toxics programs. Established in 1983, the Clearinghouse provides a tangible method of improving communication among EPA and State and local agencies. The Clearinghouse is funded by EPA and is a cooperative effort among EPA, STAPPA and ALAPCO. The goal of the Clearinghouse is to disseminate information about activities underway to solve toxic air pollutant problems and to reduce duplication of effort. Some of the kinds of information included in the Clearinghouse are: (1) regulatory program activities including the status and scope of air toxics control programs and state-adopted acceptable ambient levels; (2) source permit data, including the number of air toxics permits issued by an agency, site-specific permit data, pollutant-specific emission limits, and required control technology; (3) source test data, including quantities of pollutants emitted from specific sites and sampling and analytical techniques used; (4) ambient monitoring methods in use; (5) bibliographic citations for reports and Federal Register notices related to air toxics; (6) ongoing research and regulatory development activity descriptions; (7) emissions inventory information; and (8) selected EPA risk assessment results. With the implementation of the NATICH data base, the Clearinghouse users (e.g., State and local air quality management agencies, EPA, industry, environmental groups, and the public) may now have direct access to the Clearinghouse information through

interactive programs. In addition to direct computer access to the data base, hardcopy reports[7,8,9] of the data base information are printed and distributed annually. Other Clearinghouse publications distributed in 1988 include six issues of the Newsletter and a special report on risk communication[10]. Plans for 1989 include continuation of the prior publications, publication of a special report streamlining the on-line data base, and assessing the feasibility and possibly implementing a linkage between the NATICH database and the toxic release inventory system (TRIS) developed from the superfund section 313 data on community right to know.

## H. REFERENCES


1. "A Strategy to Reduce Risks to Public Health from Air Toxics," June 1985.

2. 53 FR 9138, March 21, 1988.

3. Hospital Waste Combustion Study: Data Gathering Phase, EPA-450/3-88-017, December 1988.

4. 53 FR 28496, July 28, 1988.

5. 54 FR 912, January 10, 1989; 54 FR 4941, January 31, 1989.

6. 53 FR 10206, March 29, 1988.

7. Ongoing Research and Development Projects, EPA 450/5-88-004, July 1988.

8. Bibliography of Selected Reports and Federal Register Notices Related to Air Toxics, Volume 2: Citations, EPA 450/5-88-005, July 1988.

9. Bibliography of Selected Reports and Federal Register Notices Related to Air Toxics, Index 1988, EPA 450/5-88-007, July 1988.

10. NATICH Data Base Report on State, Local, and EPA Air Toxics Activities, EPA 450/5-88-007, July 1988.

# VI. STATUS OF AIR QUALITY MANAGEMENT PROGRAMS

## A. POST-1987 OZONE/CARBON MONOXIDE IMPLEMENTATION ISSUES

### 1. Post-1987 Ozone/Carbon Monoxide (CO) Policy

The Clean Air Act (CAA), as amended in 1970, was based on three important premises. The first was that EPA could set standards for ambient air quality at a level that, if achieved, would protect the public health with an adequate margin of safety. The second premise was that State and local governments could develop State implementation plans (SIP's) that would show how areas could meet these standards over a three to five year time period. The third premise was that these plans, if carried out, would in fact produce the expected result of attaining the national ambient air quality standards (NAAQS).

For two widespread air pollutants, ozone and CO, the last two of these premises have not been realized in practice since the passage of the 1970 Clean Air Act. In 1977, Congress amended the attainment deadlines to allow areas until 1982 or, under certain conditions, 1987 to attain the ozone and CO standards. However, it became clear as early as 1985 that many areas would fall short of attainment. Current data now show that the earlier fears were well founded. According to air quality data through 1987, 66 areas failed to attain the ozone standard, and 50 areas failed to attain the CO standard.

To remedy this situation, EPA developed a proposed policy on how to treat areas which had not attained the ozone and CO standards by the 1987 deadline. EPA's proposed policy was published in the Federal Register on November 24, 1987, and work to complete the policy continued through 1988.[1] One of the key provisions of the proposed policy is that all States fully implement all previously required control measures, eliminating any deficiencies or deviations that may have existed. Another provision is that areas be allowed flexible attainment deadlines depending upon the severity of the problem as opposed to a single fixed attainment date for all areas. A third provision of the proposed policy is to require areas that cannot demonstrate attainment of ozone or CO air quality standards within 3-5 years to achieve minimum annual emission reductions of 3 percent beyond those achieved through federally-implemented measures such as the Federal Motor Vehicle Control Program. Finally, the proposed policy also requires that controls in expanded geographic areas

be considered in planning for attainment of air quality standards since sources located outside of current nonattainment areas often contribute significantly to nonattainment problems.

2. Mitchell-Conte Amendment

Because of concerns that EPA might act to impose sanctions on States for nonattainment of air quality standards and uncertainty whether the Clean Air Act required EPA to do so, Congress enacted the Mitchell-Conte Amendment to the Budget Reconciliation Act of 1987 which postponed EPA implementation of nonattainment sanctions until August 31, 1988. It also required EPA to "take appropriate steps" to issue new nonattainment designations, which would retrigger the planning and sanctions process under the current law. When the Mitchell-Conte deferral of sanctions expired, construction sanctions were imposed in Los Angeles, CA; Ventura Co., CA; Sacramento, CA; and both the Illinois and Indiana portions of the Chicago metropolitan area as a result of litigation against EPA. The construction moratorium in these areas applies to major VOC sources plus major CO sources in Los Angeles. These areas were some of the ones for which EPA proposed sanctions in a Federal Register notice dated July 14, 1987.[2] The EPA intends to take final action on the other areas named in this notice shortly after publication of the final ozone/CO policy.

3. Federal Implementation Plans (FIP's)

The Clean Air Act requires EPA to develop FIP's when a State fails to submit a SIP, if the SIP is inadequate, or if the State fails to revise its SIP when required to EPA to do so. In 1988, because of litigation by interested parties, EPA was working on FIP's in several areas. These areas include the South Coast Air Basin (Los Angeles, CA); Ventura County, CA; Sacramento, CA; and Chicago, IL (including the Indiana portion of the Chicago metropolitan area).

4. EPA'S May 1988 SIP Calls

Section 110(a)(2)(H) of the Clean Air Act allows EPA to notify a State whenever the SIP is deemed "substantially inadequate" to provide for attainment of the NAAQS. On May 26, 1988, and subsequently, the EPA Regional Administrators sent letters to the Governors of 42 states and the Mayor of the District of Columbia notifying them that their air pollution control plans for achieving the ozone and/or CO standards were found to be substantially inadequate and that revisions were

necessary. The inadequacy of the SIPs was based upon failure to attain these standards by December 31, 1987, as specified in the CAA and was based upon ozone and CO air quality data through 1987. The EPA believes that, even before the final post-1987 ozone/CO policy is issued, the states should initiate certain fundamental activities so that they can continue to make progress towards attaining the ozone and CO air quality standards. The States will be required to correct discrepancies between EPA's guidance and the earlier approved SIPs, to satisfy any unimplemented commitments in the SIP to adopt control measures, and to begin updating the base-year emissions inventory for the defined planning area. In general, the States have approximately one year to complete this effort. EPA is also calling upon some areas to commit to a schedule of monitoring for nonmethane organic compounds (NMOC's). The complete response to the SIP call will, in most cases, await promulgation of EPA's final policy on post-1987 ozone/CO nonattainment. At that time, states will be expected to complete development of a SIP that will lead to attainment and maintenance of the NAAQS throughout the expanded nonattainment planning area. The current schedule is for States to submit draft emissions inventories to EPA by October 1989. Revised stationary source volatile organic compounds (VOC) regulations which correct earlier deficiencies or commitments are due to EPA in the summer of 1989.

B. VOC RACT CLEARINGHOUSE

Since 1984, EPA has published a clearinghouse newsletter on matters relating to reasonably available control technology (RACT) for VOC's. For 1988, the EPA clearinghouse published information covering a number of items including the following topics:

Automobile topcoat protocol
Fiberglass fabrication control strategies
Emission inventories for post-1987 ozone SIP's
New ozone/carbon monoxide clean air initiatives
Guidance on miscellaneous VOC issues

In addition, an updated subject and title index for information published in the VOC RACT clearinghouse was issued in 1988.

In order to make State and local air pollution control officials aware of the VOC regulations across all ozone nonattainment areas, a document entitled "Summary of State VOC

Regulations--Volume 2, Group III CTG and Greater than 100 Ton Per Year non-CTG VOC Regulations," was published by EPA in May 1988 and listed in the National Technical Information Service (NTIS).[3]

## C. PARTICULATE MATTER IMPLEMENTATION POLICY AND GUIDANCE

The EPA published revised implementation regulations and guidance for particulate matter on July 1, 1987 in conjunction with revisions to the national ambient air quality standards (NAAQS) for particulate matter ($PM_{10}$).[4] As States began revising their particulate matter SIP's, it became apparent that some areas with sources which are very difficult to control or those sources whose controls would be potentially disruptive to present lifestyles would not be able to attain the standards in three to five years, as required by the Clean Air Act. Therefore, in 1988, EPA developed a long-term nonattainment policy to provide general guidance for reviewing those SIP's which will not be able to persuasively demonstrate attainment of the NAAQS within three to five years. Under the policy, EPA will: (1) approve a SIP revision which meets all its requirements, including demonstrating attainment of the $PM_{10}$ standards in 3 to 5 years; (2) disapprove SIP revisions which do not provide a persuasive demonstration of attainment of the $PM_{10}$ standards in three to five years and do not include reasonable control measures; and (3) take action on a case-by-case basis for those SIP's which cannot demonstrate attainment in three to five years but which adopt all reasonable control measures.

In addition, EPA began developing policies in 1988 for addressing attainment issues for specific particulate matter source categories. The first in a series of guidance documents on the control of open fugitive dust sources was issued. Development of a similar document for residential wood combustion was begun and work began with the American Lung Association to develop methods for improving communication with the general public on the need to reduce emissions from residential wood combustion.

On July 1, 1987, EPA solicited comments on alternative SIP requirements for rural fugitive dust areas and on the adequacy of the criteria used to identify such areas.[5] In 1988, EPA formed an interagency work group to address the issues related to revising the rural fugitive dust policy as it pertains to $PM_{10}$. The work group made progress toward defining the criteria for a rural fugitive dust area and identifying control requirements

appropriate for these areas. In addition, an analysis of the cost of attaining the $PM_{10}$ NAAQS was initiated for three example rural areas which are heavily impacted by fugitive dust.

The EPA's $PM_{10}$ implementation regulations do not require States to develop a full attainment demonstration and control strategy for every area of the country. An analysis of ambient particulate matter data for 1984-1986 indicated that less than 5 percent of the 3141 counties in the United States may have $PM_{10}$ concentrations above the NAAQS. Consequently, EPA placed all areas of the country into one of three groups to prioritize the review and revision of existing SIP requirements for particulate matter. The grouping was based upon the probability of violating the $PM_{10}$ air quality standards. Group I areas are those having a very high probability of violating the $PM_{10}$ standards. Group II areas have a moderate probability of violating the standards, and Group III areas are those EPA believes are already attaining and can maintain the standards. A listing of Group I and II areas was published in the Federal Register on August 7, 1987.[6] Any area of a State not listed as Group I or II was considered to be in Group III. Each group had specific SIP requirements. States are expected to submit complete SIP's including control strategies to attain the $PM_{10}$ standards in Group I areas. In Group II areas, states are to intensively monitor $PM_{10}$ until they have 3 years of data that demonstrate the area is attaining the standards or until the standards are shown to be violated. For Group III areas, which in some cases encompass the entire State, general SIP revisions which are applicable statewide may be necessary to implement the $PM_{10}$ NAAQS. The States are required to identify the existing PM control strategy applicable to the Group III areas. This control strategy will be presumed to be adequate to maintain the standards until EPA is shown evidence to the contrary.

In order to meet its responsibility to oversee implementation of the $PM_{10}$ NAAQS, EPA requested that States submit $PM_{10}$ SIP development plans. The plans include schedules for completing milestones in the SIP development process. To manage the $PM_{10}$ implementation program, EPA is tracking State progress in meeting the milestones. Completed SIP's were submitted for two Group I areas by the end of 1988 and draft SIP's were submitted for 20 additional areas. A total of 59 Group I areas were identified initially. Final SIP's for most of the remaining 57 areas are scheduled to be completed and submitted to EPA during 1989, however, SIP's for some areas requiring complex control strategies will not be completed until 1990 or 1991. SIP's for

the 112 Group II areas, which have a moderate probability of violating the $PM_{10}$ standards, initially are commitments by the States to monitor ambient $PM_{10}$ concentrations in the area, report any exceedances of the NAAQS, and to revise the control strategy as necessary to attain and maintain the $PM_{10}$ standards. Final SIP's for 95 of the 112 areas were submitted in 1988. The remaining SIP's for Group II areas will be completed in 1989. There are 56 Group III areas which include 50 States and 6 territories. Revisions to State regulations which facilitate implementation of the $PM_{10}$ NAAQS are required for Group III areas. Such revisions were completed by 18 States and the territory of Puerto Rico in 1988. Draft SIP revisions have been submitted to EPA for 13 additional States. Final SIP's for most of the remaining 38 Group III areas are scheduled to be completed during 1989.

To assist States in developing revised control strategies for $PM_{10}$, EPA issued a guideline document in September 1988 entitled "Control of Open Fugitive Dust Sources." Two workshops were held in December to discuss alternative fugitive dust control strategies with State/local agency personnel. Control of urban sources of fugitive dust such as paved and unpaved roads, storage piles, and construction/demolition activities were discussed.

In addition, the EPA cosponsored a specialty conference with the Air Pollution Control Association on implementation of the $PM_{10}$ standards. The conference was held in February 1988, in San Francisco, California, and was attended by approximately 400 persons representing environmental groups, industry, and Federal, State, and local government regulatory agencies. Over 50 papers discussing various issues related to implementing the $PM_{10}$ NAAQS were presented during the 3-day conference.

## D. VISIBILITY PROTECTION IN FEDERAL CLASS I AREAS

On December 2, 1980, EPA promulgated regulations to implement section 169A of the Clean Air Act.[7] These regulations required 35 States and one Territory to develop SIP's to make progress toward meeting the national goal of remedying existing and preventing future visibility impairment in certain national parks, monuments, and wildernesses (i.e., Class I prevention of significant deterioration (PSD) areas). By December 1982, only

one State had submitted such a SIP to EPA. Therefore, the Environmental Defense Fund, et al., sued EPA to force the development of the SIP's or Federal promulgation of the required plans. In April 1984, the court approved a settlement agreement which required EPA to implement a phased program to promulgate Federal implementation plans (FIP's) for delinquent States. In a series of actions starting in July 1985 and ending in 1986, EPA promulgated FIP's for new source review and monitoring. To implement the monitoring program, EPA, the National Park Service (NPS), the Bureau of Land Management, the Fish and Wildlife Service, and the U.S. Forest Service established the IMPROVE (Interagency Monitoring of Protected Visual Environments) network. Since many of the Class I areas are national parks or monuments, NPS accepted the responsibility for operating the network and has provided the major funding for it since its inception in 1987. Under an agreement with NPS, EPA has contributed approximately one third of the annual costs of the network using funds withheld from those appropriated under section 105 of the Clean Air Act. Implementation of the planned network continued during 1987 and 1988, and all sites will be operational during 1989.

On November 24, 1987, EPA promulgated the second part of the FIP's dealing with integral vista protection and long-term strategies.[8] On September 15, 1988, EPA proposed to find that controls were not necessary to remedy plume blight type impairment in four Class I areas.[9] The EPA expects to take final action on that finding in 1989.

The last action under the settlement agreement is to address plume blight type impairment in three areas. The EPA must propose its action by August 31, 1989 and complete its action by May 1990. Such action may require the installation of best available retrofit technology on two sources.

## E. TALL STACKS AND OTHER DISPERSION TECHNIQUES

The EPA issued regulations in 1982 restricting the use of tall stacks and other dispersion techniques which otherwise might be used to avoid constant emission controls. These regulations implement section 123 of the 1977 Clean Air Act Amendments. The 1982 regulations were challenged in court and portions were reversed or remanded to the Agency. Revised regulations were published in 1985.[10] Portions of the 1985 regulations were

subsequently challenged in petitions for administrative reconsideration and for review by the U.S. Court of Appeals for the D.C. Circuit.

Petitions for reconsideration which dealt with a specific source were denied in April 1986. Responses to several other petitions were deferred pending judicial review of the regulations. In January 1988, the U.S. Court of Appeals issued its opinion upholding the 1985 regulations except for three provisions, which were remanded for further consideration and rulemaking. No further action on the remaining petitions is considered necessary at this time because the court decision has disposed of most issues, and EPA's rulemaking response to the remand is expected to address the remaining issues.

In March 1988, five petitions for rehearing were filed with the U.S. Court of Appeals, but were denied in April 1988. In June and July 1988, several industrial petitioners sought review by the U.S. Supreme Court of the Court of Appeals decision. In October 1988, the U.S. Supreme Court declined to review the case. The EPA is currently preparing its proposed response to the court remand.

## F. STATE IMPLEMENTATION PLANS FOR LEAD

In July 1982, the Natural Resources Defense Council (NRDC) filed suit to require EPA to approve, or disapprove and promulgate, SIP's for the lead ambient air quality standard for States that did not submit adequate plans. The EPA negotiated a settlement with NRDC giving States and EPA additional time for completing the SIP's.

In 1988, EPA approved SIP's for lead for the following five States: Minnesota (new source review); Indiana; ASARCO, El Paso, Texas; ILCO, Jefferson County, Alabama; and RSR Quemetco, Marion County, Indiana. At the end of 1988 the only lead SIP still outstanding was for Hammond Lead-Halox Division, Hammond, Indiana, which is scheduled for completion in 1989.

## G. PREVENTION OF SIGNIFICANT DETERIORATION AND NONATTAINMENT NEW SOURCE REVIEW ACTIVITIES

The EPA made significant progress in 1988 in carrying out its responsibilities under the Clean Air Act regarding the preconstruction review of new and modified stationary sources. Major 1988 activities are described below.

PSD Regulations for Nitrogen Oxides

In 1986, the Sierra Club and other environmental groups filed suit to force EPA to develop PSD regulations for nitrogen oxides ($NO_x$), as required by section 166 of the Clean Air Act. In April 1987, the court ordered EPA to develop PSD regulations for $NO_x$ on an expedited schedule. Increments for $NO_2$ were proposed by EPA in February 1988 and final regulations were promulgated on October 17, 1988.[11] The regulations become effective one year after promulgation, on October 17, 1989, as required by the Act. States then have 13 months (until November 17, 1990) to submit their SIP's for approval or to accept delegation. Two petitions for reconsideration were received on the promulgated regulations in 1988, one from the Environmental Defense Fund and the other from the American Mining Congress. The EPA plans to take appropriate action on these petitions in 1989.

PSD Regulations for New PM10 Increments

On July 1, 1987, the EPA adopted final regulations that revised the NAAQS for particulate matter.[12] With these revisions, EPA eliminated total suspended particulate (TSP) as the indicator for the NAAQS and replaced it with a new indicator that includes only those particles with an aerodynamic diameter of less than or equal to a nominal 10 micrometers (PM10). Both the primary and secondary air quality standards were revised, taking into account the most recent scientific information available on the health and welfare effects associated with particulate matter, as well as the change in the ambient indicator for particulate matter. In the same Federal Register, EPA adopted final rules for the implementation of the revised standards in SIP's.[13] In these final rules, EPA made amendments to address the new PM10 indicator as a regulated form of particulate matter under the PSD requirements in 40 CFR Parts 51 and 52. The EPA did not, however, revise the PSD increments for particulate matter (defined under section 163 of the Act) to address PM10 at that time, but clarified the existing increments as TSP-based increments and announced its intention to promulgate increments based on the new PM10 indicator pursuant to section 166 of the Act.

In August 1987, EPA established a work group to explore alternative methods for developing new PSD increments. The EPA believes that the most appropriate course of action is to

promulgate new PM10 increments which will ultimately replace the existing TSP increments. This is based on the finding that a requirement to implement two separate sets of increments for particulate matter, i.e., TSP and $PM_{10}$, would be burdensome and unnecessary. The EPA, therefore, is in the process of developing PM10 increments that are equivalent to the TSP increments, and which can be used to continue the current PSD program for particulate matter. The current schedule calls for proposed rulemaking in 1989. Approximately one year later, the final promulgation of new PM10 increments is expected. In accordance with section 166 of the Act, the PM10 increments will become effective one year after their promulgation date. States will then have 9 months to adopt the new increments and submit revised plans to EPA for approval. Allowing time for EPA approval, States should all have the new PM10 increments as part of their approved SIP programs by mid-1992.

Chemical Manufacturers Association v. EPA

As previously reported, the EPA's prevention of significant deterioration (PSD) and nonattainment new source review regulations have been challenged by a variety of entities. These challenges were consolidated as Chemical Manufacturers Association (CMA) v. EPA, D.C. Cir. No. 79-1112. On February 22, 1982, EPA entered into a litigation settlement with the industry petitioners in which it agreed to propose certain regulatory changes. An important part of the settlement agreement was satisfied by EPA's Federal Register proposal of August 1983.[14] That proposal addressed the topics of fugitive emissions in new source review applicability determinations, Federal enforceability of various emissions reductions, "buffer zones" around Class I areas, review of secondary emissions, health and welfare equivalence when netting emissions, and offset credit for past source shutdowns. During 1988, EPA worked on developing a final action on a portion (Exhibit A) of the CMA suit. Publication of the final action on Exhibit A is planned for 1989 and publication on final action on the second portion of the CMA suit (Exhibit B) is planned for 1990.

In an August 7, 1980 promulgation, EPA listed 30 source categories for which fugitive emissions would be included in PSD applicability determinations.[15] Surface mining operations were not among these. The Sierra Club sued EPA on this point and on August 26, 1983, the D.C. Circuit Court of Appeals remanded this

matter to the EPA for explanation of its position. In October 1984, EPA published final action on this issue, reaffirming its current requirements for the inclusion of fugitive emissions in calculating whether a source is "major" for purposes of new source review.[16] The EPA further proposed to extend the requirement for inclusion of fugitive emissions to surface coal mining operations.[17] The Department of the Interior (DOI) subsequently provided comments and other information which support the regulation of fugitive dust emissions under the Surface Mining Control and Reclamation Act (SMCRA) and other available DOI authorities. The EPA is currently preparing a final rulemaking action which considers DOI's authorities.

New Source Review Task Force

In 1986, EPA formed a special Task Force on New Source Review. The principal purpose in organizing this task force was to address growing concerns about the consistency and certainty of permits issued under the Clean Air Act's new source review (NSR) programs. The task force identified specific measures to ensure that delegated permitting agencies have the knowledge and skills necessary to correctly implement the NSR programs and to provide EPA with adequate information to assure that the technology and other program requirements are implemented consistent with Clean Air Act requirements. In 1987, based on the task force findings and recommendations, EPA commenced a long range plan to improve the timeliness, certainty, and effectiveness of the NSR permit process. As a result, EPA plans to implement a program of national NSR workshops in 1989 and 1990 to deliver updated training materials and guidance.

## H. SIP PROCESSING

Prompted by concern for SIP processing delays and the negative effect of these delays on EPA's relationship with State and local control agencies, EPA established a task group to identify problems in, and recommend changes to, the SIP review process. The recommendations of the task group are described in the report entitled "Final Report of the Task Group on SIP Processing" dated October 1987. The task group identified two basic problems with the current approach to SIP review: (1) excessive review of SIP packages, and (2) uncertainty regarding the outcome of EPA review. The EPA initiated a program to improve the process of SIP review based upon the recommendations of the task group. An intra-Agency task force was formed to

implement the recommendations contained in the task group report. As a result of the recommendations and implementation discussions, EPA undertook two actions in 1988 to improve the general SIP review process.

Guidance on "completeness criteria" was issued on March 18, 1988 to the EPA Regional Offices. The objective of this guidance is to ensure that SIP packages submitted by the State are complete from the perspective of EPA review. SIP processing will be expedited by having complete packages submitted and the EPA Regional Offices not having to request additional information from the State to determine whether the revision is approvable.

In a second action, EPA issued a policy on June 27, 1988 permitting the grandfathering of certain SIP actions from meeting the requirements of recently issued EPA policies. Where approval of such action has no significant or lasting environmental impact, grandfathering the action may better serve EPA-State relations and avoid additional, but unnecessary, work by the States.

## I. NATIONAL AIR AUDIT SYSTEM

The National Air Audit System (NAAS) was developed in 1983 as a joint effort by EPA, the State and Territorial Air Pollution Program Administrators, and the Association of Local Air Pollution Control Officials. The primary goals of the NAAS are to identify any obstacles that are preventing State and local air pollution control agencies from implementing effective air quality management programs and to provide EPA with quantitative information for use in defining more effective and meaningful national programs. The five air quality management areas of motor vehicle inspection maintenance, air quality planning and SIP activities, new source review, compliance assurance, and air monitoring are included in the NAAS. The EPA Regional Offices identified 333 priority deficiencies as a result of the fiscal year 1986-87 audit program. Many of these deficiencies were corrected in 1988 through the joint efforts of State and local agencies and the EPA Regional Offices. Through the process of grant negotiations and EPA/State/local agreements, the remaining deficiencies will be addressed in future years.

The EPA distributed the audit guidance and protocol for the fiscal year 1988-89 audit cycle on April 1, 1988 and in fiscal year 1988, the EPA Regional Offices conducted audits in 21 States

and six local agencies. The EPA originally intended to audit the remaining 28 States and six local agencies in FY 1989. However, because of resource constraints and the desire of all affected parties to restructure the audit process, the FY 1988-89 audit cycle was extended to FY 1990.

## J. AIR POLLUTION TRAINING

In 1988, EPA continued to provide technical training in the abatement and control of air pollution. This training included short course presentations (3 to 5 days in length), self-study courses, technical assistance to others who conduct training, and the support of traineeships and fellowships for graduate air pollution training.

During 1988, EPA conducted 31 short courses in 17 different subject areas for a total of 804 students. These courses were presented in locations across the U.S. by six universities designated as area training centers. Technical assistance was provided to States and EPA Regional Offices for conducting 20 additional courses reaching a total of 495 students.

In support of the delegation of more air quality management responsibilities to the States, EPA continued emphasis on self-study courses as a means of providing training to more air pollution personnel. During 1988, 1947 students applied for the 30 self-study courses presently available.

As an additional means of developing qualified personnel, EPA supported 7 graduate traineeships/fellowships to employees of State and local air pollution control agencies. These awards are for both part-time and full time graduate study in the field of air pollution control.

## K. REFERENCES


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2. 52 FR, Vol 134, July 14, 1987.

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# VII. CONTROL OF STATIONARY SOURCE EMISSIONS

## A. NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Section 111 of the Clean Air Act requires EPA to regulate new stationary sources of air pollution from source categories which cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare. During 1988, NSPS were promulgated under this section for emissions of volatile organic compounds from magnetic tape manufacturing[1], petroleum refinery wastewater systems[2], plastic business machinery[3], and residential wood combustion.[4] The existing NSPS for portland cement plants[5] and sewage sludge incineration[6] were revised.

## B. BACT/LAER CLEARINGHOUSE

New or modified facilities that are to be constructed in areas of the country that are currently attaining the national ambient air quality standards are required by the Clean Air Act to install best available control technology (BACT). In those areas of the country that have not yet achieved compliance with the air quality standards, new or modified facilities are required to meet the lowest achievable emission rate (LAER) for that particular type of source. Both BACT and LAER requirements are determined on a case-by-case basis. Often an air pollution control agency will need to establish BACT or LAER requirements for a source type that is completely new to them or for which they have had only minimal experience. In these cases, the permitting agency may not be knowledgeable of the more recent advances in control technology for such sources and it is extremely helpful if the agency can refer to BACT or LAER determinations made by other control agencies.

The EPA established the BACT/LAER Clearinghouse several years ago in order to assist State and local air pollution control agencies by promoting the sharing of air pollution control technology information. The primary output of the Clearinghouse is an annual report of information about BACT/LAER determinations made by the various control agencies. The report published in 1988 contains over 1700 BACT/LAER determinations.[7] The report is available in hard copy or through an automated system. The automated data base can be accessed by both the public and private sectors.

## C. CONTROL TECHNOLOGY CENTER

The Control Technology Center (CTC) completed its second full year of operation in 1988. The CTC supports the implementation of State and local air pollution programs by providing technical assistance and support on assessing and controlling emissions from stationary sources. While the major portion of the CTC's assistance efforts in 1988 was related to air toxics, the CTC responded to a significant number of requests for volatile organic compounds and other criteria pollutants as well. The CTC provides three levels of assistance:

### 1. Hotline

The CTC Hotline provides an initial, rapid response based on information readily available from EPA staff and contractors. In 1988, the Hotline responded to more than 900 requests from State and local agencies. In addition, the Hotline received 285 requests for CTC documents.

### 2. Engineering Assistance

In some cases, it is appropriate to go beyond the rapid response level of support and provide more in-depth engineering assistance. Assistance focuses on specific problems in a particular state or local agency pertaining to assessment, control, or enforcement issues. The support may include engineering analysis and on-site support tailored for each situation. In 1988, the CTC provided direct engineering assistance to the States of Florida, West Virginia, Virginia, Connecticut, New York, and Pennsylvania and to the city of San Diego. In each case, a State or EPA regional office had requested support in resolving technical issues involved with regulations development or permitting.

### 3. Technical Guidance

The third level of support involves programs to transfer technical information on state-of-the art pollution controls to State and local agencies. Guidance prepared by the CTC focuses on current topics of national interest that become apparent through contact with control agencies through the Hotline and other means. In 1988, the CTC, in cooperation with the Northeast States for Coordinated Air Use Management, published an emission testing protocol for municipal waste combustion.[8] The CTC also

conducted a series of workshops for State and local agencies on permitting toxic air pollution sources and in cooperation with the State of New Jersey, published personal computer-based software to help evaluate applications for operating permits for air toxics.[9] Eight other guidance products are under development, including a training program for operators of hospital waste incinerators. These products will be available in 1989.

D. REFERENCES


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3. 53 FR 2672, January 29, 1988.

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5. 53 FR 5354, December 4, 1988.

6. 53 FR 39412, October 6, 1988.

7. BACT/LAER Clearinghouse - A Compilation of Control Technology Determinations, Third Supplement to 1985 Edition, July 1988.

8. Guidelines for Stack Testing at Municipal Waste Combustion Facilities, EPA-600/8-88-085, NTIS PB88-234-893/AS, June 1988.

9. Tutorial Manual for CAT (Controlling Air Toxics), Version 1.0, EPA 600/8-88-092, August 1988.

# VIII. STATIONARY SOURCE COMPLIANCE

## A. GENERAL

The goal of the Clean Air Act is to protect public health and welfare and enhance the quality of the nation's air. The stationary source compliance program is designed to assure compliance with air emission standards by stationary sources of air pollution, including such major facilities as power plants, steel mills, smelters, and refineries. The program is also concerned with transient sources which may release potentially hazardous pollution (particularly building demolition and renovation that may release asbestos), and smaller sources which may contribute in aggregate to serious air pollution (including small sources of volatile organic matter and woodstoves). In addition to ensuring compliance with emission limitations contained in State implementation plans (SIP's), EPA and delegated States are responsible for ensuring that sources comply with new source performance standards (NSPS) and national emission standards for hazardous air pollutants (NESHAP).

The EPA closely monitors the compliance status of about 34,900 stationary sources of air pollution. Approximately 33,500 of these sources are Class A SIP sources*, about 4,600 are NSPS sources (most of which are also Class A SIP sources), and about 1,100 are NESHAP sources. At the end of 1988, as has been the case since the late 1970's, the compliance rates were high, as shown in the table below:

Compliance Status of Federally Tracked Stationary Sources

| | In Compliance | Meeting Schedule | Violation; No Schedule | Unknown |
|---|---|---|---|---|
| Class A SIP | 85.7% | 1.6% | 4.2% | 8.5% |
| NSPS | 88.3% | 2.0% | 5.2% | 4.5% |
| NESHAP | 89.4% | 2.5% | 5.1% | 3.0% |

The compliance status of stationary sources is determined and tracked principally by the States. The States (and EPA) have the authority to enter and inspect stationary sources in order to obtain information for determining compliance status or preparing possible enforcement actions or for other purposes. In 1988, the States conducted 34,263 inspections and source tests of Class A SIP, NSPS, and non-transient NESHAP sources. Additionally, source owners conducted 1,157 State-observed source tests. The EPA overviews States' compliance monitoring activities and

*A Class A SIP source is a stationary source which, while operating at design capacity, has actual or potential uncontrolled emissions equal to or greater than 100 tons per year of any regulated air pollutant.

supplements the States' enforcement efforts to resolve violations of air quality regulations. In 1988, EPA conducted 2,296 inspections and source tests of Class A SIP, NSPS, and NESHAP sources.

The Clean Air Act provides a variety of administrative enforcement mechanisms for dealing with both special situations and relatively easily corrected violations. During 1988, EPA and States issued immediate compliance orders under section 113(a) of the Act (or a State equivalent) to 1272 stationary sources. One delayed compliance order under section 113(d) was issued.

Section 120 of the Act is an administrative remedy designed to recoup the economic benefit which may come from violating air pollution control regulations. A total of 119 cases were initiated under Section 120 or its State equivalent in 1988.

The EPA is also authorized to file civil and criminal actions in Federal District Court to compel a source to comply with applicable requirements, to pay penalties, or both. A total of 133 Federal and State civil actions were filed in 1988 against stationary sources for violations of the Act. As of January 1989, a total of 116 such actions were pending with the U.S. District Courts. Additionally, EPA filed 10 criminal actions in 1988, all against violators of asbestos emission standards.

The stationary source compliance program expends a major effort on the return to compliance of sources considered to be "significant violators." These sources include those that are in violation of NESHAP or NSPS regulations and non-compliant Class A SIP sources which contribute to nonattainment of the national ambient air quality standards (NAAQS). At the beginning of fiscal year (FY) 1988 (the period beginning October 1, 1987 and ending September 30, 1988), 880 significant violators had been identified, 204 of which had already initiated remedial action. By the end of the year, 728 of these sources had been addressed as follows: 335 had been returned to compliance; 123 had been placed on acceptable schedules to return them to compliance; while enforcement actions had been initiated for 270. During the year, an additional 599 new significant violators were identified, of which 215 had been returned to compliance or placed on a compliance schedule.

The EPA has continued a high level of activity in regulating the demolition and removal of asbestos containing material from buildings under the asbestos NESHAP. This program has received great attention because work sites, though transient, frequently are located in densely populated urban areas and the potential for public exposure to hazard from non-compliant activity is great. In FY 1988, EPA and the States received 52,571 asbestos demolition and renovation notifications (an increase of 21 percent over 1987), conducted 20,275 inspections and discovered 3,799 violations. The EPA and the States issued 231 administrative orders and referred 106 cases for civil enforcement action.

During 1988, the New Source Performance Standard for Residential Wood Heaters was fully implemented. Promulgated on February 26, 1988, the regulation requires emissions certification for all air-tight wood stoves manufactured after July 1, 1988. As of July 1, 1988, large manufacturers (those firms producing more than 2000 stoves annually) may only manufacture those appliances that have been tested at independent testing laboratories and certified by EPA. At year's end, a total of 170 appliances were certified. The majority, 116, were "grandfathered" under provisions of the regulation that allow stoves previously granted certification by the State of Oregon to be granted EPA certification. The remaining 54 appliances were certified by EPA. Small manufacturers (those firms producing fewer than 2000 stoves annually) have until July 1, 1989 to complete the certification requirements. At year's end 126 firms had been granted the one year, small manufacturers exemption.

## B. LITIGATION

### 1. Significant Judicial Decisions

United States v. Alcan Foil Products. The district court in this action ruled on the issue of whether EPA can use Section 113 of the Clean Air Act to enforce the currently approved State implementation plan while a state is trying to change the regulation. The court barred enforcement when the Notice of Violation (NOV) was served more than four months after the proposal. Even if the source is violating the proposed revised limit, the court held, the enforcement action must be put on hold until EPA acts on the revision. In United States v. General Motors Corp., the court ruled similarly.

United States v. Arkwright, Inc. The court held that the Agency's failure to meet the four month deadline to act on a proposed SIP revision does not bar enforcement using Section 113 of the Clean Air Act. The court adopted the penalty collection approach established for Section 120 cases in Duquesne Light Co. v. EPA, requiring EPA to reject the SIP revision before collecting the penalty. The court also held that the penalty should be assessed for the period beginning four months after submission of the proposed revision. In Arkwright, EPA had issued the NOV before the four-month period had expired.

United States v. General Motors Corp. The court held that because EPA had approved an equivalency provision as part of the Texas SIP, the director of the Texas Air Control Board could approve, without further review by EPA, equivalent methods of control as alternatives to those controls originally contained in the SIP. In other words, the court said an equivalency determination by the director does not need to be submitted to EPA as a SIP revision in order to have the effect of changing the applicable compliance standards.

Asbestec Construction Services v. U.S. Environmental Protection Agency. The Court of Appeals for the Second Circuit denied Asbestec's petition for review of a Section 113(a) order issued for alleged violations of the asbestos NESHAP. The court held that issuance of the order by EPA did not deny Asbestec due process of the law, nor did it deprive the company of a property or liberty interest protected under the Fifth Amendment. Although the order was a "final definitive statement of the Agency's position," the court felt that other factors, notably the government's need for speedy enforcement, weighed against classifying the order as final action subject to judicial review.

Solar Turbines. EPA initiated a major enforcement action against Solar Turbines, Inc., for construction pursuant to a Clean Air Act prevention of significant deterioration permit which EPA believed Pennsylvania issued without properly requiring Best Available Control Technology (BACT) for nitrogen oxides. The district court granted the government's motion to vacate an earlier temporary

restraining order prohibiting EPA from enforcing its Section 167 administrative order against Solar Turbines Inc., for construction of gas turbines which, in EPA's view, lacked best available control technology. The court concluded that the Section 167 order was a final agency action and therefore, judicial review was proper only at the circuit court level. This is the first decision by a court finding that an order issued under Section 167 of the Clean Air Act is final agency action.

United States v. Tzavah Urban Renewal Corp. The district court granted EPA's motion for a preliminary injunction against Tzavah and four other defendants, even though violations at the asbestos removal project were largely abated by the time of the oral argument in the case. The court cited the defendants' long history of noncompliance as the basis for maintaining court supervision of the remaining work. The court also held that: 1) the asbestos regulations stay in effect if work ceases at the site but asbestos remains a danger; 2) the waste disposal rules in 40 C.F.R. Section 61.152 (1987) apply to interim as well as final disposal sites; 3) the "owner or operator" definition in the rule should be construed broadly; and 4) the existence of air samples showing low levels for asbestos is irrelevant to a case such as this one, in which the violations are based on work practice standards, not emission standards.

Navistar International Transportation Corp. v. U.S. Environmental Protection Agency. The Sixth Circuit affirmed EPA's decision finding Navistar (formerly International Harvester) liable under Section 120 of the Clean Air Act. In its appeal, Navistar argued that its ten painting lines were either excluded or exempted from regulation. The court rejected all of the petitioner's arguments, deferring in each case to the Agency's interpretation of its own regulations. In addition, Navistar argued that the notice of noncompliance it received was insufficient since it lacked two of the referenced attachments which are required under 40 C.F.R. Section 66.12. The court held, however, that jurisdiction to assess Section 120 penalties is conferred upon EPA not by the regulations, but by the Clean Air Act which requires only a reasonably specific notice.

U.S. v. General Dynamics Corp. The district court held that the government can sue for relief in air pollution cases where a contractor operates property owned by the United States. The court denied defendant's motion for dismissal, rejecting the argument that this action is an interagency dispute. The court noted, in this action to enforce the Texas SIP limitations on volatile organic compound emissions, that the Air Force had made $2.3 million available to General Dynamics expressly for the purpose of installing pollution controls on the offending coating lines, but the company declined to install the controls. The lawsuit was thus properly before the court. The court also held that the Defense Production Act, which compels contractors to perform despite other contractual obligations, does not immunize defense contractors from violations of the Clean Air Act.

United States v. Wheeling-Pittsburgh Steel Corp. The Third Circuit Court of Appeals reaffirmed the principle that economic considerations do not justify postponement of compliance deadlines established by the Clean Air Act. The court applied the "successors and assigns" language from the consent decree that the government had reached with Wheeling-Pitt and found that the new owner of the Monessen, Pennsylvania, coke plant was bound by the terms of the decree. The Circuit Court rejected the district court's finding that the sale of the coke plant was a "new" or "unforseen" circumstance which could justify amendment of the decree to allow operation before installation of the pollution controls was complete.

United States v. Louisiana-Pacific Corp. The district court thoroughly analyzed the term "potential to emit" and found the defendant liable for violating prevention of significant deterioration regulations at its Kremmling, Colorado. waferboard plant. The court held that simple limits on annual emissions cannot be used to restrict potential to emit for prevention of significant deterioration purposes. It also held that federally-enforceable limitations on operations (e.g., a limit on hours per day that a plant may operate) can be used to restrict potential to emit. However, it found that when such limitations are ignored or violated, the potential to emit restriction is vitiated.

2. Significant Settlements

U.S. v. Borden Chemicals, Geismar, Louisiana. In this case, the defendant had violated several different sections of the vinyl chloride NESHAP at their complex in Louisiana and entered into a consent agreement with the government to pay $1.25 million. A unique feature of this settlement is the payment of $250,000 of the penalty to the Louisiana State University Foundation to be used solely for the purpose of research into the health impacts of hazardous air pollutants, including epidemiological studies.

U.S. v. Ford Motor Company, Mount Clemens, Michigan. This consent decree includes a civil penalty of $1.75 million, the largest paid by a defendant for violation of volatile organic compound emission limitations. In addition, Ford certified that it permanently ceased operating its non-complying printing lines and will not resume operation unless and until it obtains state operating permits.

U.S. v. Conoco, Inc., Oklahoma. This consent decree resolves alleged violations of NSPS Subparts J and GG pertaining to petroleum refineries. The Subpart J violations arose from Conoco's failure to control sulfur dioxide emissions from three new process heaters. The defendant could have achieved compliance simply by segregating its flue gas streams in order to burn only clean fuel at the new heaters while continuing to burn dirty fuels exclusively at its older, unregulated heaters. In exchange for a 75% mitigation of the $1 million penalty, Conoco agreed to install equipment that will remove sulfur from all of its fuel gases, resulting in the reduction of at least 3250 - 4500 tons of sulfur dioxide emissions per year. The net after-tax value of Conoco's mitigation project exceeds $1.5 million.

U.S. v. Raymark Industries, Inc. This civil action against the manufacturer of asbestos brakes and other asbestos products was concluded by the entry of a consent decree and payment of a $135,000 civil penalty. Other co-defendants had settled earlier for $12,500 as well as extensive injunctive relief provisions which are also featured in this settlement.

U.S. v. New York City Human Resources Administration, et al. The New York City Human Resources Administration, Department of General Services, and the City of New York agreed to pay a civil penalty of $200,000 in settlement of this action brought for violation of the asbestos NESHAP during a renovation of a city shelter.

U.S. v. Shell Oil Company, Carson, California. This decree resolves a violation of the NSPS for petroleum refineries. The action arose because Shell's sulfur recovery plant is subject to state Occupational Safety and Health administration (OSHA) inspection and maintenance requirements resulting in Shell's periodic disconnection of its pollution control equipment. Shell has agreed to install a redundant pollution equipment at a cost of $15 million to prevent exceedances of the NSPS emission limits for sulfur dioxide during future inspections of the recovery plant. In order to install connecting hardware for the redundant unit and to conduct the inspection this year, Shell took its controls off for 12 days and paid a penalty of $66,900 for this period of violation.

U.S. v. Southern Coke Corp., Chattanooga, Tennessee. In this case, the defendant agreed to pay $100,000 for this contempt action for violations of an earlier consent decree governing coke battery emissions at its facility. The defendant had taken over the coking plant from the bankrupt Chattanooga Coke and Chemicals Corp., which had been a consent decree signatory in an earlier EPA enforcement action. When the defendant failed to operate the plant in compliance with applicable consent decree requirements, EPA filed its contempt action.

3. Criminal Filings

During 1988, ten criminal cases were filed against stationary sources for violations of the Clean Air Act. All involved violation of asbestos regulations.

An important case in this area which resulted in multiple convictions was United States v. Cuyahoga. On December 5, in Los Angeles, California, all four individual defendants in this case were sentenced by a U.S. District to various terms of imprisonment as a consequence of their October 11

guilty pleas to multiple counts of an eight-count indictment that was returned on June 14. All of the defendants pled guilty to count one, which charged the defendants with conspiracy to violate NESHAP emission standards for asbestos. To accomplish the conspiracy, Cuyahoga workers who were engaged in the demolition of a Kaiser steel plant in Fontana, California, were falsely assured that the asbestos material to which they were exposed was not hazardous to their health and were provided with inadequate training in the handling of asbestos. Those who complained about safety were told that they would be fired. Other counts involved failure to notify the National Response Center as soon as the defendants had knowledge of the release of a reportable quantity of hazardous substance, namely asbestos; and willfully making false statements to the government, in describing the procedures utilized in removing asbestos. Cuyahoga, which has now filed for bankruptcy, was also sentenced on December 5 to a fine totaling $250,000.

## C. COMPLIANCE GUIDANCE AND INITIATIVES

### 1. Targeting

In the past, EPA guidelines have focused on source size as the determinant whether a source should be inspected. The EPA has conducted several pilot programs for the purpose of including other factors such as compliance history and air quality as determinants whether to 'target' a source for inspection. On March 31, 1988, two new strategies were issued which institutionalized the targeting approach in conducting inspections. Those strategies, the Compliance Monitoring Strategy and the Revised Asbestos Strategy, are to be implemented during FY 1989. The Compliance Moni-toring Strategy replaced the Inspection Frequency Guidance of June, 1986. The strategy emphasizes flexibility on use of inspection resources, but continues to require accountability for maintaining high levels of compliance.

The Asbestos Demolition and Renovation Enforcement Strategy requires that the compliance history of asbestos contractors be used to target inspections of activity covered by the asbestos NESHAP. This strategy establishes a national database of asbestos contractor compliance history, the National Asbestos contractor Registry System (NARS), to provide the information delegated agencies need for targeting. It also provides instructions for performing inspections, and requires appropriate enforcement actions for all violations detected.

2. Ozone

Regulation of volatile organic compounds (VOC) has been an area of intensive effort for the last 4 years. Such sources are major contributors to the ozone nonattainment problem and some emit compounds which are highly toxic in nature. In response to requirements contained in the 1977 Clean Air Act Amendments, many States adopted regulations requiring compliance of VOC sources on or before the end of 1982. Carrying out these regulations has led to a large growth in the number of significant violators.

Small sources of VOC may, in aggregate, impact ozone non-attainment. Ongoing efforts to reduce emissions from small sources of VOC have led to development of innovative compliance promotion methods including general public education, comprehensive inspection of all sources in a specific source category, outreach to industry associations, direct mail to affected sources and reduced fines for sources that attend training workshops. Also, on July 22, 1988, EPA issued the Record-keeping Guidance Document for Surface Coating and the Graphic Arts Industry. This document provides technical information to assist engineering evaluation of source compliance with VOC emission standards.

On March 31, 1988, EPA transmitted to its Regional Offices a protocol outlining the criteria and procedures necessary to conduct a study of rule effectiveness. Each Region was requested to commit to at least one rule effectiveness study in an ozone non-attainment area for FY 1989. Studies will occur in two phases. A field inspection phase will calculate or measure emissions and percent emissions reductions attributable to compliance. A follow-up office investigation phase will identify implementation problems. Fifteen separate studies have been initiated on source categories including gasoline marketing, petroleum refineries, surface coating at aerospace facilities, autocoating, papercoating, and miscellaneous metal parts coating. In addition, EPA Region III will soon complete a study on gasoline marketing begun in FY 1988.

3. Continuous Emission Monitoring

In the decade of the 1970's, the stationary source compliance program focused on ensuring that major sources of particulates and sulfur dioxide achieved initial compliance with Clean Air Act regulations, generally by installing control

equipment or switching to cleaner fuels. The more recent focus of attention is concerned with the continuous compliance of particulate and sulfur dioxide sources (while work continues to ensure initial compliance for sources of volatile organic compounds).

The EPA has continued to support the use of Continuous Emission Monitoring Systems (CEMS) as an important tool to promote continuous compliance of sources. On March 31, 1988, the "OAQPS CEMS Policy" was reissued to promote and encourage the utilization of CEMS data as a compliance assessment method. Compliance measures to track the installation and operation of CEMS were also established in EPA internal tracking systems.

On March 31, 1988, EPA issued an interim control policy for sources that are under order to replace or upgrade existing control equipment. A fundamental principle of this policy is that the source must maintain continuous compliance after the new or rebuilt equipment becomes operational. To assure this, all new or upgraded equipment must include spare components that can maintain emissions at compliance levels while the remainder of the equipment is being replaced, repaired or maintained. In lieu of providing redundant control equipment, sources must agree to reduce or shut down operations during periods of control equipment unavailability. Also, compliance orders are to include provisions for continuous emissions monitoring, and reporting of excess emissions.

4. Timely and Appropriate Enforcement

The annual evaluation of the "Timely and Appropriate" enforcement guidance, most recently issued by EPA on April 11, 1986, showed that implementation of the guidance was generally successful in that it has caused a more expeditious resolution of violations. The evaluation showed that 68.2 percent of the violations remaining at the beginning of the fiscal year or noted in the first three quarters had been resolved by November 1, 1988. Enforcement actions were instituted for approximately half of the violations resolved, most of which involved the assessment of penalties. Resolution of violations through enforcement and assessment of penalty was higher for cases where the EPA, rather than a State, was the lead.

5. Training

Significant progress continues to be made in the area of enforcement-related training. During 1988, EPA distributed a multilevel curriculum and actively began to implement the program for EPA personnel engaged in stationary source inspections. The objectives are to ensure that every inspector can conduct advanced inspection and that experienced personnel can stay current and develop specialized skills. Emphasis is on quality inspections, health and safety, and transferability to state/local programs. A total of 33 EPA/State workshops were conducted in 1988. An implementation plan was be issued for FY 1989, and projects to streamline, consolidate and update courses and work materials will continue to be completed over the next three years. An air training advisory group composed of Federal, State and local personnel will oversee the program.

D. COMPLIANCE BY FEDERAL FACILITIES

A total of 414 Class A SIP, NSPS, and NESHAP Federal facilities are tracked in the air program. As of January 1989, 329 (79 percent) were in compliance. A total of 17 were meeting schedules that will bring them into compliance, while 7 were of unknown status. The remainder have either shut down or are not subject to Federal regulation.

E. LIST OF VIOLATING FACILITIES

Section 306 of the Clean Air Act and Executive Order 11738 authorize EPA to bar facilities which deliberately or repeatedly violate the Clean Air Act from receiving future contracts, grants, or loans from any Federal agency or branch of the military services. Facilities where certain criminal violations occurred must be placed on the EPA List of Violating Facilities based on the Federal court conviction (Mandatory Listing). Other facilities which have continuing or recurring violations may be placed on the List at the discretion of the EPA, after notice to the owner or operator and the opportunity for an informal administrative hearing (Discretionary Listing).

In 1988, EPA expanded its capacity to use the Contractor Listing sanction by creating a Contractor Listing Staff dedicated to carrying out the Contractor Listing program. The EPA issued guidance to the Regions in 1988 encouraging the use of Discretionary Listing against demolition and renovation companies with continuing and recurring violations of the asbestos standards.

During 1988, five facilities were recommended for Listing for Clean Air Act violations. Two of these facilities are demolition and renovation companies with a long history of asbestos standard violations. Two pending Discretionary Listing actions were withdrawn after the facilities signed court consent decrees agreeing to take the necessary actions to bring them into compliance with the applicable clean air standards. No facilities were placed on the List during 1988 as a result of convictions for criminal violations under the Clean Air Act. No facilities which had been listed for Clean Air Act violations were removed from the List in 1988. Four facilities remain on the EPA List of Violating Facilities for Clean Air Act violations and Discretionary Listing actions are pending against seven facilities.

# IX. CONTROL OF MOBILE SOURCE EMISSIONS

## A. INTRODUCTION

Control of motor vehicle emissions has been a Federal responsibility since 1967. The requirements of the Clean Air Act (Act) relating to mobile sources have been subsequently refined several times, most recently in 1977. The Clean Air Act Amendments of 1977 established an ambitious regulatory program which addressed remaining problems in the motor vehicle emissions control program and bolstered efforts to attain and maintain the national ambient air quality standards for carbon monoxide and ozone. Below are listed some of the mobile source provisions of the 1977 Act.

- A schedule was established for implementation of stringent emissions standards for automobiles--0.41 grams per mile (gpm) for hydrocarbons (HC), 3.4 gpm for carbon monoxide (CO), and 1.0 gpm for oxides of nitrogen (NOx). The table below displays the level of control mandated by the standards.

New Light-Duty Vehicle Emissions

| | Without Control | 1977 CAA Standard | Percent Reduction |
|---|---|---|---|
| Hydrocarbons | 8.8 gpm | .41 gpm | 95% |
| Carbon Monoxide | 87.0 gpm | 3.4 gpm | 96% |
| Oxides of Nitrogen | 3.6 gpm | 1.0 gpm | 72% |

- Similarly, the amendments tightened standards for emissions of the above mentioned pollutants from heavy-duty engines.

- Standards for the control of particulate emissions from heavy-duty diesel engines were mandated.

- Areas not meeting carbon monoxide and ozone ambient air quality standards by 1982 were required to implement motor vehicle inspection and maintenance (I/M) programs.

Since the enactment of the 1977 amendments, EPA has made steady progress toward achieving the Act's goals. The EPA has made a number of modifications to its motor vehicle emissions

standards in order to assure that they attain the goal of cleaner air as effectively and efficiently as possible. In 1988, EPA made significant progress in the implementation of its mobile source air pollution control program.

## B. OZONE CONTROL

With the increased focus on reducing ozone levels, EPA has continued work on several areas directly aimed at this goal. One of the key actions is controlling excess evaporative emissions through regulation of in-use gasoline volatility. The EPA continued work in 1988 to complete a final rule proposed in 1987 to set volatility standards for vehicle fuels. A final rule is expected in 1989.

Another action aimed at ozone reduction is control of refueling emissions. The EPA continued work on refueling emission standards in order to reduce hydrocarbon emissions. In support of the refueling standard, EPA has, in coordination with NHTSA, studied the safety of refueling emission control systems. Three safety reports have been issued, which detail the results of EPA and contractor studies. One of these reports was a response to public comments on the refueling control proposal. The second was a "failure modes and effects analysis" of the risks associated with various evaporative emission controls and refueling emission controls. The third report assessed the risks currently involved with refueling a vehicle at a service station. Also in support of the refueling standard, EPA has developed a refueling emission control system which is simpler in many ways than the systems suggested by manufacturers. The system has been successfully applied to both General Motors and Ford fuel systems and complies with the proposed refueling emission standard. Furthermore, this system is inexpensive, and does not add complexity to the vehicle.

The EPA identified excess evaporative emissions account for an additional 5% of VOC emissions. An initial data base of running loss emission data was collected during 1988. Based on these data, it is currently estimated that running losses account for slightly more than fifteen percent of all VOC emissions in nonattainment areas. This would make it the single largest uncontrolled VOC emission source. Running losses and excess evaporative emissions account for more than 20% of VOC emissions. The EPA held a workshop in June of 1988 to discuss the test procedures for the volatility and refueling proposals. At this

workshop, EPA discussed requirements to control running loss emissions and evaporative emissions. Publication of a formal proposal is expected in 1989.

Other work related to ozone (and carbon monoxide) control involved development of on-board diagnostic (OBD) systems. Current on-board vehicle computers have the capacity to monitor emission control system components for malfunctions, notify the driver if a malfunction has occurred, and assist mechanics in diagnosing malfunctions. Thus, in-use vehicle emissions are reduced due to improved malfunction identification and repair. Considerable progress was made toward determining the benefits of federal regulation to mandate specific OBD system performance. EPA also worked closely with the California Air Resources Board in their development of OBD requirements, and chaired an a Society of Automotive Engineers committee which has made substantial progress towards standardized OBD system requirements.

A fourth ozone-related action was development of a rulemaking which will tighten the light-duty truck exhaust hydrocarbon and carbon monoxide (CO) standards. This action could reduce the nationwide VOC inventory by up to 0.8 percent, and the CO inventory by up to 1.7 percent. Publication of the proposal is expected in 1989.

Other work related to ozone (and carbon monoxide) control involved providing guidance to States on how to assess the effects of alternative fuels on air quality. A guidance document was released in January of 1988. In particular, exhaust emission credits are provided for the use of gasoline-oxygenate blends of ethanol, methanol, and methyl tertiary butyl ether (MTBE) as well as fuel methanol and compressed natural gas. This guidance document was also an important piece of EPA's carbon monoxide attainment strategy. In addition, EPA worked closely with Arizona in 1988 in its development of an alternative fuels program.

## C. VEHICLE FUELS AND AIR TOXICS

Several EPA initiatives were related to vehicle fuels in 1988. Development has continued on a notice of proposed rulemaking to control the sulfur and aromatics content of diesel fuel. This action is expected to improve the ability of manufacturers to comply with the stringent heavy-duty particulate emission standards which take effect in 1994. Publication of the

notice will occur in 1989. In another initiative, EPA continued to investigate the roles of all sources of formaldehyde exposure, as well as the need for control. Included in this is an assessment of the potential impacts of methanol-fueled vehicles. The EPA will continue its assessment as these vehicles enter the market.

The EPA also has responsibility for enforcing section 211 of the Clean Air Act relating to the regulation of fuels and fuel additives. One of the regulations under this section of the Act is aimed at protecting the catalytic converters on 1975 and later model year cars by requiring that unleaded gasoline be widely available. The EPA has established a nationwide fuels enforcement program to ensure that affected retail outlets comply with these regulations. This program includes sampling of the fuel at retail outlets by EPA field inspectors and private or State inspectors under EPA contracts or grants, in order to measure the fuel's lead content. The EPA conducted approximately 3,500 inspections under this program during 1988.

Additionally, lead use in fuel is being phased down due to considerations related to the adverse health effects of lead. The lead phasedown program continues to achieve significant reductions in the use of lead in gasoline, from six billion grams in 1987 to two billion in 1988. This represents a 99 percent decrease from the 206 billion grams of lead which were used in gasoline in 1973. The standard remains at 0.10 gram per leaded gallon (gplg) as a quarterly average for a refinery or importer. In 1988, EPA issued a report to the President and the Congress on the use of low-leaded (0.10 gplg) and unleaded gasoline in agricultural equipment designed for leaded gasoline, as required by the 1985 Farm Bill.[1] The report found 0.10 gplg to be adequate, but that some engines designed for use with leaded fuel would have some premature exhaust valve wear if operated exclusively on unleaded gasoline. Three public hearings were held to receive comments on the study. Additionally, EPA held a public workshop to discuss valve protection for agricultural engines and will continue to work with the U.S. Department of Agriculture, industry, and others to provide guidance. The EPA also announced that it has no final plans to ban leaded gasoline, but will continue to evaluate the health effects of lead and the potential for engine damage to agricultural and other equipment.

The EPA mobile source air pollution control program has shifted enforcement efforts from fuel switching to the fuel refiner/importer audit program to assure compliance with the lead phasedown regulations. Investigation and enforcement in this area involves extensive analysis of the production, importation and blending of gasoline, gasoline blendstocks and lead additives. The EPA also tracks the banking and withdrawal of lead rights and related documents and records and has successfully conducted a number of these audit investigations. Computer programs help analyze the refiners' records and a strategy has been developed to integrate and evaluate all sources of data available to identify potential refiners and importers for investigation. The EPA conducted investigations of more than 20 refiner facilities during 1988 and 34 Notices of Violation (NOV's) were issued with proposed penalties of over $9.5 million. Three of these were for proposed penalties of over $1 million and one for over $3 million.

As part of the reduction of lead in gasoline, in 1988, EPA published a final rule eliminating lead in test fuel.[2] This will mean that manufacturers of engines not requiring catalysts, such as certain heavy-duty, gas-powered engines, must meet emission standards using unleaded gasoline.

The Fuel and Fuel Additive Registration program registered over 800 fuels and additives in 1988. This registration function will assure that EPA is knowledgeable about the chemical content of fuels and fuel additives. A development plan was completed for a rulemaking to establish testing protocols to determine the health effects of fuels and fuel additives under section 211 of the Clean Air Act. Publication of an advance notice of proposed rulemaking is expected in 1990. In conjunction with EPA's development of test protocols for assessing health effects, the registration system will enable EPA to assure that proper restrictions are placed on substances which cause harm to the environment and/or public health. Further, the system permits EPA to monitor the compliance of fuel and fuel additive manufacturers with the requirements of Section 211 of the Clean Air Act concerning waivers for new fuels or additives.

Increasingly, attention is being focused on toxic air pollution in urban areas. Mobile sources contribute as much as sixty percent of the urban air toxics emissions. In 1988, EPA released a paper updating a 1987 report which compiled available information on air toxics emissions from motor vehicles and which

also discussed how motor vehicle regulations are affecting these emissions and giving a range of risk estimates for the current and future potential carcinogenic impact of these emissions.

## D. STANDARD SETTING

As part of an ongoing effort in controlling ozone, EPA in 1988 continued its efforts in the development of alternative fuels technologies. These efforts have additional benefits in helping to reduce emissions of carbon monoxide and other pollutants, as well as reducing our dependence on foreign oil. In addition, as mentioned before, there has been significant activity in the effort to reduce particulate matter from diesel engines. In addition to those standard setting activities already mentioned in this area, other 1988 accomplishments include the following:

- The EPA continued work on implementing the proposed volatility standards for vehicle fuels in order to reduce hydrocarbon emissions. The expected promulgation of the two-phase volatility control rules will lower the volatility of in-use gasoline.

- The EPA identified running losses and excess evaporative emissions as major sources of VOC emissions. An initial data base of running loss emission data was collected during 1988. The EPA held a workshop in June of 1988 to discuss the test procedures. At this workshop, EPA discussed options for controlling running loss and excess emissions. Publication of a proposed rule is expected in 1989.

- Development has continued on a notice of proposed rulemaking to control sulfur and aromatic content of diesel fuel. This action is expected to improve the control particulate emissions from diesel engines. Publication of the notice will occur in 1989.

- Worked continued to develop a notice of proposed rulemaking related to the light-duty truck exhaust hydrocarbon and carbon monoxide (CO) standards. Publication of the proposal is expected in 1989.

- A contractor study on off-highway diesel emissions and their control was completed. Publication of the report is expected in 1989.

- A development plan was completed for a rulemaking to establish testing protocols to determine the health effects of fuels and fuel additives.

- The EPA continued to investigate the roles of all sources of formaldehyde exposure, as well as the need for control. Included in this is an assessment of the potential impacts of methanol-fueled vehicles. The EPA will continue its assessment as these vehicles enter the market.

- In anticipation of the development of methanol as an alternative fuel, EPA moved forward in the development of emission standards for methanol-fueled vehicles. Methanol has the potential to reduce ambient levels of both ozone and particulate matter. A final rule is expected in early 1989.

- The EPA worked to develop a proposed rule to permit the banking and trading of oxides of nitrogen and particulate matter emission credits among heavy-duty gasoline, methanol and petroleum-fueled diesel engine manufacturers. This rule will also include an expansion of the current averaging programs. Publication of the proposal is expected in early 1989, with a possible final rule in late 1989.

- The EPA continued to promulgate nonconformance penalties for those heavy-duty engine families unable to meet certain standards applicable to a given model year. This mechanism assures that no manufacturer benefits financially from nonconformance with the emission standard, and that the least effective control technology does not determine the stringency of standards for the entire industry. A final rule to increase the stringency of the 1991 light-duty diesel truck particulate standard for light-duty trucks equipped with heavy duty engines and to offer nonconformance penalties was published in 1988.[3] A proposal to allow EPA to waive the payment of nonconformance penalties for engines sold in California for which nonconformance penalties have been paid to the State of California was published in 1988[4] and the final rule was also published in 1988.[5] A proposal to make nonconformance penalties available for 1991 and 1994 heavy-duty vehicle and heavy-duty engines is planned for 1989.

- The EPA also focused attention on the problem of carbon monoxide (CO) nonattainment in 1988. Motor vehicles are the primary source of CO emissions and projections made in the early 1980's indicated that the existing Federal Motor Vehicle Pollution Control Program (FMVPCP) would virtually eliminate CO nonattainment as the vehicle fleet turned over. While reductions in ambient CO levels have occurred, they have not been as substantial as originally projected. In 1988, EPA investigated the causes of this discrepancy and determined that increased vehicle emissions at cold temperatures was a major factor. A public workshop was held including participation by the motor vehicle and oil industries and the state and local jurisdiction. EPA decided to directly pursue a notice of proposed rulemaking, incorporating for the first time a motor vehicle CO standard at colder temperatures. Publication of the proposal is expected in late 1989.

## E. PREPRODUCTION COMPLIANCE

One of EPA's key techniques for assuring the compliance of vehicles with the motor vehicle emissions standards is the preproduction certification program. This program intensively evaluates each vehicle design to assure that only those designs reasonably likely to comply in-use are certified and allowed to be sold in the United States. Initiated in 1968, the program involves the selective engineering review and testing by EPA staff of engine families representing new vehicles which are to be sold in the United States. This process includes the submission of technical data from manufacturers about prospective production vehicles, emissions testing of prototypes by manufacturers, a review of engineering data and test results by EPA personnel, and, in certain cases, confirmatory testing of prototypes at EPA's National Motor Vehicle Emissions Laboratory in Ann Arbor, Michigan. This procedure identifies and resolves potential problems which could result in excessive in-use emissions. Correcting these problems at the preproduction stage assures maximum environmental benefits and reduces compliance cost to the industry compared to correcting the problems when discovered in use.

The EPA's National Motor Vehicle Emission Laboratory performed 950 emission tests on 500 preproduction prototype vehicles in 1988. Correlation activities with the regulated industry have resulted in improved correlation and a reduction

in industry challenges to EPA data. The technical exchange program with the Motor Vehicle Manufacturers Association, which began in 1987, has proven useful and will continue.

The EPA's vehicle certification program is the only vehicle emission compliance program which evaluates all vehicle designs from each manufacturer. It is also the only program which screens vehicles for elements of design known as defeat devices. A defeat device allows a vehicle to pass emission standards when tested according to Federal test procedures but produce unacceptably higher emissions when operated under other conditions. Coupled with the Selective Enforcement Audit and in-use compliance test programs, the certification program establishes the necessary oversight to assure vehicles are adequately designed and constructed for satisfactory in-use emissions performance. As indicated in previous annual reports, a series of regulatory and efficiency reforms have been made to the certification process over the last ten years. Effective use of computerization has been a key item in easing procedural burdens to the manufacturer and in providing increased speed and efficiency in EPA's review and approval process. However, prior to 1988, this computerization was only available for processing certification and fuel economy data associated with light-duty vehicles and trucks. In 1988, EPA completed software development and implemented a computer data processing system for heavy-duty engine and motorcycle certification. This new system is based upon the use of personal computers and more user-friendly programs than the older "mainframe" system used for light-duty vehicles. In addition to enhancing EPA's efficiency in processing heavy-duty engine and motorcycle certification, this new system serves as a model for possible future improvements to the light-duty vehicle system.

As a result of changes to the imports program, 1988 was the first year that "independent commercial importers" (ICI's) were required to receive certificates of conformity to be able to import and introduce cars into commerce. This resulted in an increase in the number of firms working with the certification process. Five new firms received certificates in 1988 and over 130 firms expressed an interest in pursuing certification and requested varying levels of assistance in understanding the program.

In 1988, EPA published a notice of proposed rulemaking providing guidance and clarification for small volume manufacturers and small volume engine families.[6] Since many new

small domestic manufacturers and modifiers of imported vehicles have entered the marketplace over the last several years, improvements and clarifications of policies are needed. The proposed revisions, when completed in 1989, will enable EPA to maintain the integrity of the current program and improve the guidance to the many new small manufacturers.

In 1988, emission testing was performed on a sample of properly maintained light-duty vehicles that use the newer technology emission control systems that EPA expects will dominate U.S. sales for the foreseeable future. The EPA uses this information to evaluate the effectiveness of the preproduction certification process in predicting how these newer systems are performing in actual use. These data will be used in EPA's continuing efforts to improve the cost effectiveness of its preproduction certification program.

Substantial progress was made in 1988 toward completing revisions to the voluntary aftermarket part certification program regulations. This final rule will effectively provide a mechanism through which quality aftermarket parts can be made available to the consumer at a reasonable cost and will assure that air quality is not compromised. The final rule is scheduled to be published in the first half of 1989. In conjunction with this rulemaking a notice of proposed rulemaking was prepared that will propose the adoption of an alternative emissions demonstration test that may be used in place of the existing certification test procedure (the Federal Test Procedure) for the certification of aftermarket parts. This alternative test is preferred by some part manufacturers as quicker and less expensive. This notice is scheduled to be published in 1989.

## F. VEHICLE INSPECTION PROGRAM

An effective strategy for dealing with in-use emissions problems is the establishment of motor vehicle inspection and maintenance (I/M) programs. The EPA's basic approach in this area was determined by the 1977 amendments to the Clean Air Act. Urban areas of the country which obtained an extension to the deadline for attaining the ambient air quality standards for ozone and carbon monoxide beyond 1982 are required by the Clean Air Act to implement an I/M program. The EPA has also interpreted the Act to require areas which did not achieve attainment in 1982 as predicted to implement I/M programs unless they could otherwise prospectively demonstrate attainment by 1987. In 1988,

EPA continued to promote the implementation of I/M programs in each locality where they were needed. By the end of the year, 64 areas had initiated programs. In addition, implementation was underway in five new areas.

To assure that operating I/M and antitampering programs actually achieve the planned emission reductions, EPA has initiated a systematic I/M auditing plan. In previous years, EPA conducted 40 initial audits and 14 follow-up audits. In 1988, EPA audited an additional two I/M programs and conducted 12 follow-up audits. Auditing and thorough follow-up by Federal, State and local officials will pinpoint and lead to the correction of any major deficiencies in individual programs.

In addition to I/M programs, EPA has promoted the implementation of State and local antitampering and anti-fuel switching enforcement programs. By the end of 1988, 42 programs had been implemented. Eight of these programs are strictly visual anti-tampering inspections and not integrated with a tail pipe testing program. Tampering and fuel switching programs focus on correcting and deterring the removal and rendering inoperative emission control devices. Therefore, they complement the tail pipe I/M programs. In seven I/M programs no emission check is performed, but antitampering and fuel switching checks make up the entire inspection.

## G. MOBILE SOURCE ENFORCEMENT

The EPA mobile source enforcement program is directed primarily toward achieving compliance with motor vehicle emissions standards and fuel regulations as required by the Clean Air Act. The major goals and objectives are to: (1) assure that both new and in-use vehicles meet emissions standards, (2) assure that emissions control systems are not removed or rendered inoperative, (3) assure that gasoline that is marketed meets EPA standards, (4) assure the reductions of lead in gasoline are achieved, (5) administer statutory and California emissions standards waivers, and (6) administer the statutory emissions warranties. To accomplish these goals, EPA maintains a number of basic motor vehicle enforcement programs:

### Selective Enforcement Auditing

In order to assure that production vehicles and heavy-duty engines are built in accordance with emissions standards, EPA conducts Selective Enforcement Audit (SEA) test programs at

manufacturers' facilities. The SEA program is a highly leveraged one. For every car EPA requires manufacturers to test during an audit, over a hundred cars are voluntarily tested by auto producers to assure that the audits do not result in a failure which could affect vehicle production. Since this close scrutiny by manufacturers results in the repair of vehicle classes that are only marginally meeting requirements, EPA has been able to reduce the number of audits it requires. In 1988, EPA conducted 20 SEAs, including three light-duty audits at foreign manu- facturers' facilities located in the U.S. and four heavy-duty engine audits. Additionally, three production compliance audits for nonconformance penalties were conducted, and approximately $2.0 million in penalties were collected.

Recall Program

Section 207(c) of the Clean Air Act authorizes EPA to order the recall of vehicles if a substantial number of any class of vehicles do not conform to emissions standards during their useful lives. During 1988, a total of 2,364,200 vehicles were recalled as a result of EPA investigations. In the same period, manufacturers voluntarily recalled an additional 904,100 vehicles to correct emissions problems. The EPA conducted a total of 25 recall investigations in 1988, and performed 578 tests of in-use vehicles at laboratory facilities in Springfield, Virginia and Ann Arbor, Michigan.

Historically, the motor vehicle recall program focused its efforts more on light-duty automobiles as they comprise the majority of the vehicles on the road. In 1988, the program further expanded its surveillance of light-duty trucks and heavy-duty engines in recognition of the increasingly stringent emission standards and useful life requirements applicable to these vehicles. This coverage included emission testing of nine light-duty truck engine families at higher mileage (greater than 50,000 miles) to determine compliance over their extended useful life and the continuation of field surveys of heavy-duty engine emission control systems.

Fuels Enforcement Program

As mentioned before, EPA greatly increased its lead phase-down enforcement activities in 1988. In 1988, EPA issued 34 notices of violation with $9.5 million in proposed penalties. In addition, EPA worked with the Justice Department in civil

and criminal prosecution of refiners based on notices of violation issued in previous years. These rules are creating a demand for other additives which may have a harmful impact on auto emissions. The EPA expects that the proliferation of additives will create a need to monitor the composition of vehicle fuels even more closely than in the past.

Analysis of gasoline for various additives, primarily lead and alcohol, was an area of substantial effort by EPA's Motor Vehicle Emission Laboratory in 1988. Over 9,000 samples from EPA's National Tampering Audit were analyzed for lead. For specific enforcement cases, 250 samples were analyzed for lead and 60 for alcohol. In addition, a major effort in the area of fuel volatility was begun as part of the previously-mentioned regulation proposed in 1987.

Tampering/Fuel Switching

The EPA is also responsible for carrying out programs designed to deter tampering with vehicle emissions control systems or using leaded fuel in vehicles which require unleaded fuel. Surveys undertaken by EPA have shown tampering and fuel switching to be continuing serious problems which undermine the emissions control performance of many in-use vehicles. A motor vehicle tampering audit indicated that about 19 percent of the vehicle fleet is subject to gross tampering, and about 6 percent to fuel-switching. Tampering and fuel-switching enforcement activities continued in 1988 with the issuance of 215 notices of violation with proposed penalties of over $2 million. There were 298 settlements obtained in 1988 (which included some notices of violation issued in previous years) from which just under $1 million was obtained in civil penalties and approximately $800,000 in alternative projects. Over $133,000 in penalties resulted from 8 consent judgments with another $10,000 assessed in a court decision. EPA also continued a "traffic ticket" program for certain nozzle violations to reinforce the agency's enforcement presence using minimal resources. Forty-nine "traffic tickets" were issued in 1988. Also, as mentioned above, EPA has promoted the implementation of State and local antitampering enforcement programs. By the end of 1988, 42 programs had been implemented.

Aftermarket Catalytic Converter Policy Implementation

A critical element of public acceptance of State and local vehicle tampering inspections is the availability of low cost replacement emission control components. The EPA published an

enforcement policy regarding the sale and use of aftermarket catalytic converters that established performance standards and installation requirements for converters. A number of investigations were initiated during the year to determine compliance with the requirements. The policy became effective in late 1986, was revised for 1988 to make enforcement easier, at which time EPA intensified monitoring compliance actions when warranted. The EPA has already brought hundreds of enforcement actions for installation of improper catalytic converters. A leaflet was developed in 1988 which outlines the aftermarket converter enforcement policy and will be available upon request to regulated parties.

Emission Warranty Enforcement

The EPA is also responsible for assessing whether the Federal emission warranty requirements of sections 207(a) and (b) of the Act are implemented. During 1988, EPA responded to a total of 2,001 inquiries. Of these, 282 were complaints specifically related to warranty coverage and were referred to the appropriate vehicle manufacturer for resolution. The updated section 207(a) defect warranty pamphlet was printed and distributed to State and local programs. An enforcement memorandum outlining coverage of the 207(a) defect warranty was drafted and will be published in the Federal Register next year. A notice of violation was also issued against Ford Motor Company for violations of the warranty provisions.

Volatility Monitoring

In 1988, EPA initiated a survey to study the extent of Stage I (control at the bulk delivery points) VOC control regulations violations occurring at both fuel distribution facilities and gasoline retailer outlets. This survey of gasoline tanker trucks Stage I evaporative control hook up violations was conducted by EPA Region III. The survey intent was to study the frequency of Stage I violations and factor the potential emission benefits lost as a result of these violations. The initial study found a very high percentage of violations occurring at the gasoline retailer outlets due to the truck operators failing to connect the Stage I control equipment. The EPA plans to conduct additional studies in several other areas and hopes to involve state and local agencies in enforcement of the evaporative control regulations.

## H. IMPORTS

The control of emissions from imported vehicles has become a major issue in recent years. Due to the desire for luxury imported cars and the strong dollar throughout most of this decade, the importation of cars which do not conform to appplicable air pollution control regulations increased from 1,500 in 1980 to a high of 68,000 in 1985. In 1988, EPA received 15,000 applications and 31,000 inquiries concerning these automobiles. The EPA believes the decrease in imports from its 1985 peak is largely attributed to the dollar's decline in exchange value in foreign markets, rather than a change in consumer taste. The EPA has substantially automated the processing of applications and test data for cars which have been modified for compliance with emission standards. In 1988, EPA implemented new regulations controlling these automobiles. Under these revised rules, the vast bulk of these imported vehicles are allowed to enter the U.S. via EPA's new vehicle certification program. The new procedures have increased EPA's confidence that the vehicles have been properly designed to assure continued satisfactory in-use emission performance.

The EPA has also been investigating various laboratories and Independent Commercial Importers to ensure that nonconforming imports have been tested properly to demonstrate conformity with Federal emissions requirements. The laboratories are required to conduct a Federal test procedure and submit the results to EPA for approval. Some laboratories, however, have been falsifying the results of these tests. In 1988, EPA successfully prosecuted two laboratories resulting in 10 individual convictions and one corporate conviction. The EPA took administrative action against one additional laboratory.

## I. LITIGATION

### Vehicle Recall

EPA and General Motors agreed to settle litigation which contested EPA's order to recall 82,000 1981 model year vehicles which were exceeding Federal standards for evaporative hydrocarbon emissions. General Motors began recalling the vehicles in September 1988. Due to the age of the vehicles and the length of time that had elapsed since EPA's investigation began, General Motors also offered its dealers incentives to help increase the owners' response rate to the recall.

Chrysler Corporation agreed to withdraw its request for a public hearing which contested EPA's order to recall 93,000 1981 model year vehicles which were exceeding Federal standards for oxides of nitrogen. The vehicles will be repaired in early 1989.

In early 1988, EPA and Ford Motor Company reached a settlement whereby Ford agreed to recall approximately 103,000 vehicles and pay $60,000 for alleged violations of the Clean Air Act.

Lead Phasedown

Enforcement of lead phasedown has resulted in criminal prosecution of individuals. At least two criminal cases are now pending which were developed in the course of EPA investigations. The EPA attorneys are participating in the prosecution of these cases in conjunction with the environmental crimes unit of the U.S. Department of Justice. Other more egregious cases, including four related cases with potential penalties of $40 million, are pending. The EPA has also issued notices to 18 refiners or importers proposing a total of $24 million in civil penalties. The parties were cited for failure to file quarterly reports, overuse of lead in gasoline production or the illegal creation of lead usage rights (banking violation).

J. REFERENCES

1. 53 FR 39516, October 7, 1988.

2. 53 FR 470, January 7, 1988.

3. 53 FR 43870, October 31, 1988.

4. 53 FR 1716, January 21,1988.

5. 53 FR 19131, May 26, 1988.

6. 53 FR 7676, March 9, 1988.

7. 53 FR 7676, March 9, 1988.

# X. STRATOSPHERIC OZONE PROTECTION

## A. DESCRIPTION OF ACTIVITIES

The EPA has been responding to growing scientific evidence linking increased levels of chlorine and bromine to depletion of the stratospheric ozone layer. If stratospheric ozone depletion occurs, increased levels of harmful ultraviolet radiation would penetrate to the earth's surface, resulting in substantial damage to human health and the environment. On August 12, 1988, EPA issued final regulations[1] to implement the Montreal Protocol on Substances that Deplete the Ozone Layer, which as of mid-January 1989 had been ratified by 26 nations representing about 90 percent of global consumption of chlorofluorocarbons (CFC's) and halons. This landmark environmental agreement calls for a 50 percent reduction in use of CFC's and a freeze on use of halons over the next ten years. By reducing the future use and emissions of CFC's and halons, these restrictions will help protect the earth's stratospheric ozone layer.

Specifically, the Protocol requires a freeze at 1986 consumption and production levels of CFC-11, -12, -113, -114, and -115 on the basis of their relative ozone depletion weights, followed by reductions up to 80 percent and 50 percent of 1986 levels beginning in mid-1993 and mid-1998, respectively. It would also prohibit production and consumption of Halon 1211, 1301, and 2402 from exceeding 1986 levels on a weighted basis beginning in approximately 1992. Under limited circumstances, somewhat higher levels of production (but not consumption) would be permitted. Consumption is defined in the rule as production plus imports minus exports of the bulk chemicals as listed above.

The EPA rule mirrors the requirements of the Protocol. It allocates quotas reflecting the allowable level of production and consumption to each of the firms that engaged in these activities in 1986. As alternatives and supplements to this approach, EPA requested public comments on other control mechanisms such as regulatory fees and auctioning of production rights.[2]

The EPA issued its regulations pursuant to section 157(b) of the Clean Air Act. The rule constitutes the United States' implementation of the Montreal Protocol. The Protocol entered into force on January 1, 1989, and the control requirements and EPA rule require that reduction begin on July 1, 1989. The Protocol responds to growing scientific evidence linking increased

atmospheric levels of chlorine and bromine to depletion of the ozone layer. If ozone depletion occurs, increased levels of harmful ultraviolet radiation would penetrate to the earth's surface, resulting in substantial damage to human health and the environment. In the fifteen years since concern about CFC's and ozone depletion was first raised, substantial scientific research has supported the general conclusion that concentrations in the stratosphere of chlorine, as well as bromine from halons, pose substantial risks of ozone depletion.

In the short time since the Protocol was signed, new scientific evidence[3] suggests that ozone depletion from CFC's maybe more advanced than previously thought and that the Antarctica "ozone hole" is linked to higher levels of atmospheric chlorine from CFC's. An EPA analysis[4] also suggests that even with the reductions called for in the Protocol, stratospheric chlorine levels will increase substantially. Thus new information will be reviewed by the Parties to the Protocol as part of its assessment and review process with a decision on whether additional controls are warranted. This decision is now scheduled to be made in 1990.

B. REFERENCES

1. 53 FR 30566, August 12, 1988.

2. 53 FR 30604, August 12, 1988.

3. Executive Summary, "Report of the Ozone Trends Panel," NASA, March 15, 1988.

4. Future Concentrations of Stratospheric Chlorine and Bromine, Hoffman, and Gibbs, EPA 400/1-88/005, August 1988.

# XI. INDOOR AIR QUALITY

## A. DESCRIPTION OF ACTIVITIES

Title IV of the 1986 Superfund Amendments and Reauthorization Act (SARA) mandated that EPA carry out a program aimed at conducting research into the scientific and technical questions surrounding indoor air quality and at disseminating information to the public. In addition, SARA required EPA to coordinate Federal, State and local, and private sector activities related to indoor air quality.

Implementation of SARA Title IV by EPA has focused on three objectives: (1) performing the policy analyses needed to make recommendations with respect to the long-term Federal role in indoor air quality issues, (2) developing mechanisms of coordination of government and private sector indoor air programs and activities, and (3) developing a wide spectrum of information on indoor air pollution problems and mitigation strategies.

Specific activities undertaken in 1988 to resolve issues about the long-term Federal role on indoor air included the following:

- Submittal of a 1987 report to Congress, as required by SARA Title IV, that outlined the EPA program on indoor air quality for the next two years.[1]

- Preparation of a report to Congress, also required by SARA Title IV, that describes the activities that EPA has carried out under SARA and that makes recommendations regarding the Federal role in indoor air quality.[2] This report will also include an overview of the problem of indoor air pollution, including both the current level of knowledge and uncertainties about pollutants, sources, modeling and monitoring methods, concentrations, exposures, health effects, existing standards, codes and legislation, economic impacts, and policy issues.

Because indoor air responsibilities are divided between many agencies at every level of government, EPA is giving much attention to its coordination role. Several actions were taken in 1988 to coordinate indoor air activities by governmental and private sector organizations, including:

- Revitalization of the Interagency Committee on Indoor Air Quality (CIAQ), comprised of 16 Federal agencies with an interest in indoor air issues. The EPA, with the cooperation of the CIAQ, published a compilation of the indoor air activities under way across the Federal government.[3]

- Conducting a survey of the private sector firms offering indoor air quality diagnostic and mitigation services to the public to begin to identify and evaluate the capability of the private sector to address indoor air problems in a variety of buildings, including residences.

- Publication of a directory of State indoor air contacts, under a cooperative agreement with the Public Health Foundation, that lists State agency contacts for up to 16 different indoor air quality issues.[4]

Much of the emphasis of the indoor air program has been directed at producing information documents useful to the public, or specific audiences within the public, including the following:

- Development and distribution, in cooperation with the Consumer Product Safety Commission, of a booklet for the general public titled "The Inside Story: A Guide to Indoor Air Quality" describing residential and public building indoor air quality problems and solutions.[5]

- Publication of a series of fact sheets on various indoor air topics of special interest.

- Initiation of work on two manuals that address specific aspects of indoor air quality including a manual for building design engineers and architects and a manual for policy makers on policy options and technical issues involved in adopting and implementing smoking restrictions.

- Initiation of work on a self-paced introductory training course on indoor air quality for State and local government personnel.

## B. DEVELOPMENT OF EPA INDOOR AIR POLICY

EPA has set two overall goals in addressing indoor air quality problems: to adequately characterize and understand the

risks to human health which pollutants pose in indoor environments and to reduce those risks by reducing exposure to indoor pollutants. To achieve these goals, the Agency will implement the following policy objectives:

1. The Agency will conduct research and analysis to further refine its assessment of the nature and magnitude of the health and welfare problems posed by individual air pollutants as well as pollutant mixtures indoors.

2. The Agency will identify and assess the full range of mitigation strategies available to address high priority indoor air pollution problems.

3. For identified high risk, high priority problems, the Agency will adopt and execute appropriate mitigation strategies. These mitigation strategies may involve one or more of the following:

- Issuing regulations under existing regulatory authorities (e.g., the Toxic Substances Control Act, the Federal Insecticide, Fungicide and Rodenticide Act, and the Safe Drinking Water Act).
- Building State and local government and private sector capability to address indoor air quality problems through non-regulatory programs of information dissemination, technical assistance, guidance, and training.
- Referring problems to other Federal agencies with appropriate statutory authority (e.g., the Consumer Products Safety Commission and the Department of Housing and Urban Development).
- Requesting separate indoor air regulatory authority from Congress if deemed necessary.

C. REFERENCES

1. EPA Indoor Air Quality Implementation Plan, 1987. [Submitted as report to Congress pursuant to SARA Title IV, Section 403(d)], EPA 600/8-87-031, June 1987; NTIS: PB87-210720.

2. Report to Congress on Indoor Air Quality. [In preparation; to be submitted to Congress pursuant to SARA Title IV, Section 403(e)].

3. Current Federal Indoor Air Quality Activities; EPA in cooperation with the Interagency Committee on Indoor Air Quality, 1988.

4. Directory of State Indoor Air Contacts; EPA and the Public Health Foundation, 1988, EPA 400/1-88-003.

5. The Inside Story: A Guide to Indoor Air Quality; EPA, 1988, EPA 400/1-88-004.

# XII. ACID DEPOSITION

In the area of acid deposition, EPA continued to focus its attention in 1988 on implementation issues, ongoing research, and policy analysis.

In 1988, EPA completed two reports on implementation issues associated with potential acid deposition control programs. The two projects are important in that they examine the issues that will be faced by State agencies in trying to implement control strategies before a control program (either legislative or statutory) is in place. These efforts will hopefully lead to the development of cost-effective control strategies that achieve environmental results in the area of acid deposition. The two reports are: (1) "Final Report of the State Acid Rain (STAR) Program," and (2) "Acid Rain Legislation and Utility Commission Regulation." The final STAR report documents the results and findings of a four-year, $3 million effort in which States identified and explored potential issues associated with the implementation of any major effort to control acid deposition (e.g., emissions trading, the role of energy conservation in reducing emissions). In coordination with State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), EPA funded 47 State projects which focused exclusively on management and administrative issues. The second report, relating to utility commissions, was motivated by a recognition on the part of EPA of the importance of electric utilities in controlling acid deposition precursors, the complexity of the utility regulatory process, and the potential impact that Federal acid deposition legislation could have on the electric utility industry and its regulation. Some of the issues explored in the second document were examined in some of the STAR projects (e.g., the role of energy conservation in reducing emissions, emissions trading), while others relate more specifically to utility commissions (e.g., the impact of multistate power grids on the allocation of emission reductions and the associated control costs).

In the area of research, EPA continued to fund work being carried out under the auspices of the National Acid Precipitation Assessment Program (NAPAP). A plan for the final NAPAP Integrated Assessment, representing the culmination of a 10-year Federal research effort on the causes and effects of acid deposition, was completed in 1988 and a public meeting was held

on the plan in November. The Integrated Assessment is scheduled for publication in September 1990. The EPA has also continued to participate in the work of the Interagency Science and Policy Committees.

The EPA has continued to participate in the Department of Energy (DOE)-led Clean Coal Technology (CCT) program through the Agency's membership on the Innovative Control Technology Advisory Panel. The purpose of the CCT program is to search for ways to reconcile a desire to utilize an abundant domestic natural resource used for the generation of electricity with the need to reduce emissions of acid deposition precursors from coal-fired power plants. In 1988, DOE announced the selection of 16 projects, valued at more than $1.3 billion, for inclusion in the program. If all 16 projects are successfully negotiated, the Federal government will contribute $537 million; this Federal funding will be in addition to $800 million in private sector funding. The government funding is part of the $2.5 billion commitment to clean coal technology made by President Reagan in 1987 in response to a recommendation made in the Special Envoys Report on acid rain.

In 1988, EPA received two petitions asking the Agency to initiate rulemaking under section 115 of the Clean Air Act, which deals with international air pollution. The petitions are aimed at achieving emission reductions in the U.S. that would benefit Canada by reducing damage to Canada's environment from air pollution that originates in the U.S. By the end of 1988, EPA had not reached a final decision on granting or denying the petitions. In the meantime, the petitioners have gone to court, seeking to force EPA to either set a timetable for rulemaking under section 115, or to formally grant or deny the petitions.

Following up on the two implementation reports, EPA decided to sponsor a workshop for public utility commissions and State air agencies. The workshop "Acid Rain Control: How Will States Respond?" was developed in cooperation with the National Association of Regulatory Utility Commissioners (NARUC) and the STAPPA, and is scheduled for the end of January 1989. The workshop objectives are: (1) to engage public utility commissions and air agencies in constructive dialogue on acid deposition control implementation issues, (2) to develop possible approaches for responding to potential acid rain legislative and regulatory implementation requirements, and (3) to establish the basis for productive future relationships between the State regulatory and air agencies, and the EPA. A conference proceedings document will be ready by April 1989.

# XIII. RADON ASSESSMENT AND REMEDIATION

## A. DESCRIPTION OF ACTIVITIES

Radon is a radioactive gas produced by the decay of uranium, which occurs naturally in soils and rocks. The EPA estimates that radon is the second leading cause of lung cancer causing about 20,000 lung cancer deaths each year. A recent report of the National Academy of Sciences entitled "Health Risks of Radon and Other Internally Deposited Alpha-Emitters" identified radon as a serious national public health issue, and confirmed EPA risk estimates.

The EPA Radon Action Program's initial efforts in 1985 were concentrated in the Reading Prong area of Pennsylvania, New Jersey, and New York where elevated levels of indoor radon were first discovered in homes. The EPA provided these States with assistance in radon measurement and mitigation of affected homes. Since then, high radon levels have been found in nearly every State and EPA's radon program has expanded in response to the growing scope and complexity of the radon problem.

In September 1988, EPA and the Public Health Service issued a National Health Advisory on radon and recommended that most homes be tested. This recommendation was based on the findings of EPA's 1988 State Radon Survey, which identified radon screening levels above 4 picocuries per liter, the level at which EPA recommends corrective action, in one of every three homes in the seven States surveyed. As a result of the strong public interest generated by the Health Advisory, an estimated one million additional homes were tested for radon in the period immediately following EPA's announcement.

The goal of the Radon Action Program is to significantly reduce the health risks of radon through a partnership with other Federal agencies and the States. To accomplish this goal, EPA is developing and disseminating technical knowledge to encourage, support, and facilitate the development of State programs and private sector capabilities.

Recognizing that radon is a national public health problem, Congress recently enacted the Indoor Radon Abatement Act (P.L. 100-551, adding a new Title III to the Toxic Substances Control Act). The bill generally supports the EPA's approach to the radon problem, and adds several new requirements and authorizations, including:

- A national long-term goal that indoor air be as free of radon as ambient air outside buildings.

- A requirement that EPA update the Citizen's Guide to Radon.

- Authorization of $10 million per year for fiscal year (FY) 1989-1991 for EPA to provide State radon program development grants.

- Authorization of $3 million per year for FY 1989-1991 for EPA to provide technical assistance to State radon programs.

- Authorization of $1 million for EPA to conduct a study of radon in the nation's schools, and an additional $500,000 to undertake diagnostic and remedial efforts.

- Authorization of $1.5 million for EPA to establish proficiency programs for firms offering radon-related services, including testing and mitigation. In addition, the bill authorizes a user fee to defray the cost of proficiency programs.

- Authorization of $1 million per year for FY 1989-1991 for EPA grants to universities to establish at least three regional radon training centers.

- A requirement that EPA develop model construction standards and techniques.

- A requirement that Federal agencies and departments study radon in Federal buildings.

Implementation of the legislation will be carried out through each of the four major elements of EPA's radon program:

- Problem Assessment - To identify areas with high radon levels in houses and to determine the national distribution of radon levels and associated health risks.

- Mitigation and Prevention - To identify cost-effective methods to reduce radon levels in existing structures and to prevent elevated radon levels in new construction.

- Capability Development - To stimulate the development of State and private sector capabilities to assess radon problems in homes and to help people mitigate such problems.

- Public Information - To work with States to provide information to homeowners on radon, its risks, and what can be done to reduce these risks.

The EPA's accomplishments in these areas during 1988 include the following:

Problem Assessment

- The document entitled "Indoor Radon and Radon Decay Product Measurement Protocols" was updated and revised to include four additional measurement methods. These standardized measurement protocols help ensure that radon measurements are comparable and accurate.

- Assistance was provided to seven States and Indian Lands in three States in designing and conducting surveys to identify areas where indoor radon may be a problem. A total of 17 States have been assisted in this manner through 1988. The EPA is assisting eight additional States and Indian Nations in eight States with similar surveys in 1989.

- Identification of geological factors and characteristics which are useful as indicators of areas with high radon levels was continued.

- The use of soil gas measurements to predict radon problems at potential building sites continued to be investigated.

- The EPA worked closely with several Federal agencies to coordinate the Federal response to the radon problem. EPA, along with the Department of Energy, co-chairs the Radon Work Group of the Committee on Indoor Air Quality. The Work Group actively coordinated Federal programs related to indoor radon.

- The 1986 Superfund Amendments and Reauthorization Act (SARA) required a national assessment of radon in homes, workplaces and schools. In addition, the 1988

Indoor Radon Abatement Act required studies of radon in schools and Federal buildings. The EPA undertook a variety of activities in 1988 to meet these requirements.

- EPA initiated the National Residential Radon Survey, designed to provide a scientifically sound estimate of the distribution of the annual average radon concentrations and exposures in houses across the country. Radon detection devices will be placed in 1989, and results of the survey are expected in the spring of 1991.

- In 1988, conducted a feasibility of radon in the workplace and in 1989 EPA will initiate and investigation of radon screening levels in a variety of Federal buildings representative of typical work environments. The results of this study will enable EPA to provide guidance for radon testing in the workplace. Interim guidance is expected in the autumn of 1990.

- EPA is also developing interim school guidelines, based on studies of radon in Fairfax County, Virginia schools. These guidelines will provide options for schools considering initiating radon measurements. Final guidance is expected to be available for use in the fall of 1990, and will be based on a school protocol development study to be conducted in 1989.

Mitigation and Prevention

- The House Evaluation Program (HEP), established in 1986 in order to assist States in evaluating and mitigating radon exposure in houses discovered to have elevated radon levels, was continued in 1988. The HEP has provided "hands-on" training to officials from New York, Virginia, Pennsylvania, New Jersey, Tennessee, Ohio, the National Park Service, and the Seneca Indian Nation in evaluating and mitigating radon exposure in over 160 selected houses in their respective areas. In 1989, the HEP will be revised and the versions of the HEP (old and new) will be offered.

- The EPA continued to cooperate with the National Association of Homebuilders and private homebuilders in 1988 to develop, demonstrate, and release interim guidance for preventing radon in new construction.

- The EPA continued to work with model building codes organizations to incorporate radon prevention techniques into national building costs.

- Research and operational programs were continued in 1988 in order to expand mitigation and prevention activities into schools and workplaces.

- Selected radon mitigation techniques were researched and demonstrated in houses in several states. Sixty-four houses have been completed and the program has been expanded into Maryland, Tennessee, Alabama, and Florida.

- A voluntary Radon Contractor Proficiency Program will be established in 1989, as required by the Indoor Radon Abatement Act. Participants who meet program requirements will be included in a list of "proficient" mitigators which will be made available to States and the public. To the maximum extent possible, program requirements will be coordinated with existing and proposed mandatory State mitigator certification programs.

Capability Development

- In 1988, EPA continued to provide a technical training course on radon diagnostics and mitigation techniques to States and private contractors. Nine courses were conducted and over 700 participants from over 40 States were trained. Approximately 500 participants are expected for the seven courses to be offered in 1989. In 1988 EPA continued to distribute a video tape of the course to the states. Also, EPA trained 40 individuals to deliver the EPA course, and an additional 60 are expected to participate in 1989.

- The National Radon Measurement Proficiency (RMP) Program was established in 1986 in order to allow private firms and other organizations to demonstrate their proficiency in measuring radon. When the program

began, 39 companies participated; by the end of 1988, the list of participants had grown to over 900. In 1989, EPA will institute changes in RMP program services in response to EPA Science Advisory Board recommendations and increased participation in the program. During 1989, EPA will conduct random blind evaluations of major companies participating in the RMP program, to ensure that their measurement performance continues to be of high quality. Companies which fail these blind tests will not be listed in the 1989 RMP program.

- In 1988, EPA planned for the establishment of at least three Regional Radon Training Centers, as required by the Indoor Radon Abatement Act. The goal of the centers is to develop information and provide training to Federal and State officials, professional and private firms, and the public regarding health risks posed by radon, and to demonstrate and teach methods of radon measurement and mitigation. Three centers are expected to be operational by the fall of 1989.

State Grants

- In 1989 EPA will be developing a state indoor radon grants program. Eligible activities will include problem assessment, problem response, public outreach and program management activities.

Public Information

- Several significant technical and program development information documents were published in 1988:
  "Radon Resistant Residential New Construction"[1]
  "Radon Reduction Techniques for Detached Houses: Technical Guidance, 2nd Edition"[2]
  "Application of Radon Reduction Methods"[3]
  "Summary of State Radon Programs"[4]
  "Key Elements of a State Radon Program"[5]
  "The National Radon Measurement Proficiency Program: Cumulative Proficiency Report (Round 5)"[6]

- EPA and the American Medical Association are producing a brochure and conducted three conferences to educate health professionals about indoor radon.

- In addition, in 1988, EPA participated in many national conferences and workshops on indoor radon, provided information and interviews to the media, organized and conducted press conferences and briefings on radon issues, and responded to thousands of public inquiries regarding indoor radon exposure.

While much of EPA's activity was initially directed at States in the Reading Prong area, the Radon Action Program is now assisting States throughout the country. Technical assistance activities will continue as an increasing number of States, Indian Nations and Federal agencies work to identify and address radon exposure problems. The EPA will also continue to expand its technical assistance capabilities in response to the increasing complexity of the radon problem.

B. REFERENCES

1. EPA 600/8-88/087.

2. EPA 625/5-87/019.

3. EPA 625/5-88/024.

4. EPA 520/1-87/19-1.

5. EPA 520/1-88/006.

6. EPA 520/1-88/024.

# XIV. LITIGATION

## A. CLEAN AIR ACT (CAA) SECTION 109: NATIONAL AMBIENT AIR QUALITY STANDARDS

On May 3, 1988 the D.C. Circuit decided Natural Resources Defense Council, Inc. v. Thomas, which involved a challenge to the legality of two Agency memoranda concerning the appropriate averaging method to be used in implementing the sulfur dioxide national ambient air quality standards. The court dismissed NRDC's petition for review finding that the case was not ripe for review because EPA "has had no chance to crystallize its own decision in a proper rulemaking, and the petitioners have demonstrated no impact on their conduct of their day to day affairs." While the court refused to require EPA to conduct a rulemaking, it stated that its holding was based on the assumption that EPA would continue to treat the averaging method issue in accordance with the court decision in PPG Industries, Inc. v. Costle. The PPG Industries case had determined that the status quo regarding averaging methods was that without a proper rulemaking EPA could not require running averages, and that either block or running averages are acceptable until a formal rulemaking confines the standard to one or the other.

An attempt to force EPA to revise the 15 year old national ambient air quality standard for sulfur oxides was blunted by a decision in April 1988 by a district court in New York. Environmental groups and states had filed a citizen suit in 1984 alleging that EPA had a non-discretionary duty to revise the sulfur oxides NAAQS and that, under the circumstances, EPA must revise or set a new "secondary" standard to protect the public against the acid rain effects of sulfur oxides. The existing sulfur oxides air quality standard does not address these effects. The plaintiffs claimed that various EPA documents attribute acid rain and visibility impairment to sulfur oxide emissions. The district court held it did not have jurisdiction because the Administrator had no duty under section 109 to revise the national standard for sulfur oxides. The court held that while section 109 imposed a duty to "review" the standards every five years, there is no duty to revise the standard because revision involves an exercise of discretion and expert judgment by the Administrator. The court distinguished the case from similar claims that were successfully litigated in the Second Circuit in NRDC v. Train. In Train, the Administrator had conceded that all statutory criteria for taking regulatory action

had been met, whereas in the Environmental Defense Fund v. Thomas case, plaintiffs attempted to prove this concession from various EPA documents and statements. The court held that plaintiffs did not show an "express finding by the Administrator that the existing sulfur oxides standards are inadequate." This and the alleged scientific uncertainties involved convinced the district court to conclude that the revision of the standard is wholly within the discretion of the Administrator.

The court also held that there is no duty upon the Administrator under section 109(a)(2) to publish proposed standards simultaneously with the publication of revised "criteria" documents issued under section 108. The obligation to do so only applies to the publication of initial criteria for a pollutant, which are listed under section 108 after the date of the 1970 Act. An appeal of the district court's decision was argued in the Second Circuit in November 1988.

B. CAA SECTION 110: STATE IMPLEMENTATION PLANS (SIP'S)

In Abramowitz v. EPA, the Ninth Circuit invalidated EPA's approval of control measures in California's South Coast ozone SIP, on the ground that EPA had improperly deferred determining whether those measures would result in attainment by December 31, 1987. Because EPA in court papers conceded that the SIP would not result in timely attainment of the ozone NAAQS, the court ordered EPA to disapprove the SIP provision containing the attainment demonstration. In response to EPA's petition for rehearing, the Ninth Circuit amended its opinion to express no view as to whether EPA could approve individual control measures that improved air quality, following the Agency's disapproval of the SIP's attainment demonstration.

In Riverside Cement Co. v. EPA, the Ninth Circuit invalidated EPA's approval of a rule establishing a NOx emission limitation for cement plants as part of California's South Coast SIP. The Court reasoned that the rule was the "bureaucratic equivalent of an illusory contract," insofar as the South Coast Air Quality Management District could alter the emission limit after hearing and without EPA's approval; thus, EPA's reading of the rule as fixing a limit impermissibly amended the rule. The court further held that the rule provided no assurance that the emissions from subject facilities would allow attainment of the nitrogen oxides air quality standard. The EPA petitioned for clarification or, in the alternative, rehearing, of the second

ground that seemed to limit EPA's authority to approve individual rules which strengthen the SIP but which, by themselves, cannot produce attainment of the national ambient air quality standards. The court modified the second ground to state that an "illusory" emission limit cannot satisfy the requirement of Clean Air Act section 110(a)(2)(B) that a SIP include "emission limitations . . . as may be necessary" to produce attainment.

The District Court for the Northern District of Texas ruled that Texas is not required to submit an alternative means of compliance, as approved by the Director of the Texas Air Control Board, to EPA as a SIP revision. The court interpreted a provision of the Texas SIP, which authorized the Director to approve alternative methods of control that are substantially equivalent to the SIP methods of control, to eliminate the requirement for EPA review as a SIP revision.

C. CAA SECTION 111: NEW SOURCE PERFORMANCE STANDARDS (NSPS)

In a decision construing the term "modification" under section 111(a)(4) of the Act, the Sixth Circuit upheld EPA's determination that a Kentucky SIP revision authorizing a source to cease operation of scrubbers previously required to control fluoride emissions would subject the source to NSPS requirements. The scrubbers had been required for the company's aluminum reduction plant under Kentucky's section 111(d) plan, and were equivalent to the NSPS for that source category. The company had requested the determination under 40 CFR Section 60.5, while Kentucky's revision was pending before EPA, and petitioned the circuit to review the adverse determination.

D. CAA SECTION 112: HAZARDOUS AIR POLLUTANTS

On the question of the scope of EPA's nondiscretionary duty under section 112, the U.S. District Court for the District of Columbia held that EPA has a nondiscretionary duty to either issue emission standards or a final determination not to regulate for each source category of a listed hazardous air pollutant. NRDC v. EPA concerned a long-standing citizen's suit to compel EPA to act on all source categories of benzene. The court had previously ordered the Agency to take final action on four source categories in 1983, and the current litigation involved an additional set of categories on which EPA had not acted, including emissions from automobile refueling at retail outlets. The court

rejected EPA's argument that, although the Agency has discretionary authority to set additional standards, its previous actions had satisfied its nondiscretionary duty under section 112. Following its holding of a nondiscretionary duty, the court ordered EPA to act by March on the remaining source categories. That order has been stayed by the court pending its decision on EPA's current motion to alter or amend the judgment. However, the court did accept the Agency's argument that it had satisfied its duty under section 202 to determine the feasibility of "onboard" controls for automotive refueling, and declined to compel EPA to act with respect to that duty.

In NRDC v. Thomas, the court held that it did not have jurisdiction to order EPA list certain pollutants as "hazardous air pollutants" under section 112 of the Clean Air Act. The EPA had issued notices of intent to list six organic chemicals and two metals under section 112. The plaintiffs contended that EPA's identification of the pollutants as probable or known carcinogens was the "functional equivalent of a finding that the pollutants are hazardous." In their view, such a finding would trigger a non-discretionary duty to list the pollutants and to set national emission standards according to deadlines in section 112. The court held that it did not have jurisdiction under the section 304 citizen suit provision because EPA had made no final decision on the health risks posed by the pollutants and because of EPA's claim that there is "not presently sufficient information to make that determination." The court was concerned that if it were to engage in an examination of whether the Agency had effectively found the pollutants hazardous, it would be invading the exclusive judicial review powers of the Court of Appeals and would chill the Agency's dissemination of "preliminary" conclusions regarding the toxic effects of pollutants. The court held that relief under section 304 would only be appropriate where EPA had shown "flagrant bad faith" and ignored "incontrovertible evidence regarding the hazardous nature of a pollutant."

## E. CAA SECTION 123: STACK HEIGHTS

On January 22, 1988, the D.C. Circuit decided the "stack height" case, Natural Resources Defense Council, Inc. v. Thomas. The suit involved eleven consolidated challenges to EPA's 1985 revised stack height regulations, (50 FR 27892, July 8, 1985), filed by environmental groups, northeastern states, and industry groups. The court affirmed the regulations in large part,

rejecting NRDC's "control first" argument (that section 123 required the maximum controls be imposed before allowing increased stack height credit to avoid excessive concentrations), and remanded three provisions to the Agency for further action:

1. The provision allowing pre-October 1, 1983 stack height increases to be grandfathered from demonstrating requirements;

2. The provision allowing grandfathering of pre-January 12, 1979 use of the refined H+1.5L formula; and

3. The provision exempting original design merged stacks from the definition of "dispersion techniques."

F. CAA SECTION 126: INTERSTATE POLLUTION ABATEMENT

In July 1988, a panel of the D.C. Circuit dismissed a challenge to EPA's denial of interstate air pollution petitions under section 126. The States of New York, Pennsylvania, and Maine had petitioned EPA in 1981 for relief from midwestern State sulfur dioxide emissions, which were alleged to cause violations of national ambient air quality standards, or visibility impairment in the petitioning States. The EPA denied the petitions in 1984. The States argued that EPA's denial of the petition was defective as a matter of law, since it did not include an affirmative finding under section 110(a)(2)(E) that the State implementation plans of the midwestern States are adequate to prevent violations of standards in other States. The D.C. Circuit rejected this claim, holding that EPA is under no obligations to make a section 110(a)(2)(E) finding in a section 126 proceeding, is not required to evaluate or investigate the adequacy of the SIP's named in a section 126 petition, or to conduct data gathering or research in response to petitioners claims, in section 126. The court held that the prohibition of certain types of interstate air pollution under section 110(a)(2)(E) need only be considered by EPA before the Administrator approves an initial SIP, or revision of a SIP. A petition for writ of certiorari was filed on this action.

G. CAA SECTION 169A: VISIBILITY PROTECTION

Two decisions upheld EPA's position on regional haze problems under the visibility impairment provisions of the Act, Section 169A. In June 1988, the Second Circuit upheld EPA's refusal to approve portions of Vermont's SIP for visibility and EPA's rejection of Vermont's petition that EPA require emission

reductions in upwind SIP's. The court held that EPA's 1980 implementing regulations did not address the problem of regional haze, and, thus, EPA's rejection of Vermont's demands did not violate those regulations. It held that until a Federal regional haze regulation is in place, Vermont may not impose emission reductions on upwind States to improve visibility in Vermont. The court concluded:

> "Finally, we note that, more than ten years after the enactment of section 169A, there is still no national program addressing regional haze. We are sympathetic to petitioner's argument that something must be done soon. EPA's assurances of future action are little comfort to Vermont . . . We can only hope that EPA will act quickly in furtherance of the national visibility goal."

A month later, however, a district court judge in Maine refused to order EPA to promulgate national visibility regulations governing regional haze. The court held that plaintiffs were barred from bringing a citizen suit to force EPA action because EPA's promulgation of visibility regulations in 1980 constituted "final action," which could only be reviewed by the U.S. Court of Appeals. The court rejected plaintiffs' claim that EPA had in 1980 simply deferred making any final decision on regional haze regulations. The court relied on the existence of an extensive administrative record supporting EPA's decision to defer action, and concluded from this that EPA's deferral constituted "final action" beyond the district court's jurisdiction. An appeal was pending in the U.S. Court of Appeals for the First Circuit at the end of 1988.

## H. CAA PART D: NONATTAINMENT PROVISIONS

In a pair of decisions in Atlantic Terminal Urban Renewal Area Coalition v. New York City Department of Environmental Protection, et.al., the U.S. District Court for the Southern District of New York issued opinions construing obligations under Part D of the Clean Air Act. In the first decision, the court was faced with the question of whether plaintiffs' allegation of failures to implement measures to attain the carbon monoxide air quality standard by December 31, 1987 was sufficient to confer subject matter jurisdiction in a citizens' suit. The court concluded that the question turned on the distinction between a failure to implement specified measures in the SIP versus a

generalized allegation of a failure to meet a goal of the Act, but that plaintiffs had alleged failures to implement with sufficient particularity to support denial of defendants' motion to dismiss.

In the second decision, the court construed the Department of Housing and Urban Development's (HUD) obligations under the section 176(c) prohibition of support for any activity which does not conform to a SIP. At issue was whether HUD had properly assured compliance with New York's carbon monoxide SIP requirements in the funding of a twenty-four acre redevelopment project in Brooklyn, NY or was in violation of section 176(c), based in part on a letter from EPA questioning whether proposed traffic mitigation plans in the final Environment Impact Statement would be sufficient to attain the standard. While the court concluded that HUD can delegate its responsibilities to the city, neither HUD nor the city had satisfied the obligations of section 176, and, accordingly, denied defendants motions to dismiss.

In a separate case, NRDC brought a citizen suit to force EPA to require New York to revise its ozone nonattainment SIP. The inadequacy of the New York SIP was demonstrated by the existence of nonattainment conditions subsequent to the December 1987 deadline for attaining the national ambient air quality standard. Relying on section 110(c)(1), the court ruled that EPA does have a duty, enforceable in a citizen suit, to require New York to submit a revised SIP by a date certain. The court reasoned that unless EPA were required to set a date for revisions, the attainment of standards under the Act, and the provisions of section 110(c)(1) would be frustrated.

## I. CAA SECTION 203: IMPORTATION REQUIREMENTS

In Anderson Shipping Company, the D.C. Circuit upheld EPA's new regulations governing importation of uncertified motor vehicles and rejected certain importers' claim that EPA has no authority over vehicles that are at least five years of 50,000 miles old when imported. The court agreed with EPA that the Clean Air Act provisions limiting the regulatory "useful life" of U.S.-certified vehicles to five years or 50,000 miles does not apply to importation of uncertified vehicles. The court also agreed that EPA's requirement that all imported vehicles comply with Federal emission standards for a period of five years or 50,000 miles after importation, regardless of the vehicles' actual age, is a reasonable exercise of the Agency's discretion to regulate imports.

## J. CAA SECTION 304: CITIZEN SUITS

The Third Circuit upheld the authority of a district court in a citizen's suit to hold the City of Philadelphia in civil contempt for failure to comply with the terms of its previously issued injunction. The issue arose in a citizen's suit filed to compel the city to comply with odor regulations in the Pennsylvania SIP in operating a sewage treatment plant. In a prior case concerning this matter, the Third Circuit had overturned EPA's rescission of its approval of the odor regulations for failure to follow the proper procedures of section 110(c). In the present case, the circuit grounded its decision in part on its earlier ruling that EPA's rescission was a legal nullity. As a result, the circuit upheld the district court's subject matter jurisdiction on the issue of the city's compliance with the odor regulations, and its subsequent findings that the city was in contempt of the injunction requiring such compliance.

## K. CAA SECTION 307: JUDICIAL REVIEW

In a case construing "finality" for purposes of judicial review, the Third Circuit held that it was deprived of jurisdiction over a petition for review of an EPA disapproval of a redesignation request due to the pendency of an administrative petition for reconsideration before the Agency. While the circuit conceded that the question of finality is a difficult one that has divided the Court of Appeals, it concluded that the Supreme Court's recent decision in ICC v. Brotherhood of Locomotive Engineers, construing section 704 of the Administrative Procedure Act to toll a statutory time period for filing a petition for review, cannot be distinguished, and that the petition for reconsideration renders EPA's disapproval "nonfinal" for purposes of judicial review. As a result, the court held that it had no jurisdiction to decide the substantive issue of the applicability of EPA's 1985 stack height regulations to West Penn's Armstrong power plant.

## L. ENFORCEMENT OF CAA REQUIREMENTS

### 1. CAA Section 110: State Implementation Plans

Three district courts ruled in 1988 on the issue of whether EPA can use section 113 to enforce the currently approved State implementation plan while a State is trying to change the regulation. All three courts said that there is a four-month

deadline for EPA to act on a proposed SIP revision, but they disagreed on the implications of that deadline. In United States v. Alcan Foil Products, the court barred enforcement when the Notice of Violation (NOV) was served more than four months after the proposal. Even if the source is violating the proposed revised limit, the court held, the enforcement action must be put on hold until EPA acts on the revision. In United States v. General Motors Corp., the court cited Alcan Foil Products and ruled similarly. However, the court in Unites States v. Arkwright, Inc. held that the Agency's failure to meet the four-month deadline did not bar enforcement. The court adopted the penalty collection approach established for section 120 cases in Duquesne Light Co. v. EPA, requiring EPA to reject the SIP revision before collecting the penalty. The court also held that the penalty should be assessed for the period beginning four months after submission of the proposed revision. In Arkwright, EPA had issued the NOV before the four-month period had expired.

Unites States v. Vanguard Corp reaffirmed the principle that economic or technical infeasibility is not a defense under the Clean Air Act. The court granted plaintiff's motion for summary judgment on the liability issue, but said that claims of good faith efforts to comply might be relevant to the calculation of the penalty to be paid by the defendant.

One Federal enforcement action was stayed pending resolution of a State court proceeding to determine whether the defendant was a paper-coating operation within the meaning of the Illinois regulation. The court extended abstention principles to the SIP context, holding that SIP's are primarily State law rather than Federal.

2. CAA Section 112: Hazardous Air Pollutants

In United States v. Dow Chemical Co., the U.S. District Court for the Middle District of Louisiana upheld EPA's interpretation of its standards for vinyl chloride against a challenge in an enforcement action. The company argued for a "common sense" interpretation of a portion of the standards that prohibited all emissions from specific equipment, contending that venting emissions through a flare which destroyed 99.3 percent of the vinyl chloride should be considered sufficient for compliance with the standard. While the court sympathized with Dow's argument, it held that the plain meaning of the standard, and EPA's interpretation of its own regulations controlled. In addition,

the court also held that it had no authority to review the regulations de novo, and that EPA's interpretation of the standards did not constitute final agency action otherwise subject to review.

In United States v. Tzavah Urban Renewal Corp., et.al., the district court granted EPA's motion for a preliminary injunction against Tzavah and four other defendants, even though violations at the asbestos removal project were largely abated by the time of the oral argument in the case. The court cited the defendants' long history of noncompliance as the basis for maintaining court supervision of the remaining work. The court also held that: (1) the asbestos regulations stay in effect if work ceases at the site but asbestos remains a danger; (2) the waste disposal rules in 40 CFR Section 61.152 apply to interim as well as final disposal sites; (3) the "owner or operator" definition in the rule should be construed broadly; and (4) the existence of air samples showing low levels of asbestos is irrelevant to a case such as this one, in which the violations are based on work practice standards, not emission standards.

Another district court found that the notice provision in the asbestos rule, 40 CFR Section 61.146, should not be read to include a duty to renotify when the dates of a removal project change.

3. CAA Section 120: Administrative Noncompliance Penalties

The Sixth Circuit affirmed the Administrator's decision finding Navistar International Transportation Corp. liable for exceeding volatile organic compound emission limits at its Springfield, Ohio, truck-painting operation. The company argued that various exemptions and exclusions applied to the painting lines, but the court rejected these arguments, deferring in each case to EPA's interpretation of its rules. The court also held that jurisdiction to assess section 120 penalties is conferred on EPA by the Clean Air Act, which requires only a reasonably specific Notice of Noncompliance (NON). Thus, the fact that the NON received by Navistar lacked the attachments describing how the penalty would be calculated, was not a defense.

4. CAA Section 165: Preconstruction Review Requirements

The district court in United States v. Louisiana-Pacific Corp thoroughly analyzed the term "potential to emit" and found the defendant liable for violating the prevention of significant

deterioration (PSD) regulations at its Kremmling, Colorado, waferboard plant. The court held that simple limits on annual emissions cannot be used to restrict potential to emit for PSD purposes. It also held that federally-enforceable limitations on operations (e.g., a limit on hours per day that a plant may operate) an be used to restrict potential to emit. However, it found that when such limitations are ignored or violated, the potential to emit restriction is vitiated.

The court also found that EPA had not met its burden of proving that the defendant's Olathe, Colorado, plant was subject to the PSD rules. The court was persuaded by defendant's testimony that the one stack test on which the government was relying had not been performed under conditions within which the plant was designed to operate. The court said that the unit being tested should be operated at maximum capacity, but in the manner designed for normal operation.

Finally, the court rejected the defendant's argument that EPA had to prove that the violation continued for the 30-day period immediately following issuance of the NOV. The court held that the jurisdictional requirement of section 113 is met if the specific violation alleged in the NOV is committed any time after the 30-day "grace" period has run.

5. Consent Decree Enforcement

United States v. Wheeling-Pittsburgh Steel Corp. reaffirmed that economic considerations do not justify postponement of compliance deadlines established by the Clean Air Act. The Third Circuit applied the "successors and assigns" language from the consent decree that the government had reached with Wheeling-Pitt and found that the new owner of the Monessen, Pennsylvania, coke plant was bound by the terms of the decree. The court completely rejected the district court's finding that the sale of the coke plant was a "new" or "unforeseen" circumstance which could justify amendment of the decree to allow operation before installation of the pollution controls was complete.

6. Enforcement Against Facilities Owned by the U.S. but Operated by a Contractor

A district court held that a government contractor operating the nation's only facility manufacturing the F-16 fighter airplane is subject to the Texas SIP limitations on volatile organic compound emissions, even though the plant is owned by the Air Force. The court denied defendant's motion for dismissal,

rejecting the argument that this action is an interagency dispute. The court noted that the Air Force had made $2.3 million available to General Dynamics expressly for the purpose of installing pollution controls on the offending coating lines, but the company declined to install the controls. The lawsuit was thus properly before the court.

The court refused to adopt a construction of the Defense Production Act (DPA) that would immunize defense contractors from liability under the Clean Air Act so long as they were attempting to fulfill their government contracts. The court held that the immunization provision of the DPA applies only to claims for breaches of third party contracts necessary to meet obligations to the Federal government. According to the court, to hold otherwise would undermine Section 118 of the Clean Air Act, which establishes that the Act applies to all Federal agencies and facilities.

7. Judicial Review of EPA Administrative Orders

In Asbestec Construction Services, Inc., v. EPA, the Court of Appeals for the Second Circuit held that orders issued by EPA under section 113(a)(3) of the Clean Air Act are not final Agency action. Thus, they are not subject to review under section 307 of the Act, and the court did not have jurisdiction to examine the merits of the order issued to Asbestec. The court held, in addition, that receiving the order did not deprive Asbestec of either property or liberty interests.

On the other hand, in Solar Turbines, Inc. v. Seif, a district court held that an order issued to Solar Turbines by EPA under section 167 of the Clean Air Act was final Agency action and that it was reviewable only in the Court of Appeals. Consequently, the district court dismissed the action for lack of jurisdiction.

M. COMMON LAW NUISANCE

In a case brought to limit water diversions by the Los Angeles Department of Water that is drying up Mono Lake, thereby creating particulate air pollution in the area, the Ninth Circuit ruled that there is no Federal common law of nuisance based on air pollution since this case does not involve any "uniquely Federal interests." In its consideration of the Federal interest here, the court concluded that there is no common law of air pollution governing this situation, and that State law provides an adequate forum for resolution of the issues here. The circuit also held that the Federal common law nuisance claim based on water pollution is entirely preempted by the Clean Water Act.