

STATEMENT OF QUALIFICATIONS

Air Pollution Consulting Services

*Ambient Air Quality and
Meteorological Monitoring Services*

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SECTION 1: OVERVIEW

Enviroplan Consulting is one of the nation's leading air pollution consulting companies. Since 1972 our staff of 30 professionals has conducted over 3,500 studies and monitoring programs for over 350 industrial and governmental clients. Our professional staff is located in 15 offices and project locations throughout the U.S. as shown in Figure 1.

We specialize in two areas: 1) air pollution consulting studies, and 2) ambient air quality and meteorological monitoring services.

For government air pollution control agencies and other government agencies, we provide air pollution permitting support, air quality and meteorological monitoring support and other air pollution consulting services including the development of greenhouse gas (GHG) emissions inventories and providing technical support for wind energy projects. We also conduct air quality analyses of proposed and existing transportation projects through emissions estimation and air quality modeling.

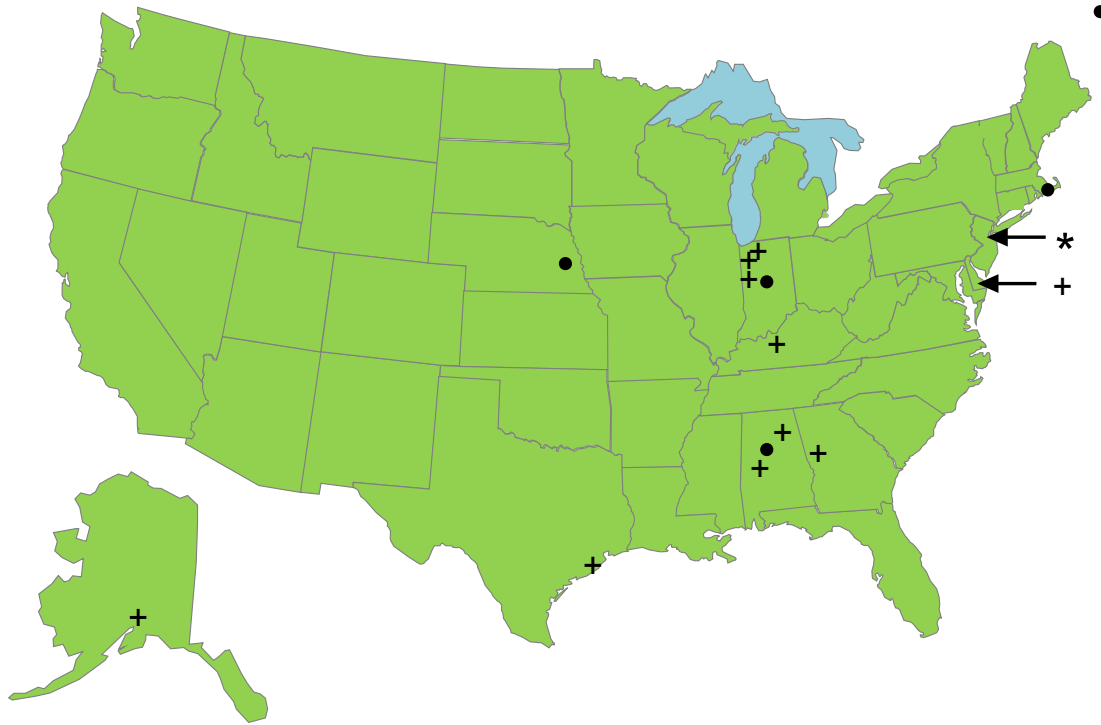
For proposed new facilities or modifications to existing facilities in the private sector, we conduct all air quality studies including all Prevention of Significant Deterioration analyses required to obtain the air quality construction permits. We also conduct all wind resource analyses for new wind energy facilities.

For existing facilities in the private sector, we provide all air pollution related consulting services. These include: 1) permitting, emissions estimation and reporting; 2) greenhouse gas emissions quantification for existing facilities, identification of mitigation projects and the associated reductions in greenhouse gas emissions, and the third party validation and verification of greenhouse gas emissions; 3) local scale and regional air quality modeling; 4) control technology evaluations and control plans; 5) Risk Management Plan development and revisions; 6) technical support to the private sector for State Implementation Plan development especially for PM_{2.5} and ozone Model Attainment Demonstrations and demonstrations that Reasonable Progress Goals for Regional Haze in PSD Class I Areas will be achieved; 7) assistance in dealing with opacity and other air pollution compliance problems; and 8) assistance with other air pollution issues.

We are one of the largest suppliers and operators of ambient air quality and meteorological monitoring services in the U.S. We have provided these services in 26 states (Figure 2) and in Puerto Rico and two foreign countries.

The development of innovative, practical and cost effective solutions to air pollution problems over the past three decades within a complex regulatory framework is the distinguishing characteristic of Enviroplan Consulting.

FIGURE 1: ENVIROPLAN CONSULTING HEADQUARTERS OFFICE, REGIONAL OFFICES, AND PROJECT OFFICES



Office	Location	Symbol
Headquarters Office	Wayne, NJ	*
Midwest Regional Office	Indianapolis, IN	●
Southeast Regional Office	Birmingham, AL	●
Canadian Regional Office	Gander, Newfoundland	●
Project Offices	Anchorage, AK; Fowler, IN; Dune Acres, IN; Wheatfield, IN; Michigan City, IN; Tarrant, AL; Hueytown, AL; Brazoria, TX; Detroit, MI.	+
Wind Energy Client Management Services	Omaha, NE	●
Greenhouse Gas Verification Services	Hingham, MA	●

SECTION 2: AIR POLLUTION CONSULTING SERVICES

Enviroplan Consulting specializes in the following air pollution consulting services for new facilities:

- Project planning assistance to identify potential pitfalls associated with the project size, location, and operating requirements as they relate to air regulatory permitting requirements
- Development of emission inventories and emissions netting analyses to determine applicability for the major source pre-construction permitting requirements of the Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review programs
- Control technology evaluations to determine Federal BACT and LAER, as well as state control technology requirements
- Air quality screening modeling and refined modeling for those pollutants subject to PSD review or state modeling requirements including determining impacts in PSD Class I areas to satisfy Federal Land Manager requirements
- Cooling tower modeling to assess the potential for annual hours of fogging/icing, as well as particulate matter deposition if necessary
- Ambient air quality and meteorological monitoring subject to PSD requirements
- Liaison with the regulatory agencies responsible for issuing the air quality permits
- Related permitting assistance and permit application preparation including Title V (Part 70) Permits, Federally Enforceable State Operating Permits, Title IV (Acid Rain) Permits, and Federal Aviation Administration Form 7460-1 for construction of tall structures (e.g. stacks)

Enviroplan Consulting also specializes in the following air pollution consulting services for existing facilities:

- Air emission inventory development and preparation of annual emission statements
- Air quality modeling
- Air pollution control technology evaluations including RACT/BACT/LAER analyses
- Hazard assessments and Risk Management Plan development under Section 112(r) of the Clean Air Act
- Title V and state operating permits
- Community Right-to-Know reporting under SARA Title III Sections 304, 312, and 313
- Odor complaint investigations and development of control plans

Table 2-1 contains selected new source review permitting experience for power generation facilities. Table 2-2 contains selected Title V permitting experience. Table 2-3 contains selected air toxics services experience.

Air Permitting

We are one of the most experienced firms in the United States conducting air permitting for existing and planned new facilities. This work includes conducting all technical analyses, preparing permit applications and negotiating permits under the Title V operating permit program, Prevention of Significant Deterioration construction permit program and other operating and construction permit programs.

Title V State Operating Permits

Our staff has prepared Title V operating permit applications for over 100 major facilities in eight states throughout the eastern half of the U.S. This work involved the development of comprehensive air emission inventories, assessment of regulatory compliance, evaluation of alternative facility operating scenarios, and development of Compliance Assurance Monitoring protocol plans for major emission units. Table 2-2 provides a partial list of our Title V application clients.

Review of Air Permit Applications New Jersey

For the New Jersey Department of Environmental Protection (NJDEP), our staff completed a contract to review the PSD and other air-quality portions of the construction permit applications for facilities in the state. Work included evaluation of the adequacy of the air quality modeling analyses conducted to satisfy PSD and NJDEP requirements.

Review of Air Permit Applications Indiana

For the Indiana Department of Environmental Management (IDEM), our staff has prepared and is currently reviewing permit applications and drafting air construction permits for hundreds of facilities in the state in many industries.

Review of Air Permit Applications Pennsylvania

For the Allegheny County Health Department, we are preparing 12 complex Title V permits for chemical plants, steel mills, landfills, metals finishing facilities and airline maintenance facilities.

**Review of Air Permits for
Kentucky Division for
Air Quality**

For the Kentucky Division for Air Quality , we were recently awarded a contract to prepare approximately 50 Title V renewals and other air permits for facilities in many industries.

JFK International Airport

We have prepared and continue work on the New York State Facility Wide Air Permit Application for all Port Authority facilities at this airport consisting of more than 25 emission units including boilers, stationary and portable diesel generators and Fire Rescue and Training facilities. Work included evaluation of alternative emission reductions strategies to be a Synthetic Minor not subject to Title V or RACT permitting requirements. Work also included determining the capital and operating costs of various NO_x emission control strategies.

**Transportation
Projects**

Enviroplan Consulting helps state and regional transportation agencies conduct the air quality impact analyses for transportation projects involving motor vehicle, rail and aviation emissions including: 1) emissions analyses, 2) air quality impact analyses, 3) review of State Implementation Plans for making project consistency determinations with the SIP, 4) planning studies and 5) litigation support. Work involves determining and assembling needed input data for emissions analyses with U.S. EPA's Mobile 6, PART5 and earlier versions of these models and air quality analyses with the CAL3QHC and CALINE3 Models as well as the Industrial Source Complex (ISC) Model.

**Massachusetts Highway
Department**

Reviewed air quality analysis portions of the various versions of the Environmental Impact Statements prepared for the Central Artery Project including intersection and highway air quality modeling, motor vehicle emissions estimated using MOBILE 5a, tunnel emissions and rail yard emissions. Provided litigation support to adversaries claiming damage from project due to air quality impacts. Prepared critiques of adversary reports and testimony and prepared testimony in court proceedings.

**The Port Authority of
New York and
New Jersey**

Prepared required transportation consistency determination for JFK Airport Light Rail Access Project that was submitted to the Federal Aviation Administration for approval of the project. Work involved review of and carrying out of emission calculations and critical review of air quality modeling analyses in the Environmental Impact Statement for the project. Evaluated the emission impact of various changes in project assumptions. Responded to FAA questions and concerns about the transportation consistency determination. Project was approved.

**The Port Authority of
New York and
New Jersey**

Conducted emissions and air quality modeling analyses of a redesign of the Jamaica, Queens train station to provide transfer facilities from the Long Island Rail Road and New York City subway system to the JFK Airport Light Rail Access Project.

**State of New York
Department of
Transportation**

Conducted emissions and air quality modeling analyses of various highway projects in the state for the applicable environmental impact statements. Projects included Interstate I-88 in Binghamton and Oneonta, Route 9 in Ossining and Yonkers Avenue and Nepperhans Avenue upgrades in Yonkers.

**State of New Jersey
Department of
Transportation**

Undertook emissions and air quality modeling analyses of various highway projects in the state for the applicable environmental impact statements. Projects included the Route 21 upgrade in Newark and the new Interstate I-195 near Trenton.

U.S. Postal Service

Conducted air quality analyses including emissions estimation and air quality modeling of alternate sites for new postal service truck maintenance facilities near New Brunswick, NJ

**Clough Harbour
and Associates**

Detailed emissions analyses and air quality analyses of motor vehicle activity generated by a proposed large regional distribution center in the Northeast for one of the nation's largest retailers. Emissions analyses were conducted using the U.S. EPA MOBILE6 and PART-2 emissions models. Air quality modeling analyses were conducted using the CAL3QHC model. Analyses addressed over 50 road segments. Testimony about the project's air quality impact was presented at a public hearing.

Litigation Support

For the Central Artery project in Boston, we provided litigation support to the Massachusetts Highway Department as expert witness on the air quality impact of a portion of the project.

New Source Review

Our staff has conducted numerous studies to obtain New Source Review construction permits, including Prevention of Significant Deterioration (PSD) permits. Table 2-1 lists selected projects for which preconstruction air permitting has been conducted. A description of some selected studies follows.

Combustion Turbines

For several electric utilities and independent power producers, we have conducted all air quality studies needed to obtain construction permits including development of emissions inventories and netting analyses to determine applicability for PSD and state review, control technology evaluations to determine BACT and LAER, air quality screening modeling and refined modeling, PSD Class I area impact analyses and presentations to regulatory agencies.

**New Power Plant Conversion
from Nuclear to Coal**

For American Electric Power Service Corporation and Cincinnati Gas & Electric Company, our staff conducted all air quality studies and air quality monitoring programs needed to obtain the PSD construction permit for the coal conversion of the Zimmer Nuclear Power Plant -- the first nuclear power plant to convert to coal. The studies involved modeling stack gas emissions and fugitive particulate emissions from coal, lime, and ash handling. The work also involved modeling of all principal background sources of SO₂ emissions in the urban, nonurban, and complex terrain areas within 50 km of this plant.

Paper Mill Addition

For Nekoosa Papers, Inc., our staff conducted all negotiations with state agencies and U.S. EPA to develop a PSD work plan and carried out all PSD analyses for issuance of a construction permit for a major mill capacity addition in Ashdown, Arkansas.

Fluidized Bed Boilers

For Fluidized Combustion Services Corp., our staff conducted all studies required to satisfy PSD requirements for a cogeneration plant consisting of two 80,000 lb/hr steam fluidized bed combustion boilers at a paper mill in New Jersey. The scope of work included air quality dispersion modeling and BACT analyses. The study required negotiations with the NJDEP and U.S. EPA Region II on selection of a dispersion model and representation of background sources. We assisted with the preparation of the permit application forms; subsequently all permits were issued.

For a cogeneration plant in Hazelton, PA, our staff conducted air quality analyses for an 80 MW fluidized bed combustion boiler. We met with the Commonwealth of Pennsylvania at the onset of the project to negotiate the scope of work. The analyses consisted of dispersion modeling of the plant and other nearby PSD sources, analysis of soils, vegetation and visibility impacts, and BACT analysis. We also assisted with the preparation of the permit application forms. All permits were subsequently issued.

Oil to Coal Conversion

For Consolidated Edison Co., Delmarva Power & Light Co., Niagara Mohawk Power Corp., and Baltimore Gas & Electric Co., our staff developed and negotiated all work plans and conducted all air quality analyses for the conversion of several power plants from oil to coal. This work included analysis of PSD increment consumption from each plant converting to coal.

Culm Boiler

For Scott Paper Co. at Chester, PA, we conducted air quality analyses to obtain all air permits including the PSD permit for construction of one of the nation's largest fluidized bed boilers designed to burn anthracite culm (low BTU waste coal) and to include cogeneration. We designed and negotiated all work plans with the Commonwealth of Pennsylvania and U.S. EPA Region III, including how to treat complex terrain and background concentrations from the nearby Philadelphia and Wilmington metropolitan areas. We conducted all analyses, submitted final reports and worked with the government agencies, which subsequently issued the required PSD permit and other environmental permits.

Stack Plume Analysis

For International Systems, Inc., our staff conducted air quality analyses for an 8 MW cogeneration plant being installed in Atlantic City, NJ. We negotiated the scope of work required for the air quality analyses with the NJDEPE. We then conducted the air quality studies

for the permit application. These studies were required because of the expected interaction of the stack plume with the hotels and tall residential buildings in the immediate vicinity. We also assisted with the preparation of the permit application to construct and operate the turbines.

Internal Combustion Engine Evaluation

For a paper company in the Northeast, our staff reviewed plans to install an internal combustion engine to determine whether PSD permits would be required. The steam would be used at the mill and the electricity generated would be sold to the local utility. Emissions from the existing boilers at the mill were planned to be reduced to offset partially the emissions from the new system. A state permit was subsequently issued.

Hazard Assessments and Risk Management

Enviroplan Consulting helps its clients comply with the chemical accident prevention requirements under 40CFR Part 68. Our services include: 1) determining whether and for which chemicals a facility is subject to the requirements of 40CFR Part 68 , 2) developing and implementing programs to exempt some or all of the chemicals from Part 68 requirements, and helping the client determine whether it is subject to the Program 1, 2 or 3 requirements.

For facilities with chemicals that remain subject to the Part 68 requirements, our services include: 1) hazard assessments and off site consequence analysis of each worst case and alternative accident scenario using the most applicable emission estimation model and air quality diffusion model, 2) compiling the required five year accident history, 3) helping develop the facility Emergency Response Program, 4) helping develop the facility Prevention Program, and preparing the facility Risk Management Plan. The scope of each of these tasks depends on whether the facility is subject to Program 1, 2 or 3 requirements.

Table 2-3 lists companies for which we have provided these and related air toxics services.

Steel Manufacturer

Developed Risk Management Plan to satisfy requirements of Section 112(r) of the 1990 Clean Air Act Amendments for facility including blast furnace, basic oxygen furnace, coke plant and pickling operations. Work includes conducting the hazard assessment and

developing the emergency response program and the accident prevention program.

Pulp and Paper Mill

Developing Risk Management Plan for major pulp and paper manufacturing facility involving use of chlorine and chlorine dioxide. Plant located in town in complex terrain. Work involves conducting the hazard assessment, developing the emergency response program, and reviewing the Process Safety Management program to satisfy the prevention program requirements.

Paper Converting Plant

Developing Risk Management Plan to satisfy the requirements of Section 112(r) of the 1990 Clean Air Act Amendments for converting plant using above threshold quantities of propane. Work includes hazard assessments, emergency response plan development and prevention program development.

Pulp and Paper Company

Conducted air quality modeling of air toxics emissions from its facility.

**Specialty Chemical
Manufacturer**

Participated in process hazard analysis to satisfy the OSHA regulation 29CFR Part 1910 for incinerator burning hazardous waste and other volatile organics. Work included determining whether gas streams could become flammable and preparing standard operating procedures and checklists for emergency response plans. Facility operates continuous batch chemical operations.

**Batch Chemical
Manufacturer**

Conducted required hazard assessments under New Jersey's Toxic Catastrophe Prevention Act (TCPA) for batch chemical producer. Work involved defining the accident scenarios, modeling emission rates and modeling concentrations to determine the hazard impact zone.

Beverage Supplier

Conducted hazard assessment and developed Risk Management Plan required under New Jersey TCPA regulation. Work included emissions and air quality modeling as part of the hazard assessment.

Two Electric Utilities

Conducted hazard assessments of accidental releases of chlorine, ammonia and other hazardous chemicals for plants located in complex terrain. Work included accidental release scenario definition, emissions and air quality modeling to define hazard impact zone.

Results used by Local Emergency Planning Committee to develop local emergency plans under 40CFR Part 355.

Air Emission Inventory Development

The development of emissions inventory data bases has been a key element of the air quality services supplied to our clients. Our staff has developed facility emission inventories in support of Title V operating permits, SARA Title III, Section 313 reports, and state emission statements. In addition, for nearly every air quality modeling study our staff has conducted, emission inventory development has been required. Our experience includes conducting engineering calculations, analyzing emission measurement data, and checking emission inventory data with respect to published values. This experience also includes evaluations of control equipment efficiencies from both design and operating standpoints.

The following selected projects illustrate the range of our experience in emission inventory development.

Annual Emission Statement Preparation

Our staff has prepared the annual emission statement for over 25 facilities in compliance with state emission statement and annual emission fee programs. Many of our clients have realized significant savings in the annual emission fees due through our use of the most recent and accurate information of emissions from their type of sources that we have provided based on our experience.

Major Utilities

For the Detroit Edison Company, our staff prepared a detailed, formatted emissions inventory record for all point sources of air pollution within and near the Detroit Edison service area. This study involved developing computer programs to process data from the Michigan DNR files, which were comprised of three separate magnetic tape reels containing records on business, source characteristics, and emission rate information. These data were re-formatted to a single file consolidating the detailed data from the separate tapes.

For the Cincinnati Gas & Electric Company, our staff developed a complete inventory of PSD and background sources for the area of significant impact near the Zimmer Power Plant.

Method 21 Leak Detection For numerous manufacturing facilities, our staff has conducted Method 21 equipment leak testing and has estimated fugitive emissions from these test results.

Chemical Industry For the Chemical Manufacturers Association, we served as national contractor for a program to develop new procedures for estimating VOC mass emission rates as a function of organic vapor analyzer screening values for fugitive emissions from equipment leaks. This project was conducted at 18 chemical plants nationwide. The results of the study were used by U.S. EPA to develop new correlation equations and default zero emission rates for its Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), November 1995.

Air Quality Modeling

Our air quality dispersion modeling studies include those for existing facilities in support of State Implementation Plan (SIP) revision requests, as well as for new facilities including Prevention of Significant Deterioration (PSD) permit analyses, nonattainment area impact analyses, and assessments to be included in Environmental Impact Statements. Our staff's experience in these areas includes the validation and application of alternative air quality dispersion models. In addition to all of U.S. EPA's current Guideline Models, we have the newest generation of U.S. EPA Models – ISC PRIME and AERMOD – that will be the models required in future air quality modeling to satisfy PSD and state air quality modeling requirements.

Our air quality modeling studies have included:

- modeling in flat and complex terrain;
- modeling plume impact on tall buildings;
- modeling aerodynamic downwash effects;
- fugitive particulate emissions modeling;
- cooling tower vapor and drift emissions modeling;
- lakeshore and coastal fumigation modeling;
- modeling of accidental releases of hazardous air pollutants;

- long range transport modeling for concentrations, atmospheric visibility and atmospheric wet/dry deposition impact analyses in PSD Class I areas;
- cumulative background source modeling;
- modeling for monitoring network design; and
- modeling in urban areas with large point and area source emissions data bases.

Our staff has also carried out many dispersion model development programs for sources located in complex terrain, near large water bodies, and near urban areas. These studies have included tracer release and measurement, LIDAR and COSPEC remote sensing, and physical modeling (wind tunnel) investigations.

We have evaluated the long range transport of ozone and ozone precursors in studies examining the impact of VOC emissions on peak oxidant concentrations.

Modeling Studies in Support of Revisions to Emission Limits

Following are some selected air quality consulting studies that illustrate the breadth of our capabilities dealing with revisions to emission limits for existing facilities.

For a group of industrial companies in Wayne County, Michigan, including Marathon Oil Company, Detroit Edison Company, Great Lakes Steel, and the Ford Motor Company, we provided assistance in reevaluation of the SO₂ SIP for combustion sources. This study involved modeling critical receptor-periods with ISCST (Urban) to evaluate emission reduction strategies that each company recommended to the Michigan Department of Natural Resources.

For a group of industrial companies in Allegheny County, Pennsylvania, including LTV Steel, U.S. Steel, and Shenango Steel, we provided assistance in reevaluation of the SO₂ SIP. This study involved a review and critical evaluation of modeling procedures being used by U.S. EPA Region III and its consultant, as well as independent modeling studies to provide additional technical evidence.

**Modeling of Complex
Emission Sources**

For Freeport-McMoran and Pennzoil Sulphur Co., we developed ventilation and flow models for liquid sulfur storage tanks as a function of meteorology and liquid level. These models were used to develop particulate emissions inventories and in air quality modeling studies. Our staff also developed, with assistance from its clients, a sulfur particulate specific emission test method for sulfur storage tanks that the State of Florida has incorporated into its regulations. Results of this work were presented in public hearings sponsored by the Florida Department of Environmental Regulation to develop new rules for the regulation of sulfur storage and handling.

**Mesoscale Modeling of
Atmospheric Deposition
and Chemically Reactive
Pollutants**

For the Orlando Utilities Commission, our staff prepared expert testimony for a hearing for certification of the Stanton Energy Center. The testimony dealt with the acid deposition impact within 300 km of the proposed facility. Enviroplan Consulting also predicted seasonal and annual average ambient SO₂ and sulfate concentrations, dry and wet sulfur deposition, and change in precipitation pH. Also estimated was the impact of the proposed plant on aquatic chemistry at a number of lakes within the region. All modeling analyses were conducted using a model developed by Enviroplan Consulting.

For the New Jersey Department of Environmental Protection, we developed and applied a model for estimating the acid deposition and ambient sulfate impact of a large coal-burning power plant in southern New Jersey.

**Interactive Modeling of
Multiple Background
Sources**

Many other air modeling projects have required the interactive modeling of multiple background sources. The Delmarva Power & Light Hay Road gas turbine project, for example, included a background NO_x emission inventory of over 200 stacks in the area centered around Wilmington, DE, covering emission sources in the states of Delaware, New Jersey, Maryland, and Pennsylvania.

The Ansaldo Industries of America South Corning, NY cogeneration project involved the compilation, verification, and modeling application of an extensive NO_x emission inventory for sources in New York and Pennsylvania.

**Modeling in Support of
Emissions Netting Analyses
Under the U.S. EPA Emissions
Trading Policy**

The Delaware Clean Energy Project involved an emissions netting analysis for the modification of existing boilers and the addition of a new gas turbine, heat recovery steam generator, flare, cooling tower, and sulfur recovery unit incinerator at an existing petroleum refinery. The project included the analysis of post-modification worst-case emission scenarios, involving multiple fuels (i.e., syngas from the gasification of petroleum coke, No. 2 and No. 6 fuel oil, and refinery gas) in the boilers and gas turbine. Air quality modeling of pre- and post-modification emissions was conducted to demonstrate ambient equivalence under the U.S. EPA Emissions Trading Policy. The project involved interaction with the Delaware Department of Natural Resources and Environmental Control and U.S. EPA Region III.

**Long Range Transport Modeling
of Proposed Electric Power
Plant Addition in PSD Class I Area**

For a Conectiv proposed addition to the Hay Road Plant in Delaware, we conducted all emissions inventory development, air quality modeling with the ISC Model within 50 kilometers of the plant and long range transport modeling with the CALPUFF Model in the nearest PSD Class I area to demonstrate compliance with allowed PSD increment consumption. Prepared all above air quality sections of the environmental report submitted in support of the PSD permit application.

**Air Pollution Control
Technology Evaluations**

Our staff has conducted numerous studies which involved the evaluation of the technological and economic feasibility of air pollution control equipment for a wide range of emission sources. These studies have included BACT/LAER determinations in support of New Source Review permitting activities, case-by-case RACT plans for existing sources in nonattainment areas, and engineering studies to specify and oversee the installation of air pollution control equipment.

**Gas Turbines - BACT
Analysis**

Our BACT analyses for new gas turbine cogeneration projects include the following: the Beaver Falls Project (Kamine Development), the South Corning and Allegany Projects (Ansaldo Industries of America), the Silver Springs Project (Indeck Energy services), the Avon Lake Project (Pentech Energy), the West Lorain Project (FirstEnergy) and the Midway Project (FirstEnergy) among others.

**Fluidized Bed- BACT
Analysis**

We have conducted the Best Available Control Technology (BACT) determinations under the PSD regulation for multiple fluidized bed combustion boiler projects and coal and oil-fired boiler projects in several states. The purpose of these analyses was to demonstrate that the pollution control methods provided an effective combination of cost expenditure and pollution control in order to evaluate project feasibility. The primary pollutants of concern were SO₂ and particulate for the coal-fired boilers and SO₂ for the oil-fired boilers. The BACT analyses included a description of the planned pollution control methods and a comparison of pollutant emission rates with applicable regulations. The control methods were compared with those of similar sources that had been permitted. The analyses also included a review of initial and annual pollution control costs and a comparison with the costs for further control levels.

SCR Evaluation

For Cincinnati Gas & Electric Co. (CGE), our staff conducted a study among electric utility and other facilities utilizing Selective Catalytic Reduction (SCR) technology to control NO_x emissions from gas turbines. At the time of the study, Ohio EPA was considering requiring CGE to install SCRs as the Best Available Control Technology on CGE's proposed 900 MW gas turbine generator. We reviewed and documented the experience of six facilities which had already implemented SCR technology on gas turbines to control NO_x emissions.

**Stationary Reciprocating
Internal Combustion
Engines - RACT Analyses**

We prepared NO_x and VOC RACT plans for 30 natural gas compression stations in Pennsylvania and New York operated by Consolidated Natural Gas Transmission Corporation and National Fuel Gas Supply. Case-by-case RACT evaluations were conducted for over 200 emission units at these facilities, including stationary reciprocating internal combustion engines, process heaters, boilers,

gas turbines, gas absorbers, glycol dehydration systems, and wastewater treatment plants. The technological and economic feasibility of alternative NO_x/VOC control options were evaluated in this project.

Boilers

For a major New Jersey pharmaceutical manufacturer, our staff assisted in establishing permit conditions for 12 boilers. The permit conditions were Federally Enforceable and limited the total NO_x emissions to the level that allowed the facility to apply for an exemption from the New Jersey NO_x RACT regulations.

Steel Facilities

For Lukens Steel, Laclede Steel, and Sharon Steel, we prepared VOC and NO_x RACT compliance plans for five iron, steel, and coke facilities in Pennsylvania. Source categories included direct-fired furnaces for slab reheat, batch and continuous heat treating, and annealing, soaking pits, electric arc furnaces, pickling lines, coke batteries, basic oxygen furnaces, blast furnaces, hot strip mills, acid regeneration units, flares, and boilers.

Computerized Database

Enviroplan Consulting maintains contacts with over 200 manufacturers of air pollution control equipment and systems. We have developed a computerized database that facilitates identification and initial screening of appropriate vendors for specific applications.

Computerized Cost-Effectiveness Calculations

State RACT rules generally require that all available control alternatives for each at a major source facility be identified and evaluated for cost-effectiveness. For a large facility with many sources, numerous calculations are required to complete a cost-effectiveness analysis. We have developed a computer model for automating these calculations and generating properly-formatted reports. The model calculates capital and annual costs for all control alternatives in accordance with the U.S. Environmental Protection Agency's Control Cost Manual.

Air Pollution Equipment Specification and Design

For Ausimont USA, Inc., we designed a wet scrubber for controlling odors emitted during plastic resin manufacturing. The project included development of a process flow diagram, piping and instrumentation diagram, and equipment specifications.

For PMC Specialties Group, Enviroplan Consulting conducted an odor control study for a specialty chemicals production facility. The

study scope included emission estimation, air dispersion modeling, and evaluation of air pollution control equipment.

Compliance Management

Enviroplan Consulting helps its clients improve their management processes for complying with all environmental regulations.

Our work includes: 1) identifying the compliance tasks the facility is responsible for, 2) assuring there is clear responsibility for who completes each task, 3) documenting the steps in each compliance task via Action Work Forms, 4) building ownership and commitment of the front line people responsible for actually carrying out each task, 5) developing a Management Checklist to assure follow up so that if a compliance task is not completed when required this is known immediately and the responsible person is contacted, and 6) keeping track of any outstanding corrective actions needed to maintain compliance. The benefits of these services are not just more effective compliance but in many cases lower costs of compliance .

Our staff has helped companies improve their environmental compliance management processes and develop compliance management systems at over 20 facilities. The following projects are representative of our experience.

Natural Gas Transmission Company

Worked with company to improve management processes for complying with all environmental regulations at compressor stations, one of which is a Small Quantity Generator under RCRA. Developed environmental compliance management system to increase the effectiveness and reduce the cost of compliance. Work included visits to and interviews with personnel at each station responsible for each of the compliance tasks.

Natural Gas Distribution Company

Reviewed environmental regulations and associated compliance tasks for customer service centers. Developing environmental compliance management systems for these facilities.

Environmental Assessments

In collaboration with our strategic partner Lawler, Matusky & Skelly, Enviroplan Consulting conducts environmental studies and prepares and submits the documents required to satisfy the environmental assessment, reporting and permitting requirements of local, state and federal agencies for new facilities and modifications to existing facilities. Such studies typically include development of baseline conditions, identification of impacts, and determination of their significance and perceived risk. Risk assessment may include the evaluation of effects from pollutant exposure due to air and water pathways. Our staff has prepared such assessments and reports for facilities ranging in size from small industrial processes to major industrial facilities and new electric power plants.

As with other aspects of environmental services, it is important to decide on the appropriate level of detail and emphasis in the environmental assessments and reports. Enviroplan Consulting develops recommendations on where to place the greatest priority. The evaluation of priorities depends on the issues of most concern to the regulatory agencies issuing the construction permits and the concerns of communities near the location of the proposed project. We then prepare the environmental assessments and reports based on these priorities. Enviroplan Consulting also prepares relevant permit applications and supporting documentation.

The following studies are representative of the experience Enviroplan Consulting's staff has had in these areas:

Power Plant Expansion

For the City of Lansing, Michigan, Board of Water & Light, our staff completed a detailed draft environmental report relating to the procurement of all permits and licenses for a planned fossil-fuel power plant expansion program. A description of the existing and proposed generating units and the existing environment of the site and vicinity were included, as were the impacts of construction and operation of the proposed unit on people, soils, water, the terrestrial ecosystem, the aquatic ecosystem, and the atmosphere. A summary of the impacts, issues and benefits of the proposed expansion was also a part of this report. Work included development and implementation of strategies for issuance of all environmental permits as well as negotiations with the Michigan Department of Natural Resources on the scope of required environmental studies.

New Manufacturing Process

For a Fortune 500 pharmaceutical products manufacturer in New Jersey, our staff completed a confidential environmental impact statement and prepared principal environmental permits for a new manufacturing process and related facility construction. The impacts of the construction and the manufacturing process on the socioeconomics, transportation, water, noise, and air quality in the vicinity of the facility were analyzed. Safety considerations and safeguards to be implemented by the client were included in the report.

Opacity Variance

For Bethlehem Steel Corporation, our staff prepared a Draft Environmental Impact Statement (DEIS) to obtain a variance from state opacity regulations for three underfiring coke oven batteries. The state required that three areas be addressed in the DEIS: aesthetic impacts, land use impacts, and health impacts. We reviewed existing records and operating procedures before developing the DEIS. Work included negotiations with the New York Department of Environmental Conservation on the scope of work in each area.

Our staff analyzed the visual impact of the plume on the neighborhood in which the plant was located to establish a view-shed. We conducted a survey of residents concerning plume impact and were responsible for a socioeconomic study of the impact this variance would have on the surrounding area. Potential health impacts of possible increases in the emissions of polycyclic organic matter, aromatic compounds and trace metals were evaluated through predicting concentrations to which the community would be exposed and comparison of these concentrations with ranges of acceptable concentrations established by various states for these pollutants.

New Cogeneration Facilities

Our staff has provided environmental consulting and monitoring services on over 30 projects for Independent Power Producers, as summarized in Table 2-1. Many of these projects have involved environmental assessments for one or more areas in addition to air quality. Example projects are briefly described below:

For two cogeneration projects in Michigan, our staff conducted environmental studies and assisted the client in obtaining environmental permits to satisfy state and federal requirements. Work involved assessing the impact of the facility on the air, surface waters, and aquatic/terrestrial ecosystems. Work involved review of

all permit requirements; negotiating with the state to obtain negative declarations for several of the permits, including wetlands permits; conducting all air quality modeling and Best Available Control Technology analyses to obtain the Prevention of Significant Deterioration (PSD) air permits; preparing the surface water discharge permits for one of the facilities; and supervising required archaeological investigations.

For a developer of cogeneration projects in New Jersey, our staff reviewed all environmental permit requirements for a new project in that state. In addition to reviewing the environmental permit requirements of this facility for all pollutant discharges to the air, surface waters and land, the review addressed permits for coastal facilities, wetlands and meadowlands.

For two cogeneration projects in New York State, our staff conducted multi-disciplinary environmental impact studies, and prepared and submitted all environmental permits to satisfy state and federal requirements. Work involved baseline natural and socio-economic resource inventories and impact assessments, wetland delineations, air quality modeling, and preparation of surface water discharge permit applications.

New Power Plant

For Pure Air, a joint venture between Air Products and Chemicals, Inc. and Mitsubishi Heavy Industries America, Inc., our staff prepared the Environmental Impact Volume (EIV) for the proposed construction of an Advanced Flue Gas Desulfurization (AFGD) plant in Indiana. The AFGD system itself was designed to remove 90 percent of the SO₂ from flue gas produced by burning high-sulfur coal through the use of wet limestone flue gas desulfurization technology, resulting in lower operating costs and decreased solid and liquid wastes. The EIV was intended to provide the Department of Energy (DOE) a data base, analyses and impact assessments of the AFGD system, and was prepared under an unusually tight deadline.

As part of the data base, we prepared a comprehensive description of the area, including information on the site itself, the surrounding communities, and the atmospheric, land, water, ecological, socioeconomic, and energy and materials resources. Enviroplan Consulting further evaluated the environmental impacts of the construction and operation of the AFGD system on each of these areas, recommended mitigating measures where necessary, and defined the monitoring requirements for the project.

Coal Injection System

For Bethlehem Steel Corporation (BSC), our staff produced an Environmental Impact Volume for a Blast Furnace Granulated Coal Injection (BFGCI) system proposed for construction at the BSC plant in Indiana under the third round of the DOE's Innovative Clean Coals Technology Program. The EIV was intended to provide the DOE with a data base, analyses and impact assessments of the BFGCI system by addressing the environmental issues associated with its development and commercial operation.

Environmental Auditing

In collaboration with our strategic partner, Lawler, Matusky & Skelly; we conduct comprehensive environmental auditing of active and inactive industrial and power generation facilities. Identification of potentially-limiting environmental site constraints is the key to successful real estate acquisition and development, facility expansion, and property transfer. Potential liabilities resulting from past facility operation or waste disposal practices cannot be ignored, especially since the cost of remediation and waste disposal can often exceed the value of a property. In addition, a given site or facility may be as effectively encumbered by the presence of wetlands or other significant natural features as by the presence of hazardous wastes or underground storage tanks.

The developer, facility owner, or investor must be made aware of existing and potential environmental encumbrances in order to make prudent, well-informed business decisions. Further, the environmental planning and assessment process often continues throughout all stages of the development of a project. Environmental factors can no longer be simply ignored - they must be recognized and effectively addressed in order for a successful transaction or continued facility operation to occur.

A large and growing number of companies periodically conduct environmental audits at existing facilities to ensure compliance with all environmental regulations.

Such audits help companies: 1) achieve their corporate goals of complying with all environmental regulations; 2) comply with their Securities and Exchange Commission (SEC) environmental disclosure reporting requirements under Regulation S-K which must be included in the annual Form 10-K submission to the SEC; 3) avoid

large fines imposed by government agencies for noncompliance with environmental regulations and consent orders; 4) protect their employees and the surrounding community from damage to health and property due to chemical releases from the facility; and 5) protect the company against large liabilities due to court-awarded judgments to workers or community members because of health problems caused by long-term continuous exposure or accidental short-term exposure to chemical releases from the company's facilities.

For many of the same reasons, there is a rapidly growing need for environmental audits and reviews to identify major potential liabilities associated with possible acquisitions or divestitures of companies, facilities, and properties.

A special resource of our environmental auditing teams is their many years of experience as plant engineers and/or plant environmental engineers. Our staff have participated in hundreds of compliance audits at various types of industrial facilities in the United States, Canada and Europe. Facilities audited include steel, pharmaceutical, chemical, consumer products, paper manufacturing, petroleum refining, and photochemical operations. We are experienced with both compliance and liability type audits. While many of the audits were comprehensive in nature, including air, water and waste aspects, others focused solely on air.

These compliance audits have, for the most part, required 1) an understanding of all facility operations, materials processed and manufactured, and applicable regulations, 2) site visits, 3) evaluation of existing permits and registrations, 4) regulatory agency file and database searches, and 5) identification of regulations which are not applicable.

Following are descriptions of selected environmental auditing assignments conducted by Enviroplan Consulting's professional staff.

Steel Company

For a steel company, Enviroplan Consulting conducted a complete audit of compliance status with all applicable air pollution regulations at one of its facilities and recommended corrective actions. LMS has conducted a large number of other environmental audits information on which is available upon request.

Law Firm

A site which had been transferred through several owners was found to contain areas of contamination as defined under the ECRA statutes. The various areas on the commercial property were identified as to the type and extent of contamination. Further work was done to determine the historical background of the site, what operations were previously performed on the site and how previous owners/tenants may have been responsible for property contamination. Once the site history had been completed, and the contaminant areas well defined, an estimate to each contributing operation was calculated for cleanup responsibilities.

Industrial Client

For an industrial client, our staff was engaged to perform site assessments and investigations on a property that had been used for solvent disposal over a period of years. Work performed included the development of an Assessment and Abatement Plan and a partial implementation of the plan. The affected area underwent extensive soil sampling. Groundwater monitoring wells were installed and were monitored quarterly. In addition, site remediation in the form of VOC vapor extraction was conducted for a period of over one year.

Chemical Manufacturer

For a chemical manufacturer in Maryland, our staff evaluated the facility's potential for inclusion on the Federal National Priorities List of Superfund sites. We conducted an intensive investigation of the site, including soil and groundwater analysis, geographic and population data, and ambient air quality, and applied the Hazard Ranking System (HRS) model according to the requirements of CERCLA to determine if the site was a priority for a superfund cleanup.

**Carbon Extrusion Machining
and Coating Facility**

We conducted an environmental audit for a client who was in the process of purchasing a carbon extrusion machining and coating facility that machines graphite extrusions and impregnates them with a phenol formaldehyde resin. The purpose of the assessment was to determine the plant's compliance with applicable environmental and safety regulations and assess the liabilities that the client would assume in purchasing the plant. The assessment included a preliminary investigation of the plant operations and property and a review of the plant's environmental and safety records. The applicable air, water, hazardous waste and Occupational Safety and Health Administration (OSHA) regulations were reviewed as a part of the audit process.

Inactive Manufacturing Plant

Enviroplan Consulting's staff conducted an environmental audit of a plant that had at one time manufactured rigid-frame buildings. The plant had not operated for several years; however the electrical components were in place. Due to the age of the facility, the majority of the transformers, oil circuit breakers and capacitors contained PCB's at varying levels of concentration. The plant was the target of vandalism that resulted in the release of PCB's. The assessment included an investigation of the property and a listing of environmental liabilities. Samples were taken to determine the extent of contamination. All of the transformers were tested as well as the soil and water in the vicinity of the spills. The study included a remediation and cleanup plan.

Nameplate Manufacturing Facility

For a nameplate manufacturing facility, Enviroplan Consulting's staff directed a project that included an assessment of the client company's compliance with environmental regulations. The company manufactures name plates from various materials, including aluminum and stainless steel. Acids, ferric chloride, solvents, inks and paint are used in the process. The company was alleged to have disposed illegally of various hazardous wastes on site and in its discharge to a wastewater treatment plant operated by the city. The assessment phase of the project consisted of a review of the company's environmental records, inventory and operating procedures, including the manner in which hazardous chemicals and wastes were handled. The resulting report contained a detailed assessment of the company's environmental situation with recommendations for improvements. As a result of the assessment, the company revised its procedures for handling and disposing of hazardous waste and installed a wastewater treatment system.

Community Right-to-Know Reporting

The Superfund Amendments and Reauthorization Act (SARA), Title III Sections 312 and 313 established reporting requirements concerning chemical inventories and chemical releases to the environment for more than four million businesses. Sections 303 and 304 have also established requirements for planning, detecting, reporting and assessing the impact on public health of emergency releases of designated chemicals. Our experience has been over a wide range of industries including the automotive, chemical, coatings

and resins, manufacturing, petroleum, pharmaceutical, pulp and paper, and steel industries.

Following is a description of these requirements, how Enviroplan Consulting can help its clients satisfy them, and how we can assist in communicating reported information to workers and the community.

SARA Section 303 and 304

Section 303 of SARA Title III requires preparation of an emergency plan that must include a description of ways to determine when an accidental release occurs and the area or population likely to be affected. Section 304 requires reporting of all emergency releases of designated chemicals and the anticipated acute or chronic health risks associated with the emergency. Our staff has assisted its clients with its Section 303 and 304 reporting requirements including preparation of emergency plans and assessments of the impact on workers and the surrounding community of accidental chemical releases. These plans have been developed for internal use by our clients and for presentation to Local Emergency Planning Committees.

SARA Section 311 and 312

Section 311 of SARA Title III requires each facility to submit its Material Safety Data Sheets (MSDS) or a list of the chemicals for which it has MSDS to governmental agencies. This requirement applies to every facility that maintains MSDS.

Section 312 requires every facility to prepare and submit by March 1 of each year information on chemical inventories within each of five physical and health hazard categories for each chemical for which an MSDS is maintained.

Our staff has helped many facilities prepare their Tier I and Tier II Emergency and Hazardous Chemical Inventory Forms to satisfy Section 312 reporting requirements. Our services include:

- Developing estimated maximum and average inventory levels and the number of days each chemical is maintained on-site;
- Reviewing MSDS to determine which of the five physical/health hazard types are applicable to each chemical and compiling a computer-based MSDS inventory.
- Generating the Tier I and Tier II Forms.

SARA Section 313

Section 313 requires each facility in SIC Codes 20-39 with 10 or more full time employees that manufactures, processes or otherwise uses any of several hundred specified chemicals in more than specified threshold quantities to report its chemical releases to the environment and other related information on U.S. EPA R Form. These forms are due by July 1 of each year.

For more than 70 manufacturing facilities over a wide range of industries, our staff developed air pollution emission inventories for toxic chemicals regulated under SARA Title III Section 313. Emissions included stack/vent emissions from combustion and process sources and storage tanks, secondary emissions from ponds, lagoons and other open liquid surfaces, and complex fugitive emissions from equipment leaks, materials handling and transfer operations, liquid loading/unloading operations, wind erosion, and vehicle traffic.

Our services include:

- Training plant personnel to estimate releases to the environment and prepare the R Forms;
- Determining which chemicals are subject to reporting;
- Estimating the releases to the environment, inventories, waste treatment efficiencies and other required information;
- Equipment leak testing and mass emissions rate testing of valves, flanges, seals and other equipment components to estimate releases more accurately;
- Preparing Form Rs;
- Preparing technical support documents with the basis of all release estimates and other documentation required under Section 313; and

We also help our clients develop effective ways to communicate information about chemical releases, exposures and risks to workers and the community. Our services include:

- Identifying the major concerns of worker/community groups about the facility's operations and chemical releases;
- Deciding what information to communicate;
- Estimating the exposures of workers and the community to each chemical released to the environment;
- Estimating the risks to which workers and the community are subject from these exposures to chemical releases;
- Training designated plant personnel to communicate the above risk information;
- Meeting with the Local Emergency Planning Committee and worker/community groups to discuss the risks associated with exposures to the chemical releases from the facility; and
- Developing on-going facility programs to communicate information about chemical releases to workers and the community.

TABLE 2-1: SELECTED NEW SOURCE REVIEW PERMITTING EXPERIENCE FOR POWER GENERATION FACILITIES

Company/Project	Location
Ansaldo Industries of America, Inc. South Corning Allegany	New York New York
Babcock & Wilcox Alliance	Ohio
Bethlehem Steel Corporation Steelton	Pennsylvania
Centerior Energy Corp. Eastlake Avon Lake	Ohio Ohio
Cincinnati Gas & Electric Co. Woodsdale Eastbend W. H. Zimmer Miami Fort	Ohio Ohio Ohio Ohio
Cogentrix Adrian Otsego	Michigan Michigan
Conectiv Energy Hay Road Units 5 – 8	Delaware
Delmarva Power & Light Co. Hay Road Units 1 - 4 Edgemoor	Delaware Delaware
Detroit Edison Belle River Greenwood	Michigan Michigan
Duquesne Light Co. Brunot Island Phillips	Pennsylvania Pennsylvania
FirstEnergy West Lorain Midway	Ohio Ohio

TABLE 2-1: (continued)

Company/Project	Location
Fluidized Combustion Services Marcal Paper Mahanoy Township	New Jersey Pennsylvania
Ford Motor Co. Rawsonville	Michigan
General Motors Wilmington	Delaware
Indeck Energy Services Silver Springs	New York
International Systems Atlantic City	New Jersey
Kamine Development Corp. Beaver Falls Milford	New York New Jersey
Nekoosa Papers, Inc. Ashdown	Arkansas
Northern Indiana Public Service Co. Bailly	Indiana
Orlando Public Utilities Commission Stanton Energy Center	Florida
Pagnotti Enterprises, Inc. Hazleton	Pennsylvania
Pentech Power Corp. Avon Lake	Ohio
Public Service of Indiana Marble Hill	Indiana
Scott Paper Co. Chester	Pennsylvania
Star Enterprise; Texaco Syngas, Inc.; and Mission Energy Delaware Clean Energy Project	Delaware
Wheelabrator Northampton Redevelopment Project	Pennsylvania

TABLE 2-2: SELECTED TITLE V PERMITTING EXPERIENCE

Client	State	Facility Type	Project
ABC Coke	Alabama	Coke	Title V Emission Inventory
Empire Coke	Alabama	Coke	Title V Emission Inventory
Gulf States Steel	Alabama	Integrated Steel	Title V Application
Koppers Industries	Alabama	Coke	Title V Application
Sloss Industries	Alabama	Coke; slag wool	2 Title V Emission Inventories
Acme Steel Company	Illinois	Coke, Iron, Steel	3 Title V Applications
Laclede Steel Company	Illinois	Steel	2 Title V Applications
Meadowbrook Company	Illinois	Metals Processing	1 Title V Application
AGFA Division Bayer	New Jersey	Graphic arts industry	Title V QA/QC Compliance Plan
Nabisco Foods Group	New Jersey	Food products manufacturer	Development of Title V Application Form
Nabisco Foods Group	New Jersey	Headquarters and research laboratories	Development of Title V Application Form
Sithe Energies, Inc.	New Jersey	Cogeneration facility	Development of Title V Application Form
The Pequannock, Lincoln Park & Fairfield Sewerage Authority	New Jersey	Municipal sewage sludge treatment facility	Emissions and Permit Review to Confirm Minor Source Status
Alloy Cast Products, Inc.	New Jersey	Foundry operation	Emissions Review to Confirm Minor Source Status
Polychrome Corporation	New Jersey	Graphic Arts film manufacturer	Emissions and Permit Review To Confirm Synthetic Minor Status
Pascack Valley Hospital	New Jersey	Hospital	Assistance in Obtaining Synthetic Minor Status
Passaic Beth Israel Hospital	New Jersey	Hospital	Assistance in Obtaining Synthetic Minor Status

TABLE 2-2: (Continued)

Client	State	Facility Type	Project
United Hospitals Medical Center	New Jersey	Hospital	Assistance in Obtaining Synthetic Minor Status
Confidential Client No. 1235	New Jersey	Nationally recognized household products manufacturer	Emission Estimating Method 21 Leak Testing VOC RACT To Confirm Synthetic Minor Status
Confidential Client No. 0958	New Jersey	Nationally recognized pharmaceutical manufacturer	Emissions Review to Determine Potential for Synthetic Minor Status
Confidential Client No. 1153	New Jersey	Municipal landfill	Emissions Review to Determine Title V Applicability
Confidential Client No. 1285	New Jersey	Specialty chemical manufacturer	Assistance in Obtaining Synthetic Minor Status
CNG Transmission Corporation	New York	Natural gas transmission	3 Title V Applications
National Fuel	New York	Natural gas transmission	7 Title V Applications
Confidential Client No. 0999	New York	Generic pharmaceutical manufacturer	Assistance in Obtaining Synthetic Minor Status
Confidential Client No. 1000	New York	Generic pharmaceutical manufacturer	Assistance in Obtaining Synthetic Minor Status
Brush Wellman, Inc.	Ohio	Copper-Beryllium Alloy Production	Title V Application
CNG Transmission Corporation	Ohio	Natural gas transmission	6 Title V Applications
Bethlehem Steel Corporation	Pennsylvania	Steel	Title V Application
CNG Transmission Corporation	Pennsylvania	Natural gas transmission	24 Title V applications 3 Synthetic Minor Determinations 1 Minor Source Determination

TABLE 2-2: (Continued)

Client	State	Facility Type	Project
Conagra Flour Milling Co.	Pennsylvania	Flour milling	6 Title V Applicability Determinations, Permitting Assistance
National Fuel	Pennsylvania	Natural gas transmission	3 Title V Applications 5 Synthetic Minor Determinations
Laclede Steel	Pennsylvania	Steel	1 Title V Application
CNG Transmission Corporation	Virginia	Natural gas transmission	1 Title V Application
CNG Transmission Corporation	West Virginia	Natural gas transmission	25 Title V Applications 2 Synthetic Minor Determinations 1 Minor Source Determination
Meadowbrook Company	West Virginia	Metals Processing	1 Title V Application
State Air Pollution Agency		Various	All types of construction and operating permits
City Air Pollution Agency	West Virginia	Various	All types of construction and operating permits

TABLE 2-3: SELECTED AIR TOXICS SERVICES EXPERIENCE

Client	Training/ Technical Assistance	Risk Management Plan Development, Emergency Planning, Exposure/Risk Assessment and Risk Communications	SARA Title III, Section 312 & 313 Reporting	Air Toxics Monitoring and Method 21 VOC Leak Testing
Acme Steel*			X	
Allegheny Power*		X		
American Cyanamid*	X	X		
American Leather			X	
American Metal Moulding			X	
Anheuser-Busch		X		
Aristech Chemical	X		X	
Atlantic Steel*			X	
Bethlehem Steel*			X	
CF&I Steel			X	
Ciba Geigy	X			
Coastal Corporation			X	
Copperweld Steel			X	
Damascus Tube			X	
Du Pont				X
Duquesne Light*	X	X		
Exxon Co. USA*			X	
FMC Corporation		X		
General Motors*		X		
Glidden*	X		X	
Gulf States Steel	X	X	X	X
Hoechst Celanese*	X		X	X

TABLE 2-3: (continued)

Client	Training/ Technical Assistance	Risk Management Plan Development, Emergency Planning, Exposure/Risk Assessment and Risk Communications	SARA Title III, Section 312 & 313 Reporting	Air Toxics Monitoring and Method 21 VOC Leak Testing
IBM Corporation		X		
Kimberly-Clark			X	
Laclede Steel*	X		X	
Lederle Laboratories*	X			X
LTV Steel*			X	
Monessen			X	
Morton Thiokol*				X
M & T Chemical	X			
Pace Industries	X			
PPG Industries			X	X
Reckitt & Colman				X
Reichhold Chemical*			X	
Republic Metal Products			X	
Sharon Steel*			X	
Shenango*			X	
Sun Refining/Marketing				X
The Grow Group			X	
Virginia Chemicals	X		X	X
Westvaco	X	X	X	
Wheeling-Pittsburgh Steel*			X	

(*) Multiple Plants

SECTION 3: AMBIENT AIR QUALITY AND METEOROLOGICAL MONITORING SERVICES

Enviroplan Consulting is one of the nation's leading air pollution consulting companies specializing in ambient air quality and meteorological monitoring.

Our air quality and meteorological monitoring services include:

- Monitoring network design
- Preparation of the Quality Assurance Project Plan
- Monitoring equipment supply
- Installation and startup
- Operation and maintenance
- Data acquisition, analysis and reporting including daily polling
- Quality Assurance Performance and Systems Audits and other QA functions

Table 3-1 provides a summary of selected experience in air quality and meteorological monitoring. We have conducted operation and maintenance, quality assurance, data analysis and reporting and auditing of over 1,900 air quality and meteorological parameters for over 5,400 parameter-years in 19 states and two foreign countries.

Currently, we are operating monitoring programs including 397 air quality and meteorological parameters in 11 monitoring networks.

We provide these services from our Operations Center and Quality Assurance Laboratory in Fairfield NJ and with our on-site monitoring personnel located at each monitoring network.

Highly trained monitoring technicians carry out sensor component and electronic instrumentation repair. Our field engineering resources, diagnostic instrumentation, and large spare parts and monitor inventory help assure reliable network operations.

A fully equipped quality assurance laboratory is maintained at our Wayne, N.J. headquarters. This laboratory provides the NIST-traceable calibration/certification of gaseous standards, flow-measuring devices, and includes other support equipment used for field quality control and performance audits. Enviroplan Consulting's Quality Assurance Section has had extensive experience working with U.S. EPA, regional, state and local agencies to ensure that all routine

and special quality assurance requirements are fully met. Our networks have been subject to independent audits by seven state air pollution agencies. Enviroplan Consulting also participates in the EPA National Performance Audit Program.

The parameters monitored include PM_{2.5}, PM₁₀, TSP, SO₂, O₃, NO_x, NO_y, CO, H₂S, VOC, SVOC, total HC, NMHC, carbonyl, other speciated HC compounds, sulfates, nitrates, dioxins, furans, lead, mercury, metals, and various meteorological parameters.

Our over 5,900 parameter-years of experience includes instrumentation from every major manufacturer as well as a wide range of state-of-the-art equipment.

Table 3-1: Number of Air Quality and Meteorological Parameters Monitored and Period of Monitoring								
Revision: 6/19/09								
			Total Number	Total Number	Total Number	Total	Number of	Number of
	Period of		Air Quality	Meteorological	Air Toxics	Number	Parameter	Meteorological
Network Name	Operation	Years	Parameters	Parameters	Parameters	Parameters	Years	Parameter-Years
Currently Operated								
ABC Coke	1998-Present	11	1	7	0	8	88	77
Alaska Wind Energy Project	2007-Present	2	0	4	0	4	8	4
Major Wind Energy Developer - Michigan	N/A	N/A	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	0	0	N/A
Major Wind Energy Developer - Pennsylvania	2008-Present	1	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	0	0	N/A
MeadWestvaco Corporation	1997-Present	12	9	11	0	20	240	132
Northern Indiana Public Service Co.	1991-Present	18	3	26	0	29	522	468
Oak Grove Resources, LLC: Concord Coal Preparation Plant (Initial State-up Phase)	N/A	N/A	2	10	0	12	12	10
Pollution Control Financing Authority of Warren County	2007-Present	2	2	6	0	8	16	12
Steel Dynamics Bar Products Division	2003-Present	6	13	4	0	17	102	24
Steel Dynamics Structural Mill Division	2001-Present	8	3	4	0	7	56	32
Texas Commission for Environmental Quality (TCEQ)	2008-Present	1	6	6	0	12	12	6
Valero Coke and Flux Handling Facility	2002-Present	7	11	0	0	11	77	0
Valero Oil Refinery	2000-Present	9	21	6	0	27	243	54
SubTotal			70	77	0	147	1288	742
Other Networks Operated Since 1998								
Ohio Wind Energy Project	2008-2009	1	0	4	0	4	4	4
Warren County NJ Air Monitoring Project	2002-2006	4	4	10	60	74	296	40
University of Texas at Austin: TexAQS II Monitoring Project	2005-2007	2	22	41	0	63	126	82
Conectiv Energy	2002-2005	3	3	0	0	3	9	0
Caribbean Petroleum Refining	1999-2000	1	2	7	0	9	9	7
City of Toledo, Ohio	2001	1	4	0	0	4	4	0
Plantation Pipeline	2005-2007	2	4	4	86	94	188	8
Lions Copolymer	2005-2006	2	2	2	43	47	94	4
Steel Dynamics -Butler	1998-2001	3	3	4	0	7	21	12
SubTotal			44	72	189	305	751	157

Table 3-1: Number of Air Quality and Meteorological Parameters Monitored and Period of Monitoring

Revision: 6/19/09								
			Total Number	Total Number	Total Number	Total	Number of	Number of
	Period of		Air Quality	Meteorological	Air Toxics	Number	Parameter	Meteorological
Network Name	Operation	Years	Parameters	Parameters	Parameters	Parameters	Years	Parameter-Years
Currently Operated								
ABC Coke	1998-Present	11	1	7	0	8	88	77
Alaska Wind Energy Project	2007-Present	2	0	4	0	4	8	4
Major Wind Energy Developer - Michigan	N/A	N/A	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	0	0	N/A
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MeadWestvaco Corporation	1997-Present	12	9	11	0	20	240	132
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University of Texas at Austin: TexAQS II Monitoring Project	2005-2007	2	22	41	0	63	126	82
Conectiv Energy	2002-2005	3	3	0	0	3	9	0
Caribbean Petroleum Refining	1999-2000	1	2	7	0	9	9	7
City of Toledo, Ohio	2001	1	4	0	0	4	4	0
Plantation Pipeline	2005-2007	2	4	4	86	94	188	8
Lions Copolymer	2005-2006	2	2	2	43	47	94	4
Steel Dynamics -Butler	1998-2001	3	3	4	0	7	21	12
SubTotal			44	72	189	305	751	157
Other Networks Operated Since 1992								
American Electric Power	1992-1995	3	4	8	0	12	36	24
BHP Minerals - Hartley	1992-1994	2	0	7	0	7	14	14
BHP Minerals - Mali	1992-1996	4	1	7	0	8	32	28
Caribbean Petroleum Corporation	1991-1996	5	3	7	0	10	50	35
Central Hudson Gas and Electric	1987-1998	11	10	17	0	27	297	187
Chambers Works Cogeneration Project	1993-1994	1	5	3	0	8	8	3
DuPont Chambers Works-Post Construction	1992-1993	1	8	4	98	110	110	4
Georgia Department of Natural Resources	1998-1999	1	124	0	72	196	196	0
Indianapolis Power and Light Company-Marion	1995-1996	1	3	3	0	6	6	3
Indianapolis Power and Light Company-Partriot	1991-1993	2	11	0	0	11	22	0
Indiantown Cogeneration Project	1994-1996	2	6	3	0	9	18	6
Keystone Cogeneration- Post Construction	1993-1994	1	4	0	0	4	4	0
Long Island Lighting Co. - Keyspan	1992	1	4	16	0	20	20	16
NARSTO Northeast	1995-1996	1	56	63	7	126	126	63
Pittsburgh Plate Glass-Circleville	1986-1994	8	6	7	30	43	344	56
Washington University Medical School	1993	1			4	4	4	0
Texas Air Control Board	1993	1	0	60	0	60	60	60
SubTotal			245	205	211	661	1,347	499

Network Name	Period of		Total Number	Total Number	Total Number	Total	Number of	Number of
	Operation	Years	Air Quality Parameters	Meteorological Parameters	Air Toxics Parameters	Number Parameters	Parameter Years	Meteorological Parameter-Years
Other Networks Operated Prior to 1992								
Allegheny Power Systems	1988	1	1	4	0	5	5	4
Allied Chemical	1980-1981	1	5	3	0	8	8	3
Arkansas Power and Light	1983-1984	1	0	5	0	5	5	5
Ashkelon Regional Assoc. of Towns for Env. Quality - Israel	1990	1	42	0	0	42	42	0
Baltimore Gas and Electric	1980-1981	1	2	0	0	2	2	0
Bath Iron Works	1990-1991	1	5	3	0	8	8	3
Breed Corporation	1985	1	0	0	1	1	1	0
Champion International	1987	1	14	7	0	21	21	7
Cincinnati Gas and Electric-Eastbend	1978-1985	7	9	0	0	9	63	0
Cincinnati Gas and Electric-Miami Ft/Beckjord	1975-1983	8	10	0	0	10	80	0
Cincinnati Gas and Electric-Zimmer	1984-1985	1	14	11	0	25	25	11
City Public Service Board of San Antonio	1981-1983	2	0	12	0	12	24	24
Cleveland Electric Illuminating-Avon Lake	1976-1989	13	13	21	0	34	442	273
Cleveland Electric Illuminating-Eastlake	1977-1982	5	15	24	0	39	195	120
Cleveland Electric Illuminating-Ashtabula	1976-1984	8	3	6	0	9	72	48
Cleveland Electric Illuminating-Lakeshore	1976-1984	8	3	0	0	3	24	0
Cleveland Electric Illuminating-Monitoring/Modeling Validation Study	1980-1981	1	13	18	0	31	31	18
Consolidated Edison	1979-1982	3	4	12	0	16	48	36
Consumers Power Company	1984	1	7	10	0	17	17	10
Cooperative Power	1981-1982	1	10	9	0	19	19	9
County of Westchester	1986	1	0	4	0	4	4	4
Dallas Independent School District	1981-1982	1	0	0	2	2	2	0
Dayton Power and Light	1982	1	3	4	0	7	7	4
DuPont Chambers Works-Pre Construction	1989-1990	1	9	4	0	13	13	4
Duquesne Light Company	1980-1984	4	22	8	24	54	216	32
Ferro Corporation	1987-1988	1	3	0	2	5	5	0
Ford Motor Company	1986	1	6	0	0	6	6	0
Foster Wheeler Power Systems, Inc.	1985-1986	1	2	0	0	2	2	0
Sub Total			113	165	28	273	1,127	615

Network Name	Period of Operation	Years	Total Number Air Quality Parameters	Total Number Meteorological Parameters	Total Number Air Toxics Parameters	Total Number Parameters	Number of Parameter Years	Number of Meteorological Parameter-Years
Other Networks Operated Prior to 1992								
Freeport Sulfur Co./Duval Corp.	1985	1	2	4	0	6	6	4
Keystone Cogeneration- Pre Construction	1990-1991	1	4	0	0	4	4	0
Manner Textile Processing	1985	1	0	0	2	2	2	0
Marathon Oil	1980-1981	1	0	5	0	5	5	5
Massachusetts Port Authority	1985-1990	5	1	3	0	4	20	15
New England Power Company	1980-1983	3	12	12	0	24	72	36
New York State DOT	1974	1	3	4	1	8	8	4
Ohio Edison- Edgewater	1979-1982	3	23	20	16	59	177	60
Ohio Edison-Gorge	1979-1982	3	14	6	8	28	84	18
Ohio Edison-Niles	1982-1983	1	10	3	0	13	13	3
Ohio Edison Company-Burger/Sammis	1989-1991	2	0	10	0	10	20	20
Ohio Edison Company-Burger/Sammis	1978-1980	2	7	22	0	29	58	44
Ohio Edison/Penn Power Company-Mansfield/New Castle	1989-1991	2	11	22	0	33	66	44
Orange and Rockland Utilities - Bowline	1978-1983	5	7	20	0	27	135	100
Orange and Rockland Utilities - Lovett	1986-1991	5	12	0	0	12	60	0
Pennsylvania Power Company-Mansfield/New Castle	1982-1983	1	11	14	5	30	30	14
Pittsburgh Plate Glass-Barberton	1980-1982	2	8	2	0	10	20	4
Plaza Humaco Mall	1990	1	1	4	0	5	5	4
Public Service of New Hampshire	1980-1983	3	0	8	0	8	24	24
Public Service of New Mexico	1984	1	0	16	0	16	16	16
Public Service of Indiana	1983-1985	2	5	20	0	25	50	40
Public Service of Indiana	1981-1982	1	4	0	0	4	4	0
Taiwan Power Company	1988	1	8	0	0	8	8	0
Union Electric Company	1986	1	0	8	0	8	8	8
United Engineers and Constructors	1989-1990	1	5	11	0	16	16	11
Wisconsin Power and Light Company-Edgewater/Lakeshore	1976-1991	15	14	16	0	30	450	240
SubTotal			490	560	89	1,106	3,875	1,944
TOTALS			849	1,079	517	2,492	8,388	3,957

Note to Table 3-1: Several air quality and meteorological monitoring networks previously operated by Enviroplan Consulting are not included in this table.

SELECTED AIR QUALITY AND METEOROLOGICAL MONITORING PROGRAMS

Descriptions of selected current and recent air quality and meteorological monitoring network programs designed, installed and operated by our staff are shown below. Budgets for these programs ranged from approximately \$30,000 to \$1,500,000.

- Georgia** For **State of Georgia**, we operated the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; 29 PM_{2.5} monitors; and about 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Work involves full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits of all monitoring equipment except for the PM_{2.5} samplers.
- Delaware** For a **major oil refiner**, we refurbished, audited and operate 16 continuous monitors for ozone, NO_x, SO₂ and CO, four TSP and one PM₁₀ sampler and one meteorological tower. Work involves full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits of all monitoring equipment
- Alabama** For **Drummond Company, Inc.'s ABC Coke Production Facility**, we designed, supplied, installed and provide on-going complete support services for a single-station air quality and meteorological monitoring program consistent with regulatory guidelines. Air quality parameters include continuously-measured PM₁₀ and analysis of time-integrated PM₁₀ samples for organic and inorganic elements and compounds using bulk analyses methods and microscopy. Meteorological parameters include continuously-measured wind speed, wind direction, sigma theta, air temperature, relative humidity and precipitation.
- Florida** For **Indiantown Cogeneration Limited Partnership**, we installed, operated and maintained a two station ambient air quality and meteorological monitoring network in support of the construction of a pulverized coal-fired cogeneration plant. Parameters monitored include SO₂, NO_x, PM₁₀ (primary and collocated), wind speed, and wind direction. All phases of data reduction, data processing, data validation, data reporting, and quality assurance including an independent audit program are included in this program.
- Indiana** For **Indianapolis Power & Light**, we conducted three PSD preconstruction ambient air quality monitoring programs in support of three generating stations. We designed, supplied and installed all three networks, which monitored O₃, SO₂, CO, NO_x and particulate matter. Data for continuous air

quality parameters of O₃, SO₂, CO, NO_x were collected with TECO instrumentation. We conducted all operation, maintenance, data reduction, data reporting, quality assurance (including quarterly quality assurance audits) on all parameters. These projects began operation in 1990; final decommissioning of the third network was in April 1996.

Indiana

For **Northern Indiana Public Service Company**, we operate and maintain air quality and meteorological monitoring networks for the Bailly, Michigan City and R.M. Schahfer generating stations. These networks comprise seven SO₂ channels, 39 meteorological channels, and 3 PM₁₀ channels.

For **American Electric Power Service Corp.**, we conducted a monitoring program in the vicinity of a fossil fuel generating station in southern Indiana. The program's objective was to collect the highest quality data possible to satisfy state regulatory requirements. Services provided included equipment installation and start-up, operation and maintenance, data processing and validation, quality assurance and data reduction and reporting.

Louisiana

For **Placid Refining Co.** in Port Allen, we developed and helped negotiate Monitoring Plan and provided detailed technical assistance for the purchase and installation of an air quality monitoring system consisting of three sites including non-methane hydrocarbons, meteorology and canister samples of hydrocarbons for speciation analysis. Client is planning to conduct monitoring program internally.

For **Plantation Pipeline Co.** in Baton Rouge, we are supplying, installing and operating a two station air quality monitoring network with one meteorological tower monitoring for non-methane hydrocarbons, meteorology and canister samples of hydrocarbons for speciation analysis. We will also be processing data from an onsite gas chromatograph for speciation analysis of hydrocarbons.

For **DSM Copolymers** in Baton Rouge, we are supplying, installing and being considered for operation of one station air quality monitoring network for non-methane hydrocarbons, meteorology and canister samples of hydrocarbons for speciation analysis.

Maine

For **Bath Iron Works**, we supplied, installed and operated a one year PSD air quality and meteorological monitoring station in Bath, Maine. The program consisted of one SO₂ monitor, five PM₁₀ samplers, and one 15 meter meteorological tower equipped to measure wind speed, wind direction and sigma theta.

- Massachusetts** For the **New England Power Company (NEPCO)**, we provided complete operation and maintenance, data processing and quality assurance for the Salem Harbor and Brayton Point networks. These two networks included 10 SO₂, six TSP, and two meteorological monitoring systems. We designed and installed the first data acquisition system in Massachusetts that telemetered the monitoring data in real-time to the Massachusetts Department of Environmental Quality Engineering.
- Michigan** For **Champion International Corporation**, we provided data reduction, data reporting, quarterly performance/systems audits, and operation and maintenance support for a single station PSD air quality and meteorological program in support of the Quinnesec Mill plant. Parameters included: SO₂, NO/NO₂/NO_x, O₃, TSP, PM₁₀, wind speed, wind direction, temperature, dew point, and solar radiation.
- New Hampshire** For the **Public Service Company of New Hampshire**, we designed and installed the meteorological monitoring system and provided quarterly meteorological calibration/audits and emergency support for the Seabrook nuclear generating station. Our services were subject to strict scrutiny under Nuclear Regulatory Commission QA/QC requirements.
- New Jersey** For **DSM Nutritional Products**, we designed, supplied and currently operate a three- station air quality and meteorological monitoring network in the vicinity of Belvidere, NJ measuring SO₂, volatile organic hydrocarbons and their speciated compounds, mercury deposition, and meteorology. Data from the network is being used to establish the first citizen emergency notification system in New Jersey in the event of elevated air pollution concentrations. Data is also to be used in a large health effects study.
- For the **DuPont Company**, we supplied, installed and operated a four-station PSD air quality and meteorological monitoring network with measurements for SO₂, NO_x, TSP, PM₁₀, wind speed, wind direction, temperature, as well as many toxic air pollutants, including mercury vapor, dioxins, furans, trace metals, VOCs and SVOCs. SO₂ and NO_x were continuously monitored by a TECO 43 and TECO 14B/E analyzer, respectively. Meteorological data was measured with Climatronics Corp. instrumentation. This network began operation in April 1992 in support of a permit to construct a new rotary kiln incinerator and secure landfill in southern New Jersey. Our services included network design, installation and all phases of operation, maintenance, data reduction, data reporting and quality assurance associated with the project.

For **Bechtel Power Corporation and/or U.S. Generating Company**, we conducted four multi-year PSD monitoring programs between 1989 and 1996 in the vicinity of Deepwater, NJ. These networks consisted of one to three sites monitoring SO₂, NO_x, PM₁₀, and meteorological data. TECO analyzers comprised the SO₂ and NO_x monitoring instrumentation with Climatronics Corp. instrumentation installed on the meteorological towers. The monitoring programs were performed in support of air permit requirements for new cogeneration facilities. All network design, siting, installation, operation, maintenance, data reduction, data reporting and quality assurance was performed by our staff.

New York

For **Orange and Rockland Utilities**, we operated a meteorological and air quality monitoring network for the Bowline Point Power Plant from 1982 through 1986. The meteorological monitoring system consisted of one 100-meter tower, instrumented with Climatronics Corp. instrumentation at three levels. The data from this tower were used as backup for the Consolidated Edison meteorological monitoring system at the Indian Point nuclear power plant. Three monitoring sites for sulfur dioxide (SO₂), using TECO 43 pulsed fluorescent SO₂ monitors, made up the air-quality monitoring network. We installed real-time computer equipment to replace previously used equipment. This data acquisition system was available for interrogation by Con Edison, Orange and Rockland, and the New York State Department of Environmental Conservation (DEC). We conducted all phases of operation, maintenance, quality assurance, data processing, and report preparation.

In another project for **Orange and Rockland Utilities**, we installed and conducted one of the largest air-quality and meteorological monitoring programs ever conducted for an electric power plant in support of the Lovett Generating Station coal reconversion project. This network included five meteorological towers and 12 SO₂ monitoring sites located throughout a state park, in complex terrain. We were responsible for the design, installation, and all phases of the operation, maintenance, quality assurance, data processing, and report preparation. All data was collected using our AIRDAS computer system that provided continuous real-time data transmission to the New York State DEC. We were also responsible for designing and implementing the computer software and communication protocols used by the New York State DEC to obtain data from this monitoring network.

For **Central Hudson Gas and Electric**, we currently operate and maintain a PSD air quality and meteorological network in support of the Roseton Generating Station. This network has been operated by our staff since 1987 and includes six SO₂ stations and one meteorological station with a 100 meter

tower equipped with Climatronics Corp. instrumentation. All operation, maintenance, data reduction, data reporting and quality assurance activities, including a quarterly audit program, are included in this contract.

Ohio

For **PPG Industries'** Barberton Chemical Plant, we operated a seven-station SO₂ monitoring network and 100-meter meteorological tower instrumented at multiple levels in strict accordance with PSD requirements. Our responsibilities included design, installation, operation and maintenance, quality assurance and data reduction and reporting. The data from this network was used in a U.S. EPA authorized air quality model validation study and site-specific model development program conducted by us .

Also for **PPG Industries**, we installed and are currently operating a long-term PSD monitoring program in support of a hazardous waste incinerator. This network began operation in 1986 and has included monitoring for SO₂, NO_x, NMHC, TSP, various meteorological parameters, ambient VOC measurements, and heavy metals analysis. TECO analyzers comprised the SO₂ and NO_x instrumentation, with meteorological parameters being measured with Climatronics Corp. instrumentation. The network currently monitors meteorological parameters. We conduct all phases of operation, maintenance, quality assurance, data processing, and report preparation.

For the **Cincinnati Gas & Electric Company**, we provided ambient air-quality and meteorological monitoring program support services to the Beckjord, Miami Fort, and East Bend plants where we were responsible for the supply, installation, operation, maintenance, data processing, and quality assurance of the monitoring programs for these plants in Ohio and Kentucky. In 1984, we installed and operated a PSD monitoring program to support the conversion of the W.H. Zimmer nuclear plant to a coal-fired facility. This is the first plant in the United States to undertake such a conversion. The American Electric Power Company, the Dayton Power and Light Company, and Columbus & Southern Ohio Electric Company are co-owners of this facility.

For **Cleveland Electric Illuminating Co.**, Avon Lake, Eastlake, Ashtabula, and Lake Shore plants, we supplied, installed, and provided full service support for a continuous air pollution and meteorological monitoring program that has included 30 continuous SO₂ monitors, and two 100- and three 10-meter towers on which 26 meteorological parameters were monitored. Continuous air quality parameters were collected using TECO analyzers with all meteorological parameters collected using Climatronics Corp. instrumentation. Included in this program were four monostatic acoustic

radar units and two doppler radar units. We were responsible for overall monitoring program supervision, operation and maintenance, administration of the quality assurance program, and analysis of all data from the monitoring network.

Pennsylvania

For **Foster Wheeler Power Systems, Inc.**, Livingston, NJ, we conducted a one-site SO₂ and NO₂ background PSD monitoring program near Scranton, PA. We prepared the monitoring plan for submittal to the PA Department of Environmental Resources (DER), leased and installed the monitoring equipment, and operated and maintained the network for the contract period. Operations included data processing, reporting to the Pennsylvania DER, and quality assurance.

Puerto Rico

For **Caribbean Petroleum Corporation**, we operated and maintained a PSD air quality and meteorological monitoring network in support of the CPC refinery in Bayamon, Puerto Rico. We installed three stations which monitor SO₂ and one station equipped with Climatronics instrumentation on a 30 meter meteorological tower. The tower measures wind speed, wind direction and sigma theta at two levels and also ambient temperature. All operation, maintenance, data reduction, data reporting and quality assurance activities, including a quarterly audit program, were conducted by us.

Texas

For **City Public Service Board of San Antonio**, we operated and maintained an air-quality PSD monitoring network at the Bastrop Plant, San Antonio, TX, from 1981 to 1987. The monitoring plan for this program was designed by us and approved by the Texas Air Control Board. The network consisted of a 61-meter tower with meteorological instruments at the 10- and 61-meter levels. Thirteen parameters were measured, including horizontal wind speed, horizontal wind direction, barometric pressure, temperature, dew point, precipitation and visibility.

For **Texas Air Control Board**, we provided quality assurance audits on existing meteorological systems at twelve ambient monitoring stations in Regions 7 and 10, followed by design, installation and calibration of new replacement meteorological monitoring systems. The entire scope of work was completed in one month, at the emergency request of TACB for the 1993 COAST monitoring project.

For **Key Laboratories**, we designed the network and installed hi-volume samplers at two site locations for the Dallas Independent School District. The scope of work also included operation, maintenance, quality assurance and

data reporting. Parameters reported were total suspended particulates and lead.

Virginia

For **MeadWestvaco**, Enviroplan Consulting operates a four station monitoring network. The parameters monitored include meteorology, SO₂, H₂S, TSP and PM₁₀.

For **United Engineers and Constructors (UEC)**, we designed, supplied and conducted a single-station background PSD monitoring program near Sutherland, VA. The parameters monitored included O₃, SO₂, NO_x, TSP and PM₁₀, with a 100 meter meteorological tower consisting of 11 channels. Ozone was monitored using a TECO 49 analyzer while SO₂ was monitored using a TECO 43A analyzer. The 100 meter meteorological tower was equipped with Climatronics Corp. instrumentation at two levels. All quality assurance activities, including an independent quarterly audit program, were included in this contract.

West Virginia

For **Weirton Steel Company**, we conducted semi-annual meteorological performance and systems audits and provided technical support for a 10 meter meteorological monitoring system. The tower was equipped to measure wind speed, wind direction, temperature, humidity, barometric pressure, and precipitation.

Wisconsin

For **Wisconsin Power & Light**, we conducted a long-term PSD air pollution and meteorological monitoring program in support of the Edgewater Plant in Sheboygan, Wisconsin. This program, which began in 1976 and concluded in 1991, included the continuous measurement of SO₂ at five site locations with data telemetered to our centralized data collection and processing facility. Nitrogen oxides, ozone, non-methane hydrocarbons, and TSP concentrations were also measured. Surface and upper-air meteorological observations were made at two 330-foot meteorological towers, one at lakefront and another several kilometers inland. Horizontal wind direction, wind speed, standard deviations of wind direction, and temperature were measured at upper and lower levels on each tower. In addition, the vertical temperature structure of the atmosphere was measured by means of on-site acoustic radar and a radiosonde program. The meteorological monitoring program was specifically designed to measure incidents of lake breeze-induced fumigation of the power plant plume.

OVERSEAS AMBIENT MONITORING PROGRAMS

Africa For **BHP-Minerals**, we designed, installed and provided semi-annual audits, data analysis and reporting for meteorological and air quality monitoring stations located in Mali and Zimbabwe. These programs were operated to meet World Bank environmental impact assessment requirements in conjunction with newly-developed mining and ore roasting facilities. Parameters monitored include SO₂, wind speed, wind direction, temperature, relative humidity, net radiation and precipitation. We provided complete training for monitoring station operation to BHP's local personnel, augmented by a cost-effective technical support program in conjunction with these monitoring projects.

Israel For **Ashkelon Regional Association of Towns for Environmental Quality**, we designed and installed a seven station air quality monitoring network with PC-based data acquisition systems in Ashkelon, Israel. We also conducted a training program for the local network technicians on the proper operation and maintenance of the instrumentation. Parameters installed included: SO₂, O₃, CO, NO_x, Total Hydrocarbon, TSP, PM₁₀, wind speed, wind direction, temperature, relative humidity, solar radiation and barometric pressure.

EXPERIENCE IN AMBIENT AIR QUALITY MONITORING PROGRAMS INVOLVING TOXIC AIR POLLUTANTS AND VOLATILE ORGANIC COMPOUNDS

Descriptions of selected ambient air quality and source emissions monitoring programs involving toxic air pollutants and VOC's follow.

DuPont Company We designed, installed and operated a four-station PSD air quality and meteorological monitoring network with measurements for SO₂, NO_x, TSP., PM₁₀, wind speed, wind direction, air temperature, as well as over 100 toxic air pollutants, including speciated volatile and semi-volatile organics, dioxins, furans, organic matter and heavy metals collected on various sample media. This monitoring program, which operated from April 1992 to April 1993, was in support of a permit to construct a new rotary kiln incinerator and secure landfill in southern New Jersey. The monitoring program included all phases of operation, maintenance, data reduction, data reporting and quality assurance associated with air quality monitoring.

PPG Industries We installed and are currently operating a long-term PSD monitoring program in support of a hazardous waste incinerator. This network began operation in 1986 and has included monitoring for SO₂, NO_x, NMHC, TSP, various meteorological parameters, ambient VOC measurements, heavy metals analysis and speciated VOC and air toxics compounds. The air toxics monitored for this project included acetone, MEK, toluene, ethyl benzene, isobutanol, MIBK, 2-ethoxyethyl acetate, 2-butoxyethanol and n-butanol. TECO analyzers comprised the SO₂ and NO_x instrumentation and meteorological parameters were measured with Climatronics Corp. instrumentation. We conduct all phases of operation, maintenance, quality assurance, data processing, and report preparation.

**General Electric
Aircraft Engines** We supplied Summa canister sampling equipment, laboratory analysis and reported results in support of FAA certification for a new jet engine. Sample analysis was performed using U.S. EPA Compendium Method TO-14 for over 40 different organic compounds.

**Ames Rubber
Corporation** We conducted volatile organic and carbon monoxide compliance testing. Sample analysis was conducted on-site using multiple gas chromatographs under observation by state regulatory representatives.

**Confidential
Industrial Clients**

We conducted VOC sampling project utilizing two on-site portable gas chromatographs.

We conducted area source sampling for combustible gas emissions.

We developed and implemented a sampling technique to measure volatile organics from a batch process operation from a reactor vessel utilizing an on-site portable gas chromatograph. A correlation was developed between process parameters and pollutant emission rates.

We completed a sampling project located at a landfill site. Sampling methodology included sorbent tubes and low flow calibrated sampling pumps. Analysis methodologies utilized gas chromatography and mass spectroscopy.

Hercules

We conducted extensive VOC sampling preliminary to planned plant modifications. Services included analyses for recommended placement of gas sensors to detect unintentional releases of ethylene oxide and propylene oxide.

Mead Corporation

We conducted a VOC sampling project on a toluene recovery system.

**CIBA-GEIGY
Corporation**

We conducted emission testing at the Toms River Plant for methanol.

GAF Corporation

We conducted dioxane sampling utilizing a portable gas chromatography analyzer.

**ITT Avionics
Division**

We conducted a VOC testing program at four plant locations.

Unifoil

We conducted sorbent tube sampling of two exhaust vents on an oven for MEK and toluene

Permacel

We conducted toluene emission testing and sampling from facility Units 4 and 5.

Ohaus Scale Corp.

We conducted emission testing at the Florham Park facility for THC, VOC, O₂, CO and CO₂.

Breed Corporation

We conducted indoor air sampling for worker exposure to VOCs.

Morton Thiokol

We conducted a pilot study to estimate releases of xylene from the Red B Dye process. Also performed equipment leak testing using U.S. EPA Method 21.

**Manner Textile
Processing**

We conducted TVOC sampling at two locations.

**ENVIROPLAN CONSULTING'S EXPERTISE
WITH AIR MONITORING INSTRUMENTS**

Enviroplan Consulting's Air Quality Monitoring Division is experienced in operating and servicing a wide variety of leading manufacturers' air quality and meteorological monitoring instruments. Our expertise in this area extends to the following categories of instruments and product lines:

1. Manufacturers of Continuous Gas Analyzers, Dilution Calibrators, Permeation Calibrators and Clean Air Supplies:

Thermo Environmental Instruments (TECO)	Monitor Labs
Columbia Scientific Industries (CSI)	Vici-Metronics
Dasibi	Teledyne-Advanced Pollution
Byron	Instruments

2. Manufacturers of Air Quality Sampling Systems and Instruments

Graseby-Anderson	Amatek
General Metal Works	Staplex
Wedding and Associates	SKC

3. Manufacturers of Meteorological Monitoring Systems and Instruments

Climatronics Corp.	Teledyne-Geotech
R. M. Young	Setra
Met One	Eppley
Climet	Aerovironment

4. Manufacturers of Digital Data Acquisition Systems and Chart Recorders:

Environmental Systems Corp. (ESC)	Hewlett-Packard
Odessa Engineering	Esterline-Angus
Environmental Monitoring Co. (EMC)	Leeds and Northrup
SumX Corp.	Chessell

5. Manufacturers of Test Instruments for Calibrating and Maintaining Monitoring Instrumentation

Fluke	Data Precision
MKS	Hewlett Packard
Teledyne Hastings-Raydist	BGI
Unit	Datel
Waters BK Precision	
Brooklyn Thermometer	Tektronix

SECTION 4: CAPABILITIES AND EXPERIENCE OF KEY PERSONNEL

Following are resumes of Enviroplan Consulting key personnel in our environmental consulting and air quality and meteorological monitoring businesses. Table 4-1 presents a summary of the capabilities and experience of our professional staff.

Howard M. Ellis, D.B.A., QEP, President

Environmental Studies Division

Allen C. Dittenhoefer, Ph.D., Senior Vice President

Michael F. Hirtler, CCM, Vice President

John Bewick, D.B.A.

Chin Chiu

Edd Frazier, P.E.

Stephen Greene

Boyd Hurst, P.E.

James Mahoney, Ph.D.

Linda M. Quigley

Julia Shannon, E.I.T.

Dan Steen, Esq., P.E.

Ganesh Srinivasan, EI

Tanya White

Charles Zarzecki

Air Quality Monitoring Division

David Cummings, Vice President

Thomas Ferrebee, Quality Assurance Manager

Kevin Ruggiero, Senior Monitoring Engineer

Kathleen M. Stanwood, Data Analysis and Reporting Manager

Ron Baldwin, Wind Energy Services

David Arbanes

Wayne Biro

Thomas W. Surfus

Table 4-1: Enviroplan Consulting Key Personnel (7/2/09)							
Name	Position	Years Exper. in Air Pollution Field	Education	States with Experience	Areas of Expertise	Registrations and Licenses	Office Location
Environmental Studies Division							
Ron Baldwin	Business Development Director, Wind Energy Services	12	B.A.S. Nuclear Technology; A.A.S. Radiation Protection Technology	Throughout the U.S.	Business development of wind operations and development.		Council Bluffs, IA
John Bewick	Senior Engineer	36	B.S. Engineering Physics; M.S. Nuclear Science, M.B.A., D.B.A.	CN, MA, RI	Development of environmental management processes and systems, environmental assessments and audits, greenhouse gas emissions inventory development.		Hingham, MA
Chin Chiu	Project Engineer	30		MA, NY, NJ, DE, MD, VA, PA, WV, OH, IN, MI, IL, KY, TN, TX, CO, FL, GA, MO, WI	Air quality modeling, database management, computer system design and implementation, applications software for air quality and meteorological monitoring.		Fairfield, NJ
Allen Dittenhoef	Senior Vice President and Project Manager	28	B.S., M.S. and Ph.D. Meteorology	AL, CA, CO, DE, FL, GA, IL, IN, IA, KY, LA, MD, MA, MI, MO, NJ, NY, NC, OH, PA, SC, TN, TX, VA, WV, WI	New source review including PSD permitting, air quality modeling, air pollution control technology evaluations, other air quality permitting, emissions estimation, environmental management systems, risk management plans, regulatory analyses for applicability determinations, complaint response to material damage from air pollution, greenhouse gas emissions inventory development.		Birmingham, AL
Howard Ellis	President and Project Manager	36	B.S. Electrical Engineering; M.B.A., D.B.A., Post Graduate Courses Meteorology	MA, NY, NJ, DE, MD, VA, PA, WV, OH, IN, MI, IL, KY, TN, TX, CO, FL, GA, MO, WI	New source review including PSD permitting, air quality modeling, air pollution control technology evaluations, other air quality permitting, emissions estimation, environmental management systems, risk management plans, regulatory analyses for applicability determinations, complaint response to material damage from air pollution, greenhouse gas emissions inventory development.	Qualified Environmental Professional	Fairfield, NJ
Edd Frazier	Manager	31	M.S. Mechanical Engineering; B.S. Mechanical Engineering	KY	Air quality permit application review for completeness and technical accuracy, emissions estimation, regulatory reviews and compliance assessments, BACT analyses, NSPS, NESHAP and Title V permit preparation. Management of above permitting activities.	Professional Engineer	Louisville, KY
Julia Handley	Engineer	2	B.S. Chemical Engineering	IN, AK	Air quality permit application review for completeness and technical accuracy, emissions estimation, regulatory reviews and compliance assessments, BACT analyses, NSPS, NESHAP and Title V permit preparation.	Engineer in Training	Fairfield, NJ
Michael Hirtler	Vice President and Project Manager	23	B.S. Meteorology; Graduate Courses Atmospheric Science	NJ, NY, PA, OH, DE, IN, IL, WV, AL	New source review including PSD permitting, air quality modeling, long range transport modeling in PSD Class I areas, fugitive emissions impact analyses, complex terrain modeling, hazardous air pollutant modeling Title V and state air permitting.	Certified Consulting Meteorologist	Fairfield, NJ

Name	Position	Years Exper. in Air Pollution Field	Education	States with Experience	Areas of Expertise	Registrations and Licenses	Office Location
Environmental Studies Division (continued)							
Boyd Hurst	Manager	28	M.S. Mechanical Engineering; B.S. Mechanical Engineering	Throughout the U.S.	Emissions estimation, applicability determinations and control technology evaluations for air pollution permits at 29 Exxon Mobil oil refineries and chemical plants.	Professional Engineer	Louisville, KY
Kenneth Jaffe	Senior Wind Energy Manager	>25	M.S. Atmospheric Sciences; B.S. Atmospheric Sciences	Throughout the U.S.	Senior wind energy manager with >25 years of professional experience. Expertise in wind analysis, energy assessment, project and team management, weather forecasting, wind farm design, operational testing/evaluation, meteorological monitoring, and business development.		Austin, TX
James Mahoney	Senior Scientist	40	B.S. Physics; Ph.D. Meteorology	Throughout the U.S.	Global climate change; acid precipitation, insurance recovery for environmental damages; technical analyses of regional air quality and haze patterns, environmental compliance, planning and engineering.		Ashburn, VA
Linda Quigley	Staff Scientist	13	B.A., Geography and Environmental Studies	IN and AK	Air quality permit application review for completeness and technical accuracy, emissions estimation, regulatory reviews and compliance assessments, BACT analyses, NSPS, NESHAP and Title V permit preparation. Data analysis and reporting and quality assurance for air quality and meteorological monitoring networks.		Fairfield, NJ
Daniel Steen	Senior Principal	43	B.S. Electrical Engineering; Juris Doctorate	Throughout the U.S.	Senior Principal at Enviroplan Consulting where his primary focus is consultation on planning and design of compliance options for GHG emission limitations. Following his retirement in 2009 as V.P., Environmental of FirstEnergy Corporation.	Professional Engineer; Licensed Attorney	Ohio
Ganesh Srinivasan	Engineer	5	M.S. Civil & Environmental Engineering; B.E. Instrumentation and Control	FL, OH, IN, IL	CAMX modeling for Model Attainment Demonstrations for the 8-hour ozone SIP. Emissions inventory and air quality modeling input data preparation and verification. Air quality permit application review for completeness and technical accuracy, emissions estimation, regulatory reviews and compliance assessments, BACT analyses, NSPS, NESHAP and Title V permit preparation.		Indianapolis, IN
Tanya White	Scientist	4.5	B.S., Environmental Science and Physical Geography	KY, IN, AK, SC, MD, NJ, NY, OH	Air quality permit application review for completeness and technical accuracy, emissions estimation, regulatory reviews and compliance assessments, BACT analyses, NSPS, NESHAP and Title V permit preparation.		Newfoundland, Canada

Name	Position	Years Exper. in Air Pollution Field	Education	States with Experience	Areas of Expertise	Registrations and Licenses	Office Location
Air Quality and Meteorological Monitoring Division							
David Arbanes	Monitoring Technician	2	Certificate-Electronics Technology	IN	Operation and maintenance of air pollution and meteorological monitoring networks.		Wheatfield, IN
Wayne Biro	Monitoring Engineer	3	Certifications, U.S. Navy Electronics Schools	DE	Operation and maintenance of air pollution and meteorological monitoring networks.		Bear, DE
Dave Cummings	Vice President and Project Manager	23	Associates of Applied Science, Electronics	AL, DE, FL, GA, IL, IN, MA, ME, NH, NJ, NY, OH, PA, PR, TX, VA, WI, WV	Management of air quality and meteorological monitoring operations, preparation of Quality Control Plans for monitoring, auditing of monitoring operations, air quality data analysis .		Fairfield, NJ
Thomas Ferrebee	Manager	13	B.S. Electronic Engineering Technology	GA, IN, VA, NY, DE, OH, AL	Air quality and meteorological monitoring operations, auditing of monitoring operations, air quality data analysis, training in operation of monitoring instrumentation.		Fairfield, NJ
Brian Hambrick	Monitoring Technician	7	B.S.	VA, IN	Air quality and meteorological monitoring operation and maintenance and quality control.		Covington, VA
Josh Miller	Monitoring Technician	2	B.A.S.	IN	Air quality and meteorological monitoring operation and maintenance and quality control.		Churubusco, IN
Justin Stinson	Monitoring Technician	1	A.A.S. Electronics Engineering	IN	Air quality and meteorological monitoring operation and maintenance and quality control.		Columbia City, IN
Renee Simms	Monitoring Technician	2	B.S. Microbiology	LA	Air quality and meteorological monitoring operation and maintenance and quality control.		Baton Rouge, LA
Kathy Stanwood	Manager	28	B.S. Biology; M.A. Environmental Studies	AL, DE, FL, GA, IN, MA, ME, MI, NH, NJ, NY, OH, PA, PR, RI, TX, VA, WI, WV	All phases of air quality data analysis and reporting in support of air quality and meteorological monitoring.		Fairfield, NJ
Tom Surfus	Monitoring Engineer	25	A.A.S. Electronics Engineering	MA, NY, NJ, DE, MD, VA, PA, OH, IN, MI, IL, KY, TN, CO, FL, GA, MO, WI	Air quality and meteorological monitoring operation and maintenance and quality control.		Avon, IN
Kevin Ruggiero	Monitoring Engineer	1	B.S. Business Management	NJ, PA, OH, IN, DE, VA, AL, TX	Operation and maintenance of meteorological monitoring networks. Meteorological data review and quality control. Auditing of meteorological monitoring networks. Supervision and technical support for field personnel.		Fairfield, NJ

HOWARD M. ELLIS, D.B.A., QEP

AREAS OF SPECIALIZATION

President of Enviroplan Consulting. 39 years of experience in air quality modeling, air pollution emissions inventory development, air pollution compliance strategies, air pollution permitting, air quality and meteorological monitoring, and development of risk management plans and environmental management systems.

EXPERIENCE

Project Manager and Co-Principal Investigator on numerous projects on behalf of electric power companies for development of State Implementation Plan revisions for demonstrating attainment of the National Ambient Air Quality Standards for ozone and PM_{2.5}, Reasonable Progress Goals for Regional Haze in PSD Class I Areas.

Project Manager and Principal Investigator for BART Determination studies for coal and oil-fired power plants. Work involved conducting the 5-Step process specified in Appendix Y to Part 51—Guidelines for BART Determinations Under the Regional Haze Rule.

Project Manager and Principal Investigator for the American National Standards Institute on development of an accreditation program for validation and verification bodies of GHG emissions. Work involved designing and conducting a survey of major stakeholders in the U.S. relating to GHGs, a review and development of suggested guidance for implementation of applicable GHG standards developed by the International Organization for Standardization, and assisting in development of agreements with GHG programs in the U.S to accept ANSI accreditation for GHG validation and verification bodies.

Project Manager and Co-Principal Investigator on numerous projects for development of State Implementation Plan revisions for demonstrating attainment of the National Ambient Air Quality Standards for ozone and PM_{2.5} and Reasonable Progress Goals for Regional Haze in PSD Class I Areas including projects in the Chicago-Milwaukee-Racine, Cleveland and Birmingham AL Nonattainment Areas.

Project Manager and Principal Investigator on numerous Prevention of Significant Deterioration studies to obtain construction permits for new simple cycle and combined cycle combustion turbines and coal-fired power plants. Work involved directing and conducting project planning assistance to identify potential pitfalls associated with the project; development of emission inventories and emissions netting analyses to determine applicability for the major source PSD pre-construction permitting requirements; control technology evaluations to determine Federal BACT and LAER, as well as state control technology requirements; air quality screening modeling and refined modeling for those pollutants subject to PSD review or state modeling requirements including determining impacts in PSD Class I areas to satisfy Federal Land

Manager requirements; liaison with the regulatory agencies responsible for issuing the air quality permits; and related permitting assistance.

Project Manager and Principal Investigator on many projects dealing with air pollution emissions inventory development for a large cross section of industrial sources and electric power generating units.

Consultant on atmospheric diffusion modeling to more than 50 electric utility and industrial companies, the U.S. EPA, the Army Corps of Engineers, and several state and local governments for existing and proposed new facilities.

Consultant responsible for developing environmental management systems consistent with the ISO 14001 standards for environmental management systems. Principal investigator in developing environmental management systems at four facilities. Completed training course for certification as auditor of environmental management systems for compliance with the ISO 14001 standard.

Served as Chairman of the ISO 14000 Intercommittee Task Force of the Air and Waste Management Association responsible for the training and dissemination of information on ISO 14000 to the largest professional association in North America devoted to air pollution and waste management with over 16,000 members.

Served as Chairman of the Meteorology Committee of the Air and Waste Management Association (AWMA). Organized and directed an evaluation of the U.S. EPA proposed revisions to the Guideline on Air Quality Models that was conducted by the AWMA Meteorology Committee. Coordinated the committee's review of the Guideline, prepared the final committee position statement, and organized and chaired the committee presentation and panel discussion at the U.S. EPA Modeling Conference to discuss the Guideline.

Served as Chairman of the Meteorology and Modeling Committee of the Technical Advisory Committee to the Allegheny County (Pennsylvania) Department of Health on the development of new air pollution regulations for that county.

Private industry projects have included diffusion modeling studies and associated analyses to aid in developing air pollution regulations for existing power generation facilities within a number of states including Delaware, Colorado, Florida, Illinois, Indiana, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin.

Participated in particulate deposition monitoring and particle identification and attribution program for coal fired power generation facility.

Directed large scale field studies and research programs to quantify the most extreme vertical dispersion rates governing plume dispersion based on remote plume sensing data and air quality and meteorological monitoring data. He has developed models for plume transport in complex

terrain based on aerial tracer studies. He has also participated in the development of models for treating building-effect downwash and fumigation due to gradient onshore flows from water bodies. He has served as a consultant to various electric utilities on studying the variability in SO₂ emission rates from coal-fired power plants and on developing proposed compliance methods for SO₂ emission limits.

Directed a study for the Chemical Manufacturers Association (now American Chemistry Council) on analysis of data from bagging of equipment leaks for more than 20 chemical plants to develop more accurate procedures for estimating fugitive emissions from equipment leaks.

Testified at numerous public hearings and administrative proceedings representing clients as an expert witness on air quality modeling, PSD permitting and all aspects of compliance with air pollution regulations.

Responsible for developing risk management plans and the five year updates to these plans to satisfy requirements under Section 112(r) of the 1990 Clean Air Act Amendments including hazard assessments, emergency response program development and prevention programs.

Responsible for administrative oversight and general management of contracts for state and local air pollution control agencies including those in the states of New Jersey, Pennsylvania, Indiana, Kentucky and Alaska to prepare air pollution construction permits and operating permits for large cross sections of industry.

Project manager for contract with state air pollution control agency in the Southeast to operate the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; 29 PM_{2.5} monitors; and 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Work involved full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits.

Consultant to the Massachusetts State Highway Department as expert witness on air pollution emissions estimation and air quality modeling in litigation involving the Central Artery highway project -- the largest current public transportation project in the U.S.

Consultant to The Port Authority of New York and New Jersey on air pollution emissions estimation, air quality modeling and transportation consistency determinations required under the Clean Air Act for new transportation project. Work has included the JFK Airport Light Rail Access System and the redesign of Jamaica Station.

Consultant to various state transportation agencies to estimate emissions and predict air quality impacts using various emissions and air quality models.

Senior Reviewer for the design, supply and operation of PSD and other air quality and meteorological monitoring networks.

Consultant on development of Compliance Assurance Monitoring plans to satisfy Title V operating permit requirements.

Consultant on community right-to-know reporting of toxic chemical releases as required under Section 313 of the Superfund Amendments and Reauthorization Act Title III. Designed release estimation procedures and conducted seminars for chemical company personnel on these procedures.

Consultant on designing programs for equipment leak testing and mass emissions sampling from equipment components. Participated in EPA and Chemical Manufacturers Association meetings on developing protocols for equipment leak testing. Organized technical sessions and conferences at which equipment leak testing procedures and results were presented.

PUBLICATIONS

Ellis, H.M., "U.S. EPA's New NAAQS and Implementation Rules, Their Impact on Electric Power Companies and Suggestions for How to Respond", Presented at the Energy and Environment Conference, Phoenix, AZ, February 2-4, 2011.

Ellis, H.M., Pan, S., Pinto, A.A, Shannon (Handley), J.C., and White, T.L. (2009) "Summary of State Activities Including Control Strategies and Modeling Plans to Attain the New 24-Hour PM2.5 NAAQS". Presented at the EUEC Energy and Environment Conference, Phoenix, AZ, February 2-4, 2009.

Ellis, H.M., Manousos, P., Pan, S., and White, T.L. (2009) "Electric Power Company Strategy for Attaining the 24-Hour PM2.5 NAAQS by using the U.S. EPA Exceptional Events Rule". Presented at the EUEC Energy and Environment Conference, Phoenix, AZ, February 2-4, 2009.

Ellis, H.M., Handley, J.C., Pinto, A.A., White, T.L. (2007) "Changes in State and Local Air Pollution Compliance Practices Due to Increased Title V and Other Permit Recordkeeping and Reporting Requirements". Presented at the Air & Waste Management Association 100th Annual Meeting, Pittsburgh, PA, June 22-24, 2007.

Ellis, H.M., Yousuf, A.A., Bent, A., Roy, Seema, Thotakura, R., Ogunsola, F. (2004) "Projected PM2.5 Attainment Status of Each County in the U.S. and Strategies for Dealing with Nonattainment Designations and With the Proposed Interstate Air Quality Rule". Presented at the Air & Waste Management Association 97th Meeting, Indianapolis, IN, June 22-24, 2004.

Ellis, H.M., Thotakura, R., Pan, S., Hirtler, M. (2004) "Permitting Practices, Resources and Performance of State Air Pollution Control Agencies". Presented at the Air & Waste Management Association 97th Annual Meeting, Indianapolis, IN, June 22-24, 2004.

Yousuf, A.A., Hydari, N.H., Earls, P.A., Ellis, H.M. (2003) "Second Annual Survey of the Most Recent BACT/LAER Determinations for Combustion Turbines by State Air Pollution Control

Agencies”. Presented at the Air & Waste Management Association 96th Annual Meeting, San Diego, CA, June 22-26, 2003.

Dittenhoefer, A.C., Ellis, H.M., Yousuf, A.A., Hydari, N.H., Bent, A. and Roy, S. (2003) “Projected Attainment Status of Each County in the U.S. with the PM_{2.5} National Ambient Air Quality Standards Based on 1999-2001 Monitoring Data and Strategies for Dealing with Nonattainment Designations”. Presented at the Air & Waste Management Association 96th Annual Meeting, San Diego, CA, June 22-26, 2003.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2002) “New Developments Impacting Air Pollution Construction Permitting for New Combustion Turbines”, EM Magazine, July 2002.

Ellis, H.M., and Lippincott, B. (2002) “Survey of the Difficulty of Obtaining Environmental Permits for the Construction and Operation of New Power Generation Capacity in 28 States”. Presented at the Air & Waste Management Association 95th Annual Meeting, Baltimore, MD, June 24-28, 2002.

Hydari, N.H., Yousuf, A.A. and Ellis, H.M. (2002) “Comparison of the Most Recent BACT/LAER Determinations for Combustion Turbines by State Air Pollution Control Agencies”. Presented at the Air & Waste Management Association 95th Annual Meeting, Baltimore, MD, June 24-28, 2002.

Ellis, H.M., Hydari, N.H., Yousuf, A.A. and Bent, A. (2002) “Projected PM_{2.5} Attainment Status of Each County in the U.S. Based on 1999-2000 Monitoring Results and Projected Impact on Existing and Proposed New Electric Power Generation Facilities”. Presented at the U.S. Dept. of Energy National Energy Technology Laboratory Conference “PM_{2.5} and Electric Power Generation: Recent Findings and Implications”, Pittsburgh, PA, April 9-10, 2002.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2001) “Impact of New Regulatory and Technological Developments on Obtaining Air Pollution Construction Permits for New Combustion Turbines for Electric Power Generation and Strategies for Dealing with These Developments”. Presented at the Air & Waste Management Association 94th Annual Meeting, Orlando, Florida, June 24-28, 2001.

Ellis, H.M. and Ritz, P. (2001) “Bench Marking Survey of State Air Pollution Control Agencies on the Resources Required to Conduct Air Quality Monitoring Programs”. Presented at the Air & Waste Management Association 94th Annual Meeting, Orlando, Florida, June 24-28, 2001.

Ellis, H.M., Dittenhoefer, A.C. and Fridley, W. (1998). “Developing Environmental Management Systems Based on ISO 14000 Principles for Companies in the Metals Industries: Why and How”. Presented at Air & Waste Management Association Specialty Conference on Environmental Innovations in the Metals Industry”, Pittsburgh, PA, March 1998.

Ellis, H. M., Plante, V., Arruda, C. (1995) “Successful Service Support Strategies for 40CFR75 CEM Systems”, Presented at Air & Waste Management Association International Conference:

Continuous Compliance Monitoring Under the Clean Air Act Amendments, Chicago, IL, October 25-27, 1995.

Ellis, H. M. (1997) "The Compliance Assurance Monitoring Rule: A Summary", Environmental Manager, November, 1997.

Ellis, H.M., and Lackaye, R. (1989) "Estimating Fugitive Emissions of Volatile Compounds from Equipment Leaks", JAPCA, Vol. 39, No. 12, December 1989.

Ellis, H.M., Logan, M., and Chiu, C. and Tufts, S.A., PPG Industries (1984) "Investigation of Plume Dispersion Using Lidar Plume Measurements." Presented at 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 1984.

Ellis, H.M., Greenway, A.R., and Duplak, E., (1982) "Summary of the Federal Emissions Trading Policy Statement." Journal of the Air Pollution Association, August 1982.

Ellis, H.M. (1982) "Evaluation of Prediction Models for the Avon Lake Power Plant Under Unstable Meteorological Conditions". Third Joint Conference on Applications of Air Pollution Meteorology, January 12-15, 1982, San Antonio, Texas. Published by the American Meteorological Society, Boston, Massachusetts.

Ellis, H.M. and Liu, P.C. (1981) "Review of the Performance of the RAM Model in Predicting Highest Measured Concentrations." Journal of the Air Pollution Control Association, Vol. 31, No. 2, February 1981, pp 148-152.

Ellis, H.M. and Greenway, A.R. (1981) "The Prevention of Significant Deterioration of Air Quality - Summary of the Final Federal Regulation," Journal of the Air Pollution Control Association, Vol. 31, No. 2, February 1981, pp 136-138.

Ellis, H.M. and Liu, P.C., Enviroplan, Inc., and Runyon, C., Ohio Edison Co. (1980) "Comparison of Predicted and Measured Concentrations for 58 Alternative Models of Plume Transport in Complex Terrain," 72nd Annual Meeting of the Air Pollution Control Association, Cincinnati, Ohio, June 1980.

Ellis, H.M., Liu, P.C., and Dalzell, G. (1980) "Comparison Study of Measured and Predicted Concentrations with the RAM Model at Two Power Plants Along Lake Erie," Second Joint Conference on Applications of Air Pollution Meteorology, New Orleans, Louisiana, March 24-27, 1980.

Ellis, H.M. and Liu, P.C. (1980) "Discussion - An Air Quality Performance Assessment Package," Atmospheric Environment, Vol. 14, 1980, pp 1113.

Ellis, H.M., Liu, P.C., Bittle, C.R., and Deland, R., Enviroplan, Inc., Lyons, W.A., Mesomet, Inc., and Parker, K., Wisconsin Power & Light Co. (1979) "Development and Validation of a

New Prediction Model for Treating Gaussian Dispersion, Aerodynamic Downwash, and Fumigation Due to Lakeshore Meteorology," Fourth Symposium on Turbulence, Diffusion and Air Pollution, January 15-18, 1979, Reno, Nevada.

Ellis, H.M. and Liu, P.C. (1977) "Comparison of Maximum Measured and Maximum Predicted SO₂ Concentrations with the U.S. EPA Single Source (CRSTER) Model," 70th Annual Meeting of the Air Pollution Control Association, Toronto, Ontario, Canada, June 20-24, 1977.

Ellis, H.M., Guise, D., and Liu, P.C. (1975) "Predicting SO₂ Impact from 1000-MW Power Plant," Power, July 1975.

Ellis, H.M. and Keeney, R.L. (1972) "A Rational Approach to Governmental Decisions Concerning Air Pollution," Journal of Systems Engineering, Vol. 3, No. 1, Summer 1972.

PROFESSIONAL CERTIFICATION

Qualified Environmental Professional, Certificate No.7990037, Institute of Professional Environmental Practice

EDUCATION

B.S., Electrical Engineering, Massachusetts Institute of Technology

M.B.A., Harvard Graduate School of Business Administration

D.B.A., Harvard University. Doctoral dissertation concerned with development of rational approaches to government decisions concerning air pollution.

Training course to become a certified auditor of ISO 14000 environmental management systems

AFFILIATIONS

Former Member Editorial Review Board, EM Magazine, Former Chairman, ISO 14000 Intercommittee Task Force, Air and Waste Management Association, Former Chairman, Air Toxics Source Emissions Characterization Committee, Air and Waste Management Association, Former Chairman, Critical Review Subcommittee of Publications Committee, Air and Waste Management Association, Former Chairman, Meteorology Committee, Air and Waste Management Association

ALLEN C. DITTENHOEFER, Ph.D.

AREAS OF SPECIALIZATION

Senior Vice President of the Environmental Studies Division. Dr. Dittenhoefer has over 30 years of experience as an environmental consultant in areas including air permitting, estimation of air emissions and other chemical releases from complex mobile and stationary sources, atmospheric dispersion modeling, health risk assessments, receptor modeling, atmospheric chemistry, atmospheric visibility, and multimedia environmental audits. His responsibilities include principal investigator, project management and senior review, administration of company research programs and coordination of new technical developments, regulatory negotiations, and other air pollution consulting services.

PROJECT EXPERIENCE

Dr. Dittenhoefer has managed projects relating to estimating and measuring emissions from complex source groups such as coke batteries and steel-making melt shops, storage tanks, equipment components and surface impoundments; air pollution control systems; PSD/NSR air permitting studies; plume transport and diffusion in complex terrain and lakeshore environments; dispersion model development and evaluation; PM_{2.5} and ozone chemistry and transport; air quality and precipitation chemistry trends; plume sulfur chemistry; greenhouse gas emission inventories; and coal sulfur variability. Selected project experience includes:

ABC Coke, Sloss Industries, U.S. Steel, Nucor Steel, U.S Pipe, McWane Pipe, and American Cast Iron Pipe Company in Birmingham, AL: Organization of a coalition of Birmingham industries to work with the Jefferson County Department of Health (JCDH), Alabama Department of Environmental Management (ADEM), and U.S. EPA to address attainment of ambient air quality standards and community air toxics issues. Work involved extensive regulatory agency interaction, including review of attainment demonstration modeling protocols, preparation of facility emission inventories, dispersion modeling of industrial and urban mobile source PM_{2.5} emissions, analysis of air toxics monitoring data, development of air toxics monitoring work plans, chemical mass balance receptor modeling analyses, and a health risk assessment. Studies involved the application of the AERMOD dispersion model to an inventory of PM_{2.5} emitting sources in support of facility PM_{2.5} RACT plans. The studies included the establishment of full plant emission inventories, the use of hourly emissions files that reflect actual source operating schedules, and the development of buoyancy plume height parameterizations for fugitive hot gaseous releases that would otherwise be treated as neutrally buoyant in AERMOD.

Sloss Industries, ABC Coke, and Solutia, Inc.: Project Manager for study to apply the CALPUFF Model to determine whether certain BART-eligible emission units at each of the three plants were subject to BART requirements of the *Protocol for the Application of the*

CALPUFF Model for Analyses of Best Available Retrofit Technology (BART) prepared by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS).

Steel Company: Development of risk management plan to satisfy requirements of Section 112(r) of 1990 Clean Air Act Amendments. Work included hazard assessment and development of an emergency response plan and prevention program.

Coke Industry: Review, development and application of improved/refined emissions estimation methodologies for the coke industry, including work for the American Coke and Coal Chemicals Institute and various member companies. Preparation of comments and recommendations to U.S. EPA on AP-42 emission factors and residual risk emission inventories and dispersion modeling protocols for the coke industry.

Title V Permitting: Project Manager/Senior Reviewer for numerous Title V projects for the iron/steel/coke, natural gas transmission, cogeneration, and metals processing industries. Work includes permitting strategy development, interface with regulatory agencies, comprehensive emission inventory development, regulatory applicability and compliance assessment, evaluation of alternative operating scenarios, and development of monitoring/recordkeeping protocols. Clients include ABC Coke, Walter Coke, Southern Precision Sands, Bethlehem Steel, Consolidated Natural Gas Transmission, Acme Steel, Gulf States Steel, Koppers Industries, Shenango, and Laclede Steel.

Major Steel Company: Project Manager of study to assess environmental impact of alternative opacity limits for coke oven underfire stacks. Work included a plume view-shed analysis using an atmospheric visibility model, a community health impact analysis, and coordination of activities related to aesthetic and land use impacts of increased plume opacities.

Selected Industrial Companies: Project Manager/Principal Investigator on numerous studies involving emissions inventory development and air quality modeling of multi-source regions including steel, chemical, and other industrial manufacturing complexes. Work included SARA Title III Sections 312 and 313 reporting.

Major Electric Utility: Development of an air dispersion modeling methodology to estimate the impact of wet scrubbing technology on plume fogging and icing.

Major Electric Utility: Project Manager/Principal Investigator of a study to determine and document the operating experience of electrical power generation facilities that use Selective Catalytic Reduction (SCR) for the control of NO_x emissions from gas turbines. The study involved a literature review of SCR technology and site visits to three cogeneration facilities which utilize SCR.

Chemical Manufacturers Association (CMA): Project Manager to coordinate a CMA fugitive emissions study for ethylene oxide and butadiene production facilities. The study involved review and development of a mass emissions sampling protocol for fugitive emissions from

equipment components, organization of a workshop for U.S. EPA and CMA-member companies to discuss the sampling protocol and QA/QC procedures, overseeing the collection of sampling data at 17 facilities, and data analysis and reporting.

Several Electric Power Companies: Project Manager on numerous projects involving the permitting of simple cycle and combined cycle gas turbines. Work involved PSD air quality modeling and BACT analyses, preparation of air pollutant and cooling water discharge permit application forms, on-site sound-level analyses, and analysis of proposed facility impacts on land, water, agriculture, public health, energy, transportation, historic and archaeological resources, plants and animals, aesthetic resources, etc. Work also included participation in public hearings.

Truck Stops of America: Project Manager to review existing air quality and to assess the air quality impact of a proposed expansion of a truck stop along Interstate Route 80, in Knowlton Township, NJ. The project involved application of U.S. EPA emission factors for moving and idling vehicles and appropriate air quality dispersion models. Dr. Dittenhoefer provided expert testimony on the results of the investigation.

Freeport McMoRan, Inc.: Project Manager to measure and model the particulate and gaseous (i.e., SO₂, H₂S, and VOC) emissions from multi-vent liquid sulfur storage tanks. The study involved development of a test method for particulate emissions and a technique to measure wind-induced ventilation of these tanks, as well as air quality modeling of tank emissions.

Several Electric Utilities: Project Manager for studies of coal sulfur variability and of the impact on SO₂ NAAQS attainment of alternative SO₂ emission limit compliance methods. These studies involved the simulation of short-term SO₂ emission rate variability through use of a first-order autoregressive model applied to the distributional and time series properties of observed longer-term coal sulfur data.

Ohio Edison Company: Project Manager to analyze data collected from an airborne plume tracer field study conducted downwind of the Sammis Power Plant. The objectives of the study were to compare observed plume rise to that predicted using standard formulas, to determine an empirical relationship between rising terrain and elevation of plume centerline above ground level, and to quantify the effects of hilly terrain on plume dispersion for input into a site-specific dispersion model.

Cleveland Electric Illuminating Company: Project Manager to analyze ground- and aircraft-based monitoring data collected from a field study of plume dispersion at the Avon Lake Plant. Study objectives were to study plume dispersion under conditions of lake-effect fumigation and to develop and evaluate a site-specific fumigation dispersion model for the plant.

Allegheny Power Service Corporation: Project Manager to evaluate air quality dispersion models for use at the Albright Power Station. The project involved the evaluation of five

complex terrain dispersion models using on-site and airport meteorological data, continuous emission monitoring data, and SO₂ monitoring data.

Firestone Tire & Rubber Company: Principal Investigator to analyze meteorological conditions during high measured ozone concentrations in the California North Central Coast Air Basin and to assess the influence of regional-scale transport on these ozone episodes.

Ohio Edison Company: Project Manager to develop and evaluate a receptor-oriented regional-scale simulation model. Study objectives were to 1) develop a long range transport model to simulate the transport, chemical transformation, and deposition of acid precursors and 2) evaluate this model against measured precipitation sulfate concentrations at the MAP3S site at Whiteface Mountain, NY. An analysis of Lagrangian precipitation statistics was also conducted.

National Research Council/National Oceanic and Atmospheric Administration: National Research Council Post-Doctoral research Associate at the Mauna Loa Observatory, Hawaii. The purpose of this research assignment was to monitor global baseline concentrations of atmospheric sulfate particles, quantify their impact on light scattering and precipitation chemistry, and investigate the long range transport of soil dust and anthropogenic sulfur particles from Eastern Asia to Hawaii.

New Jersey Department of Environmental Protection: Project Manager of a study to estimate the air quality and atmospheric acid deposition impact throughout southern New Jersey of a major coal-burning power plant. The study involved the application of the Enviroplan Climatological Dispersion and Deposition Model, developed by Dr. Dittenhoefer for evaluating worst-case mesoscale acid deposition impacts of point or area sources.

Ohio Electric Utility Institute: Project Manager to analyze recent sulfur wet deposition and SO₂ emissions trends in Eastern North America. The objectives of this study were to 1) investigate the relative importance of meteorological versus SO₂ emissions with respect to precipitation sulfate concentrations, 2) examine the relative importance of local versus distant SO₂ source regions on sulfate concentrations, and 3) estimate the degree of linearity between regional SO₂ emissions and sulfate wet deposition in the northeastern U.S.

The Pennsylvania State University/U.S. Department of Energy: Ph.D. Dissertation. The objectives of this research were to measure the chemical transformation of SO₂ to sulfate in a coal-fired power plant plume and to estimate the relative importance of various gaseous/aqueous phase chemical mechanisms for plume sulfate formation. The study involved sampling of the Keystone Power Plant plume in western Pennsylvania using instrumented aircraft and featured use of an innovative technique to quantitatively detect sulfate in individual particles with an electron microscope.

SELECTED PUBLICATIONS/PRESENTATIONS

Dittenhoefer, A.C. (2010) **“Population-Based Health Risk Assessment for Jefferson County, AL.”** Presented at the 2010 Annual Meeting and Technical Conference Southern Section Air & Waste Management Association, Mobile, AL, August 3-6, 2010.

Dittenhoefer, A.C. (2008) **“Condensable Particulate Matter: Challenges for Electric Power Companies Complying with PM_{2.5} Emission Standards.”** Presented at the 11th Annual EUEC Energy and Environment Conference, Tucson, AZ, January 28-30, 2008.

Dittenhoefer, A.C. (2005) **“Overview of the Boiler MACT and Strategies for Compliance,”** Presented at the Air & Waste Management Association 98th Annual Meeting, Minneapolis, MN, June 19-23, 2005.

Dittenhoefer, A.C., Ellis, H.M., Yousuf, A.A., Hydari, N.H., Bent, A. and Roy, S. (2003) **“Projected Attainment Status of Each County in the U.S. with the PM_{2.5} National Ambient Air Quality Standards Based on 1999-2001 Monitoring Data and Strategies for Dealing with Nonattainment Designations”.** Presented at the Air & Waste Management Association 96th Annual Meeting, San Diego, CA, June 22-26, 2003.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2002) **“New Developments Impacting Air Pollution Construction Permitting for New Combustion Turbines”**, *EM Magazine*, July 2002.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2001) **“Impact of New Regulatory and Technological Developments on Obtaining Air Pollution Construction Permits for New Combustion Turbines for Electric Power Generation and Strategies for Dealing with These Developments”.** Presented at the Air & Waste Management Association 94th Annual Meeting, Orlando, FL, June 24-28, 2001.

Dittenhoefer, A.C. (1998) **“MACT Residual Risk Issues Facing the Metals Industry”.** Presented at the Air & Waste Management Association Specialty Conference on Environmental Innovations in the Metals Industry for the 21st Century, Pittsburgh, PA, March 1998

Dittenhoefer, A.C., Fleck, C.M., Hirtler, M.F., and Pan, S.C. (1997) **"Hazard Assessment Modeling Under Clean Air Act Section 112(r) at Iron and Steel Facilities."** Presented at the Air & Waste Management Association 90th Annual Meeting, Toronto, Canada, June 8-13, 1997.

Dittenhoefer, A.C. and Menne, M.L., (1992) **"Evaluation of the U.S. EPA SRDT and Net Radiation-Based Stability Classification Systems."** Air & Waste Management Association 85th Annual Meeting, Kansas City, MO, June 21-26, 1992.

Dittenhoefer, A.C., Ellis, H.M., Romano, R.R., and Arnold, S. (1992) **"Correlation Equations and Default Zero Emission Rates for Equipment Components: Comparison of Results from**

U.S. EPA's SOCFI Study and a New Study of 17 Chemical Plants." Air & Waste Management Association Specialty Conference, King of Prussia, PA, April 21-24, 1992.

Dittenhoefer, A.C., Simpson, E.B., and Romano, R.R. (1991) "**Status Report on the Chemical Manufacturers Association/U.S. EPA Fugitive Emissions Bagging Study for Ethylene Oxide and Butadiene Production Facilities.**" Air & Waste Management Association Specialty Conference on SARA Title III Section 313, New Orleans, LA, March 12-14, 1991.

Dittenhoefer, A.C. and Fridley, W.I., (1991) "**Industry Guide for Improving the Accuracy of SARA Title III Section 313 Release Estimates.**" Air & Waste Management Association Specialty Conference on SARA Title III, Section 313, New Orleans, LA, March 12-14, 1991.

Dittenhoefer, A.C. and Fridley, W.I., (1989) "**Toxic Emissions from the Coke, Iron, and Steel Industries: A Guide to SARA Title III Reporting.**" Air & Waste Management Association 82nd Annual Meeting, Anaheim, CA, June 25-30, 1989.

Dittenhoefer, A.C., Fridley, W.I., and Holcombe, R.S. (1989) "**SARA Title III, Section 313 R Form Preparation for Gulf States Steel, Inc.**" Air & Waste Management Association Specialty Conference on SARA Title III, Section 313 - Industry Experience in Estimating Chemical Releases, King of Prussia, PA, April 3-6, 1989.

Berglund, R.L.; Dittenhoefer, A.C.; Ellis, H.M.; Watts, B.J.; and Hansen, J.L. (1987) "**Evaluation of the Stringency of Alternative Forms of a National Ambient Air Quality Standard for Ozone.**" APCA International Specialty Conference on The Scientific and Technical Issues Facing Post-1987 Ozone Control Strategies, Hartford, Connecticut, November 16-19, 1987.

Dittenhoefer, A.C. and Solinski, P.J. (1987) "**On the Use of Elemental Tracers for Regional Sulfate Source Apportionment.**" 80th Annual Meeting of the Air Pollution Control Association, New York, New York, June 21-26, 1987.

Dittenhoefer, A.C. and Ferullo, A.F. (1985) "**Analysis of Recent Sulfur Wet Deposition and SO₂ Emissions Trends in Eastern North America.**" 78th Annual Meeting of the Air Pollution Control Association, Detroit, Michigan, June 16-21, 1985.

Dittenhoefer, A.C. and Ferullo, A.F. (1985) "**A Comparison of Predicted and Measured Sulfate Concentrations for Precipitation Events at Whiteface Mountain.**" 78th Annual Meeting of the Air Pollution Control Association, Detroit, Michigan, June 16-21, 1985.

Dittenhoefer, A.C. and Ferullo, A.F. (1984) "**A Comparison of Lagrangian Precipitation Statistics Computed with Two Regional-Scale Atmospheric Transport Models.**" 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 24-29, 1984.

Dittenhoefer, A.C. (1984) "**Evidence of Aqueous Phase SO₂ Oxidation in Power Plant Plumes.**" 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 24-29, 1984.

Dittenhoefer, A.C. (1983) "**Critical Review of the National Research Council Report on Acid Deposition**", Enviroplan Report No. 1141-285, prepared for the Ohio Electric Utility Institute.

Dittenhoefer, A.C. and Ferullo, A.F. (1983) "**A Dual-Mode Regional Air Back-Trajectory Model,**" Air Pollution Control Association Specialty Conference on The Meteorology of Acidic Deposition, Hartford, Connecticut, October 16-19, 1983.

Dittenhoefer, A.C. (1983) "**Measurements of Power Plant Plume Dispersion in Hilly Terrain.**" 76th Annual Meeting, of the Air Pollution Control Association, Atlanta, Georgia, June 19-24, 1983.

Dittenhoefer, A.C. (1982) "**The Effects of Sulfate and Non-Sulfate Particles on Light Scattering at the Mauna Loa Observatory**", *Water, Air and Soil Pollution* 18, 105-121.

Dittenhoefer, A.C. (1982) "**The Effects of Sulfate Particles on the Precipitation Chemistry of Hawaii,**" Second Symposium on the Composition of the Nonurban Troposphere, Williamsburg, Virginia, May 25-28, 1982.

Dittenhoefer, A.C. (1982) "**The Effects of Sulfate and Non-Sulfate Particles on Light Scattering at the Mauna Loa Observatory,**" in *Long-Range Transport of Airborne Pollutants*, D. Reidel Publishing Company, Dordrecht, Holland.

Dittenhoefer, A.C. (1982) "**A Critical Review of Long Range Transport/ Acid Precipitation Models.**" 75th Annual Meeting of the Air Pollution Control Association, New Orleans, Louisiana, June 20-25, 1982.

Dittenhoefer, A.C. (1981) "**The Long-Range Transport of Atmospheric Sulfate Observed at the Mauna Loa Observatory,**" AMS/CMOS Conference on Long-Range Transport of Airborne Pollutants, Albany, New York, April 27-30, 1981.

Dittenhoefer, A.C. and de Pena, R.G. (1980) "**Sulfate Aerosol Production and Growth in Coal-Operated Power Plant Plumes,**" *Journal of Geophysical Research* 85, 4499-4506.

Dittenhoefer, A.C. and de Pena, R.G. (1979) "**The Conversion of SO₂ to Sulfate Particles in Coal-Fired Power Plant Plumes,**" Fourth Symposium on Turbulence, Diffusion, and Air Pollution, Reno, Nevada, January 15-18, 1979.

Dittenhoefer, A.C. and de Pena, R.G. (1978) "**A Study of Production and Growth of Sulfate Particles in Plumes from a Coal-Fired Power Plant,**" *Atmospheric Environment* 12, 297-306.

Dittenhoefer, A.C. and Dethier, B.E. (1976) "**The Precipitation Chemistry of Western New York: A Meteorological Interpretation,**" Office of Water Research and Technology, U.S. Dept. of Interior, Washington, D.C., 45 p.

EDUCATION

Ph.D., Meteorology, The Pennsylvania State University

M.S., Meteorology, Cornell University

B.S., Meteorology, Cornell University

AFFILIATIONS

Air & Waste Management Association

MICHAEL F. HIRTLER, CCM

AREAS OF SPECIALIZATION

Vice President with 26 years consulting experience in Enviroplan Consulting's Environmental Studies Division. Criteria pollutant air dispersion modeling as part of NSR/PSD permitting and SIP revisions. Dispersion modeling of hazardous air pollutant (HAP) source releases including hazard assessments required under Section 112(r) of 1990 Clean Air Act Amendments. Point source and fugitive air pollutant emissions inventory development. Part 70 (Title V) air permitting, and state and federal New Source Review (NSR) and Prevention of Significant Deterioration (PSD) air permitting.

PROFESSIONAL CERTIFICATION

Certified Consulting Meteorologist, No. 504, American Meteorological Society.

PROJECT EXPERIENCE

Mr. Hirtler has acted in both a technical and managerial capacity for many air permitting and dispersion modeling analyses conducted in support of new/modified source permits. This includes hazard assessments and other air-pathway health risk analyses of hazardous air pollutants to assess potential for human exposure. Selected project experience is presented below:

SELECT AIR QUALITY MODELING EXPERIENCE

Confidential Steel Manufacturing Client: Principal Investigator for 1-hour SO₂ and NO₂ attainment area modeling study using the AERMOD dispersion model for a full stationary source inventory of SO₂ and NO₂ emitting sources (point, area, volume, and buoyant volume releases). The study included the establishment of full plant emission inventories for affected stationary source; development of meteorological and receptor data using AERMET/AERMAP; GEP stack height analysis with BPIBPRM, and the development of buoyancy plume height parameterization for fugitive hot gaseous releases that would otherwise be treated as neutrally buoyant in AERMOD. Project also involves client contact; data presentation; report preparation; agency interface.

Confidential Utility Client: Principal Investigator for 1-hour SO₂ attainment area modeling study using the AERMOD dispersion model for a coal-fired power plant. The study included the establishment of the plant emission inventories for affected coal-fired emission units and oil fired units; consideration of flue gas merging; development of meteorological and receptor data using AERMET/AERMAP; and GEP stack height analysis with BPIBPRM. Project also involves client contact; data presentation; report preparation; agency interface.

U.S Pipe, Sloss Industries, American Cast Iron Pipe Company and ABC Coke in Birmingham, AL: Principal Investigator for study to apply the AERMOD dispersion model to an inventory of PM_{2.5} emitting sources developed for each facility in support of each plant's PM_{2.5} RACT plans required for submittal to the Alabama Department of Environmental Management. The study included the establishment of full plant emission inventories for each facility; the use of hourly emissions files that reflect actual source operating schedules; and the development of buoyancy plume height parameterization for fugitive hot gaseous releases that would otherwise be treated as neutrally buoyant in AERMOD.

Sloss Industries and ABC Coke in Birmingham, AL and Solutia, Inc. in Decatur, AL: Principal Investigator for study to apply the CALPUFF Model to determine whether certain BART-eligible emission units at each of the three plants were subject to BART requirements of the *Protocol for the Application of the CALPUFF Model for Analyses of Best Available Retrofit Technology (BART)* prepared August 16, 2006 by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS). Assisted the Project Manager in ensuring CALPUFF dispersion modeling conducted by modeling principal investigator was done in accordance with the protocol; assisted in results summarization; conducted quality assurance of the modeling files and post-processing related files and data; and assisted with report preparation.

Dynegy Northeast: Principal Investigator for study to apply the CALPUFF Model to determine whether certain BART-eligible emission units at each of two plants were subject to NYSDEC BART requirements. Performed CALPUFF dispersion modeling in accordance with established NYSDEC BART visibility modeling protocol; assisted in the retrofit control technology evaluation performed for significant impact BART eligible units; conducted BART visibility modeling at each of 7 PSD Class I areas and determined cost effectiveness of various control options (on cost and visibility basis); prepared technical report; attended agency/client meetings; responded to Federal Land Manager comments. Also prepared two years of CALMET data for use in the BART evaluation study. CALMET data prepared in accordance with 2009 EPA guidance on preparation of CALMET data, using MM5 and multiple surface/upper stations.

Engineering and Construction Company: Project Manager for study to determine offsite styrene odor impacts due to fiberglass reinforced plastic (FRP) product being manufactured at a at an existing power plant for use as a stack liner in a new tall stack. ISCST3 and SCREEN3 modeling was conducted to produce off-site styrene concentration estimates for each of 11 FRP building stack release scenarios. A literature search was conducted to ascertain the most appropriate styrene odor detection threshold for use in the study, which typically reflects the lowest concentration of a substance that can be detected above a blank sample by 50% of panel testers, and is a standard metric used in odor assessment analyses. Based on use of a U.S. EPA 1-hour average odor threshold for styrene, all model predicted concentrations were adjusted to reflect peak (3-minute) average concentrations, and the overall worst-case predictions were compared to a styrene odor detection threshold.

Conectiv (as former Delmarva Power & Light Company): Principal Investigator for modeling study to assist the utility in selecting a site for the installation of two new gas turbines.

Performed urbanization analysis for four potential sites to determine land-use type. Determined GEP formula stack height. Processed meteorological data. Determined the potential for aerodynamic downwash of pollutants due to source proximity to nearby structures. Performed dispersion modeling considering urban vs. rural land use, complex vs. simple terrain, and downwash vs. non-downwash cases for four potential sites. Applied CALPUFF for the assessment of project impacts at nearest Class I area and to determine project related impacts on Class I air quality related values, including the potential for regional haze.

Conectiv (as former Delmarva Power & Light Company): Principal Investigator for modeling study to assist the utility in selecting a site for the installation of two new gas turbines. Performed urbanization analysis for four potential sites to determine land-use type. Determined GEP formula stack height. Processed meteorological data. Determined the potential for aerodynamic downwash of pollutants due to source proximity to nearby structures. Performed dispersion modeling considering urban vs. rural land use, complex vs. simple terrain, and downwash vs. non-downwash cases for four potential sites. Applied CALPUFF for the assessment of project impacts at nearest Class I area and to determine project related impacts on Class I air quality related values, including the potential for regional haze.

FirstEnergy: Project Manager on two (2) air construction permitting studies for merchant power plant facilities located in Ohio. One study was subject to major new source PSD permit review, and one study was a new PSD synthetic-minor subject to state-only permit review. Responsible for client contact, interfacing with the state agency, dispersion modeling protocol preparation and submittal, dispersion modeling analyses, including downwash and cavity region analyses, oversight on Best Available Control Technology (BACT) and Best Available Technology (BAT for state-only) determinations, final report preparation, and air permit preparation.

FirstEnergy (as former Ohio Edison Company): Project Manager on study to evaluate and obtain agency approval for revision to SO₂ SIP allowable emission rates for the W. H. Sammis Power Plant. Performed detailed interactive modeling of the power plant with other SO₂ sources within modeling domain using ISC/Complex I/RTDM/CTSCREEN. Conducted detailed analysis of measured background data. Attended meetings with regulatory agency. Prepared final technical report.

Two Chemical Manufacturers and Paper Manufacturer: Principal Investigator for several risk management program (RMP) studies conducted pursuant to the requirements of Section 112(r) of the 1990 Clean Air Act Amendments. As a component to RMP hazard assessments, conducted offsite consequence modeling of each subject chemical/process using U.S. EPA approved dense gas/neutrally buoyant type dispersion models. The analysis was used to determine the potential for exposure to nearby populations due to an accidental release of a regulated contaminant.

Former Bethlehem Steel Corp.: Project Manager for PSD permitting study to modernize melt shop operations and increase SO₂ allowable emission rate. Determined source applicability to PSD requirements through extensive emissions netting computations. Implemented innovative multimodel dispersion analysis using BLP/ISC/Complex I/RTDM. Assisted with BACT

analysis preparation. Attended meetings with regulatory agency. Prepared air permit application and final technical report summarizing study methodologies, results, and conclusions.

Fortune 500 Pharmaceutical Company (Confidential Client): Project Manager to assess the potential for human exposure to 14 HAPs emitted from a large chemical complex. Processed hourly NWS meteorological data into STAR summary data. Developed an emissions inventory for point and fugitive sources. Determined the potential for aerodynamic downwash of pollutants due to stack location and nearby building configurations. Performed air dispersion modeling analysis to determine long term concentration predictions at nearby sensitive locations.

Northern Indiana Public Service Company: Principal Investigator for study to obtain a Permit to Construct for a new stack associated with facility installation of an Advanced Flue Gas Desulfurization unit. Conducted dispersion modeling to determine state SIP compliance for SO₂. Demonstrated through detailed fugitive particulate emission rate calculations that the facility was not subject to PSD review for PM due to plant-wide net reductions. Responsible for development of a roadway fugitive dust control plan. Prepared final report and permit applications.

Fortune 100 Company (Confidential Client): Project Manager for study to determine concentrations at rooftop and ground level fresh air intakes for HAPs emitted from surface rooftop vents. Conducted literature search for relevant guidance on predicting building rooftop and air intake concentrations, estimated emissions for catastrophic release scenarios, developed computerized algorithm to simulate prediction procedures, prepared final report detailing modeling methodologies, results, and source exhaust placement recommendations.

Cogeneration Developers: Project Manager on three separate studies for cogeneration facilities located in rural New York State and subject to PSD review. Responsible for client contact, interfacing with the state agency, dispersion modeling protocol preparation and submittal, dispersion modeling analyses, including downwash and cavity region analyses, Best Available Control Technology (BACT) analyses, final report preparation, and air permit preparation.

Cogeneration Developers: Principal Investigator on four separate PSD studies of cogeneration facilities located in rural Pennsylvania. Processed multiple years of NWS meteorological data. Estimated allowable source emission rates. Determined potential for aerodynamic building downwash effects. Performed dispersion modeling in both simple and complex terrain to determine impacts due to proposed sources. Assembled background emissions inventory, including other increment consuming sources, performed refined modeling to determine total increment consumption and NAAQS compliance for applicable pollutants, and performed visibility screening analyses.

FirstEnergy Corp. (as former Cleveland Electric Illuminating Co.): Project Manager on study to determine placement of three PM₁₀ monitors at a new coal ash repository. Determined short-term and annual fugitive PM₁₀ emissions from planned activities at the new site. Conducted dispersion modeling of related dust generating activities to determine locations of maximum

short term and annual impacts. Assessed compliance with related NAAQS and made recommendations on controls and work practice modifications to meet the air standards. Recommended siting for one "upwind" monitor, one fixed location "downwind" monitor and, due to constantly shifting activities at the new facility, one mobile "downwind" monitor.

SELECT AIR PERMITTING EXPERIENCE

Alaska Department of Environmental Conservation: Project Manager to assist the Division of Air Quality with multiple technical assistance projects on an as-needed basis. The projects may include some or all of the following: preparation of major source Title V operating permits; preparation of Title I minor and major source permits, including Prevention of Significant Deterioration (PSD) and synthetic minor, i.e., Owner Requested Limit (ORL) permits; performance of routine and/or full compliance reviews and evaluations; performance of technical services involving the Department's Quality Management System (QMS) used to develop training material, internal procedures and work instructions for compliance/enforcement activities and the Department's AIRTOOLS used to input source compliance and permit data to database software; evaluation of air dispersion modeling protocols, analyses and study reports, and performance of air modeling as needed, to ensure compliance with EPA (Guideline on Air Quality Models) and state modeling procedures established air quality increments, air quality standards, other established thresholds and standards and emission control efficiencies and permit limitations; evaluation of visible impact assessments for BART affected sources and applicant visibility modeling analyses for source impacts at local air sheds, Class I areas and prescribed fire approvals; review of PSD permit application Class I area impact assessments to ensure compliance with AQRVs established by Federal Land Manager and the Department for the specific Class I area, including visible impacts (regional haze), acid deposition and other environmental parameters as necessary; and collect, analyze, audit, quality assure and process monitored meteorological and/or ambient air pollutant data in accordance with EPA's volumes for *Quality Assurance Handbook for Air Pollution Measurement Systems* and EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications* and standard meteorological practices.

Kentucky Division for Air Quality: Project Manager to assist the state agency in issuance of construction/operating permits for minor sources and conditional major and Part 70 (Title V) source operating permits for various industries. Projects involve the review of permit application for completeness and technical accuracy, calculating potential and allowable emissions, modeling, conducting regulatory review and compliance assessments with applicable state and federal regulations, review of NSPS, NESHAP, issuing draft and final permits, including special operating conditions (e.g., operating limits for Conditional Major), testing, record keeping and reporting requirements, and response to comments after formal public notice and EPA review. Responsibilities include review and quality assurance of deliverables prior to submittal to Division; assist with resolution of complicated permitting issues; maintain direct contact with Permit Review Branch chief and Permit Support section supervisor regarding project status; provide periodic status reports relating to project milestones and their completion; and project invoicing and accounts records maintenance.

Indiana Department of Environmental Management, Office of Air Quality: Principal Investigator to assist state agency in issuance of air permits under three separate permitting programs: 1) state construction permits for new/modified minor sources, 2) Federally Enforceable State Operating Permits (FESOPs) for Part 70 synthetic minor sources, and 3) Part 70 (Title V) operating permits. General permit issuance responsibilities include review of application materials for completeness and technical accuracy; computation of source-wide potential emission rates for all applicable air pollutants; determination of applicable state and federal air rules; compliance status with applicable air rules; preparation of draft permits, establishing special operating conditions, testing, record keeping and report requirements; issuance of draft permits for public notice; respond to all comments received during and immediately following the public notice period, including comments from the public, applicant, U.S. EPA, and surrounding state agencies; revise draft permit as needed; and issue final permit. A wide range of industrial source categories have been permitted, including hot mix asphalt batch plants; concrete batch plants; sand and gravel quarries; surface coating operations, including spray painting operations, printing operations, fiberglass reinforced plastics operations; secondary metals production, including iron and aluminum foundries and die casting operations; petroleum storage and transfer terminals; casket manufacturing; recreational vehicle manufacturing; and many other industrial source categories.

City of Indianapolis, Office of Environmental Services (OES): Project Manager to assist OES, as a local agency with delegated IDEM and EPA authority to issue air permits, in the issuance of air construction and operating permits for various industries. Project involves the review of new and modified Registration, MSOP, FESOP, and Part 70 (Title V) permit applications for completeness and technical accuracy; calculating potential and allowable emissions; conducting regulatory reviews and compliance assessments with applicable state and federal regulations; review of BACT, MACT, NSPS and NESHAP; issuing draft and final permits, including special operating conditions (e.g. operating limits for FESOP), compliance monitoring requirements, testing, record keeping and reporting requirements; and response to comments after formal public notice period.

Allegheny County Health Department: Project Manager for air permitting project involving preparation of 12 Title V permits in the Pittsburgh, PA metropolitan area. Sources included chemical plants, coal fired power generation plant, land fills, steel mill, metals finishing facility, airline maintenance facility and various other industries. Responsibilities include review and quality assurance of deliverables prior to submittal to Department; assist with resolution of complicated permitting issues; maintain direct contact with Department section chief regarding project status; provide periodic status reports relating to project milestones and their completion; and project invoicing and accounts records maintenance.

FirstEnergy Corp.: Project Manager for two air permitting projects, with one project involving a major PSD source modification at an existing power station and one for a new PSD-synthetic minor greenfield power station. Both projects included the installation of multiple simple cycle combustion turbines, and entailed a determination of source applicability to PSD requirements

through emissions computations. Conducted air dispersion modeling analyses to demonstrate insignificant air quality impacts. Assisted with BACT analysis preparation. Conduct meetings with client and permitting authority. Prepared air permit application and final technical report summarizing study methodologies, results, and conclusions.

Bethlehem Steel Corp., Laclede Steel (3 separate plants), Gulf States Steel, Acme Steel, Koppers Industries (2 separate plants) and Damascus Tube: Project Manager and Principal Investigator on studies involving preparation and submittal of Part 70 permit applications. Primary involvement included regulatory assessment, including review of facility operations; review of existing air permits and specific operation conditions; and review of state and federal air regulations to determine regulatory applicability and compliance. Provided support on application preparation and emissions calculations. Also prepared technical supporting documents when needed.

Bethlehem Steel Corp.: Project Manager for PSD permitting study to modernize melt shop operations and increase SO₂ allowable emission rate. Determined source applicability to PSD requirements through extensive emissions netting computations. Implemented innovative multimodel dispersion analysis using BLP/ISC/Complex I/RTDM. Assisted with BACT analysis preparation. Attended meetings with regulatory agency. Prepared air permit application and final technical report summarizing study methodologies, results, and conclusions.

New Jersey Department of Environmental Protection: Principal Investigator to assist the state agency with the review air quality modeling protocols, analyses and study reports submitted in support of air pollution control permit applications. Project involved the determination for accuracy of stationary source air quality modeling study submittals with respect to NJDEP and U.S. EPA guidance. Responsible for completeness review of modeling studies; accuracy of technical analyses; recommendations to NJDEP regarding study deficiencies, if any; and approvability of studies.

PUBLICATIONS

Ellis, H.M., Thotakura, R., Pan, S. and Hiirtler, M. (2004), "Permitting Practices, Resources and Performance of State Air Pollution Control Agencies", Air & Waste Management Association 97th Annual Meeting, Indianapolis, IN, June 2004, Paper # 412.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2002), "New Developments Impacting Air Pollution Construction Permitting for New Combustion Turbines", *EM (Environmental Manager)*, July 2002

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2001) Impact of New Regulatory and Technological Developments on Obtaining Air Pollution Construction Permits for New Combustion Turbines for Electric Power Generation and Strategies for Dealing with These Developments, Air & Waste Management Association 94th Annual Meeting, Orlando, Florida, June 24-28, 2001.

Dittenhoefer, A.C., Fleck, C.M., Hirtler, M.F., and Pan, S.C. (1997) Hazard Assessment Modeling Under Clean Air Act Section 112(r) at Iron and Steel Facilities, Air & Waste Management Association 90th Annual Meeting, Toronto, Canada, June 8-13, 1997.

EDUCATION

Graduate Coursework, Atmospheric Science, University of Illinois at Champaign-Urbana
B.S., Meteorology, Cook College at Rutgers University

AFFILIATIONS

American Meteorological Society
Air and Waste Management Association

FORREST (EDD) FRAZIER, JR

AREAS OF SPECIALIZATION

Extensive air quality experience in dealing with a broad range of air pollution issues as permit writer and supervisor of air permitting for the Kentucky Division for Air Quality.

PROJECT EXPERIENCE

Kentucky Division for Air Quality: Environmental Engineer / Permit reviewer from 1972 to 1975. Projects involved reviewing applications based on state and federal regulations (i.e. NSPS, NESHAPS) and issuing permits related to air emissions for various industries in the state of Kentucky. Worked on variety of permits such as Title V permits, NSR/PSD, state origin, synthetic minor and conditional major permits. Supervisor of the Emissions Inventory Section from 1975 to 1981. Has extensive experience with emissions inventory system such as KYEIS (Kentucky Emissions Inventory System). Supervised Combustion Section from 1981 until 1991 and supervised Metallurgy Section from 1991 until 2000. Served as an Environmental Engineering Consultant for the Permit Review Branch from 2000 until 2002. Also served as senior reviewer on air permitting contract with DAQ from June 2005 through June 2006 (contract term).

REGISTRATION

Registered in the State of Kentucky as a Professional Engineer (No. 10434).

EDUCATION

M.S. Mechanical Engineering, University of Kentucky, KY.
B.S. Mechanical Engineering, University of Kentucky, KY.

HONORS AND AFFILIATIONS

Approximately 15 EPA classes regarding air quality
Approximately 10 state of Kentucky classes regarding management, writing, etc.

BOYD E. HURST

AREAS OF SPECIALIZATION

Extensive experience in working with all aspects of fired equipment including design, specification, trouble-shooting, and emissions reduction. Very familiar with Clean Air Act and requirements for compliance. Have been awarded numerous patents for air emissions control technology. Have 24 years of environmental work experience and 15 years of combustion /heat transfer experience within ExxonMobil Research & Engineering Co. Conducted technical analyses including emissions estimation, applicability determinations and control technology evaluations for air pollution permits at 29 Exxon Mobil oil refineries and chemical plants

PROJECT EXPERIENCE

Kentucky Division for Air Quality: Senior permit reviewer from June 2005 to June 2006 on air permitting contract with DAQ. Projects involved reviewing applications and draft permits and accompanying documents prepared by staff permit writers for accuracy with respect to state and federal regulations (i.e. NSPS, NESHAPS), and air emissions for various industries in the state of Kentucky. Worked on variety of permits such as Title V permits, state origin, and conditional major permits.

Environmental Work Experience/Work Performed : Technical expert on air emissions estimating and control measures. Assisted projects in developing estimates of criteria pollutants and air toxics emissions including review and assistance in obtaining Permits. Provided expert consulting on optimization of emissions control equipment. Project leader for major environmental projects. Examples of relevant experience include:

- Led team responsible for bringing world's largest FCCU into compliance with 30 lb/hr particulate emission limit. Developed statistical approach to identifying/quantifying major source components of the emissions. Applied same methodology at other locations.
- Led PERF projects aimed at defining suitable packings for block valves to meet stringent fugitive emission regulations.
- Led application and development of Thermal DeNO_x technology for controlling the emission of NO_x from combustion equipment. In this capacity, led development of second generation DeNO_x technology that achieves much higher NO_x reduction at up to 50% less capital investment.
- Developed tool for estimating cost of installing selective catalytic reduction as a control measure for NO_x emissions.
- Led development of Environmental Impact Assessment for a major refinery expansion.
- Assessed particulate emissions and provided recommendations for reducing emissions from large power boilers firing a combination of low Btu gas and coke fines.
- Conducted technical and economic feasibility of thermal desorption technology for removing hydrocarbons from contaminated soil to meet regulatory cleanup standards.

- Directed effort to standardize environmental practices and procedures through the use of a common environmental information system. System enables the preparation of environmental inventories, permits, proper handling of wastes, monitoring of groundwater, required governmental reporting, etc. and enables certification of environmental compliance.
- Directed development and application of technology to enable major oil company in Houston area to reduce NO_x emissions by greater than 80% from 5 plants. Sources included all types of fired equipment (over 150 fired heaters, pyrolysis heaters, boilers, gas turbines), process sources and engines. Technologies involved the development of ultra low NO_x combustion equipment and enhanced application of post-combustion technologies.

Combustion/Heat Transfer Experience: Developed/applied improved combustion devices to reduce unburned hydrocarbons in furnaces and flares. Reduction of flare utilization through use of flare gas as fuel in furnaces/boilers.

- Developed company standards for utilization of vendor supplied boilers including sizing criteria based on fuel type, safety equipment and controls, cleaning requirements, steam purity, etc.
- Provided combustion technical service including design, troubleshooting, and field startup of fired equipment. Work included application of technology to achieve high efficiency combustion/heat recovery, oil loss reduction, energy conservation. Included evaluation of the impact of burner type, excess O₂, etc. on ESP particulate collection.
- Successfully implemented the utilization of difficult fuels such as aromatic tar, residual from heavy crudes, fluid coke, without encountering excessive particulate emissions.

REGISTRATION

Registered in the State of New Jersey as a Professional Engineer, No. GE17572, as of January 27, 1970.

PUBLICATIONS

Thirteen technical papers on the topic of NO_x emissions control from fired equipment.

EDUCATION

M.S. Mechanical Engineering, University of Kentucky, KY.

B.S. Mechanical Engineering, University of Kentucky, KY.

PATENTS AND AFFILIATIONS

US Patents 4,507,269; 4,624,840; 4,636,370; 4,693,874 re NO_x Control.

US Patents 4,853,193; 4,956,161 re NO_x/SO_x Control.

Three other patents re NO_x emissions applied for.

American Society of Mechanical Engineers, Member, 1974.

American Academy of Environmental Engineers, Diplomate, Air Pollution Control, 1988.

LINDA M. QUIGLEY

AREAS OF SPECIALIZATION

Staff Scientist with 16 years of experience dealing with a broad range of air pollution issues. Specializing in Part 70 and 71 (Title V) air permitting, state and federal New Source Review (NSR) air permitting, Minor Source air permitting, point source and fugitive emissions inventory development, and compliance assessments. Also experienced in all aspects of air pollution monitoring.

GREENHOUSE GAS VERIFICATION AND VALIDATION

Conflict of Interest (COI) Manager. Provide independent oversight and management of procedures for assuring that the Verification Body (VB) shall act impartially and shall avoid unacceptable COI's. The COI Manager is appointed based on knowledge of Enviroplan Consulting's clients, experience in consulting work, and educational background that ensures the ability to identify COI's and take actions to avoid COI's. The COI Manager assures that no COI exists for any client project of the company's VB.

AIR POLLUTION PERMITTING AND COMPLIANCE REVIEWS

Experienced using the TANKS Emissions Estimation Software, Version 4.09D for estimating volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions from fixed- and floating-roof storage tanks based on the emission estimation procedures from Chapter 7 of EPA's Compilation of Air Pollutant Emission Factors (AP-42).

Prepared over a hundred air permits and compliance reviews for state and local air pollution control agencies. Projects involved the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews and compliance assessments with applicable state and federal regulations, reviewing NSPS, and NESHAP, preparing draft and final permits, including special operating conditions (e.g., operating limits for Owner Requested Limits (ORL), compliance monitoring requirements, testing, record keeping and reporting requirements, and response to comments after formal public notice period.

Conduct routine compliance reviews of Facility Operating Reports and Annual Compliance Certifications. Working with subcontractor to perform source test reviews, documenting all compliance issues and preparing a report and cover letter detailing the compliance issues and/or the acceptance of the Facility Operating Report and/or Annual Compliance Certification.

Preparation and quality assurance review of Work Instruction document providing clear and concise procedural steps for reviewing Permittee Excess Emissions and Permit Deviation

(EE/PD) report submittals containing events requiring evaluation against the federal NSPS SSM provision allowances.

AIR POLLUTION CONSULTING EXPERIENCE BY SELECTED CLIENT

County of Morris, NJ. Principal Investigator to provide the County government with air compliance consulting services. The project included an on-site air quality compliance evaluation whose purpose was to create a full inventory of County owned/operated combustion sources located at identified County buildings. Air pollutant emission rates were computed for all sources identified in the site evaluation. Obtained NJDEP air permit files and reviewed such information for identification of established enforceable permit limits and incorporated such limits into the air pollutant emissions inventory. Developed a comprehensive air permitting strategy for all identified sources such that the County would not be a major source under the NJDEP Title V operating permit program. Completed all requisite air permit applications and filed such applications on behalf of the County to NJDEP for approval.

Norpak Corporation. Principal Investigator to provide this New Jersey company with air compliance consulting services. The project included evaluation of potential emissions from an existing printing operation including storage tanks. Air pollutant emission rates were computed for determination of permit level. Obtained NJDEP air permit files and reviewed such information for identification of established enforceable permit limits and incorporated such limits into the air pollutant emissions inventory. Completed all requisite air permit applications and filed such applications on behalf of Norpak to NJDEP for approval.

NJ Transit. Principal Investigator to provide NJ Transit with air compliance consulting services. The project included on-site air quality compliance evaluation of six NJ Transit bus garage locations and the evaluation of potential emissions from existing paint booths and combustion units. Completed all requisite air permit applications for each facility using NJDEP's Radius program.

City of Indianapolis, Office of Environmental Services (OES). Project Manager to assist the state agency in issuance of construction/operating permits for minor sources and conditional major and Part 70 (Title V) source operating permits for various industries. Projects involve the review of permit application for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory review and compliance assessments with applicable state and federal regulations, review of NSPS, NESHAP, preparing draft and final permits, including special operating conditions (e.g., operating limits for Conditional Major), testing, record keeping and reporting requirements, and response to comments after formal public notice and EPA review. Responsibilities include review and quality assurance of deliverables prior to submittal to Division; assist with resolution of complicated permitting issues; maintain direct contact with Permit Review Branch chief and Permit Support section supervisor regarding project status; provide periodic status reports relating to project milestones and their completion; and project invoicing and accounts records maintenance.

Alaska Department of Environmental Conservation (ADEC). Preparing Title V permits and Title I minor and major source permits for various facilities in the State of Alaska. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews and compliance assessments with applicable state and federal regulations, reviewing NSPS, and NESHAP, preparing draft and final permits, including special operating conditions (e.g., operating limits for Owner Requested Limits (ORL), compliance monitoring requirements, testing, record keeping and reporting requirements, and response to comments after formal public notice period.

Indiana Department of Environmental Management (IDEM). Permit reviewer to assist state agency in issuance of construction permits for minor sources and Part 70 (Title V) operating permits for various industries. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews and compliance assessments with applicable state and federal regulations, review of Best Available Control Technology (BACT) analyses, MACT, NSPS, and NESHAP, preparing draft and final permits, including special operating conditions (e.g., operating limits for FESOP), compliance monitoring requirements, testing, record keeping and reporting requirements, and response to comments after formal public notice period.

AIR QUALITY AND METEOROLOGICAL MONITORING

Experienced with Enviroplan Consulting's Air Quality Monitoring Division specializing in air quality and meteorological monitoring quality assurance protocols, data analysis and validation. Assure that all networks meet applicable Federal and state regulatory requirements for ambient air monitoring for Prevention of Significant Deterioration (PSD), and other regulatory standards and protocols as may apply to a particular program. Fully versed in all phases of data analysis, reduction and report preparation, including State and Federal regulatory reporting requirements for ambient air quality and meteorological monitoring programs. Prepared detailed quarterly, semi-annual and annual reports summarizing monitoring program and meteorological audit results submitted to federal or state agencies and clients. Assisted in maintaining the calibration and certification of gaseous standards, flow meters, electronic test equipment and all other standards associated with the calibration of air quality and meteorological monitoring equipment. Assured that calibration data is current, valid and correctly applied to the data sets. Regularly reviewed documentation associated with field checks on monitoring equipment to ensure accuracy of reported test results.

Has extensive field auditing experience in conducting systems audits of network field activities and performance audits of air quality and meteorological monitoring systems, including SO₂, NO_x, CO, O₃, NMHC analyzers, PM₁₀ and TSP Hi-volume samplers, air toxics monitoring systems, and meteorological sensors to assess accuracy of data collection and program conformance to quality assurance/quality control protocols and Standard Operating Procedures. Generated reports summarizing audit findings and recommendations.

EDUCATION

B.A., Geography/Environmental Studies, Montclair State University

TRAINING

Certificate of Completion from the New Jersey Department of Environmental Protection (NJDEP) Air Quality Permitting Seminar for training on June 14 and 15, 2011, at Rutgers University, Office of Continuing Professional Education

JULIA SHANNON

AREAS OF SPECIALIZATION

Chemical Engineer with five years of experience in air pollution consulting including support for air quality modeling studies; preparation of Minor Source Operating Permits, New Source Construction Permit, Federally Enforceable, Title V-Synthetic Minor Operating Permits, and Title V Permits; and work related to Greenhouse Gas emissions inventory development and verification. Additional two years of experience working for NJ DEP on flood hazard area regulatory issues.

AIR QUALITY MODELING

Support for development on input data for and quality assurance of this data for various air quality modeling studies for private sector clients dealing with compliance with NAAQS, visibility impacts in PSD Class I areas, and regional modeling for Attainment Demonstrations for the PM_{2.5} and ozone NAAQS. Work also included quality assurance of modeling results.

AIR POLLUTION PERMITTING, COMPLIANCE REVIEWS AND GREENHOUSE GAS EMISSIONS INVENTORY DEVELOPMENT EXPERIENCE

Ms. Shannon has prepared permits or conducted compliance reviews of over 75 air pollution permits for state and local air pollution control agencies. Emission units covered in this work included combustion units, storage tanks, storage piles and other fugitive sources, and other sources of air pollution emissions.

As part of air permit preparation and air permit compliance reviews for state and local air pollution control agencies, conducted reviews of potential and actual emissions including the use of EPA's TANKS Emissions Estimation Software. Conducted regulatory review of applicable state and federal regulations applicable to storage tanks, including NSPS Subparts K, Ka, and Kb. Incorporated aforementioned state and federal regulations into draft permits including associated monitoring, recordkeeping and reporting requirements.

Completing routine compliance reviews including review of submitted operating reports and annual compliance certifications. The reports are reviewed against the required reporting requirements in Title V and Minor source permits. The submitted data is reviewed against limits found in applicable permits and a determination is made as to the acceptable nature of provided information and documentation.

AIR POLLUTION CONSULTING EXPERIENCE BY SELECTED CLIENT

Midwestern City. Investigator assisting in developing the Scope 1 and Scope 2 Greenhouse Gas emissions inventory for this city for a Base Year and for the 2007. Emissions inventory development work is based on using The Climate Registry Reporting Protocol.

American National Standards Institute. Assisted in developing a training program in Greenhouse Gas emissions inventory development and verification for assessment teams from ANSI who will accredit independent bodies in the verification of GHG emission assertions in accord with The Climate Registry requirements. Assisting ANSI in other work related to the accreditation program.

Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ). Permit reviewer for Enviroplan Consulting assisting the state agency in issuance of construction and operating permits for various minor and major sources. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, review of BACT, MACT, NSPS, and NSHAP analyses, issuing draft permits, compliance monitoring requirements, testing, record keeping and reporting requirements. Direct contact with the applicants, their representatives, the OAQ office, Local Review offices, and other related parties is conducted as part of the permit review and preparation process.

City of Indianapolis. Permit reviewer for Enviroplan Consulting assisting the local agency in issuance of construction and operating permits for various minor and major sources. Project involved the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, review of BACT, MACT, NSPS, and NSHAP analyses, issuing draft permits, compliance monitoring requirements, testing, record keeping and reporting requirements. Direct contact with applicants and other related parties conducted as part of the permit review and preparation process.

Alaska Department of Environmental Conservation (DEC). Permit reviewer for Enviroplan Consulting preparing Title V permits for various facilities in the State of Alaska. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews and compliance assessments with applicable state and federal regulations, reviewing NSPS, and NESHAP, issuing draft and final permits, including special operating conditions (e.g., operating limits for FESOP), compliance monitoring requirements, testing, record keeping and reporting requirements, and response to comments after formal public notice period.

Alaska Department of Environmental Conservation (DEC). Reviewed submitted routine compliance review documents submitted to the DEC including operating reports, annual compliance certifications, test plans, and test reports. The reports are reviewed against the required reporting requirements in Title V and Minor source permits. The submitted data is reviewed against limits found in applicable permits and a determination is made as to the acceptable nature of provided information and documentation.

Alaska Department of Environmental Conservation (DEC). Develop a Work Instruction for Review of Excess Emission (EE) Reports and Permit Deviation (PD) Notifications with Possible NSPS Start-up, Shut Down, and Malfunction (SSM) Provision Allowances for use by DEC Air Permits Program technical staff. Work instruction document outlined steps to DEC staff. Work Instruction document provided clear and concise procedural steps for reviewing Permittee EE/PD report submittals containing events requiring evaluation against the federal NSPS SSM provision allowances. Existing Departmental information and QMS templates were utilized to complete this task and work to ensure the document maintains consistency with the Air Quality Program's Quality Management System.

Kentucky Division for Air Quality (DAQ). Prepared draft construction and operating air pollution permits including Title V permits. Used the Remote AIMS Data Input User System (RADIUS) system. Aided in calculation of potential emissions and verified accuracy of RADIUS system input and output to expedite permit review and submittal process.

U.S. Power Generation. Member of GHG verification team to verify greenhouse gas emission inventory for submittal to The Climate Registry (TCR). Project involved review of submitted GHG emission inventory against TCR general reporting protocol requirements, conducting site visit, and completion of verification report for submittal to TCR.

First Energy. Carried out quality assurance, consent order interpretation, data analysis, and report preparation functions for study to assess accuracy of the SO₂ and NO_x annual emissions in the LADCO 2009 round 5 regional emissions inventory for electric power plants with U.S. EPA consent orders relating to new source review enforcement settlements.

First Energy. Conducted Chemical Mass Balance (CMB) receptor modeling study of 2005 monitoring data for two Speciation Trends Network (STN) sites in Cleveland, OH. This study utilized receptor model source profiles taken from the technical literature and supplemented using information on the local industrial operations, fuel supplies, and air pollution control equipment in use in the vicinity of the monitor sites. This study also applied a methodology to separate the primary and secondary organic carbon (OC) in the monitoring data to provide better resolution of the carbonaceous PM_{2.5} sources.

Dynegy Northeast. Carried out quality assurance, data analysis, and report preparation functions for Best Available Retrofit Technology (BART) Determination Study for two oil-fired and one coal fired electric generating unit in New York State. Work included determination of technically feasible SO₂, NO_x, and PM BART control options, the costs of compliance, and the energy and non-air quality environmental impacts of compliance while taking into account the existing pollution control technology in use and the remaining useful life of the source.

Confidential Client. Conducted AERMOD modeling to evaluate the impact of the new 1-hour SO₂ and 1-hour NO₂ NAAQS on the coal-fired power plant. Modeling was conducted in accordance with EPA procedures including those pertaining to treatment of background concentration data and exclusion of any hourly concentration data at the background monitor

sites that were impacted by the major source being modeled. The modeling provided the client information needed to develop strategies for attaining these NAAQS in the most cost effective ways as well as the opportunity to share these control strategies with state agencies for its work in developing State Implementation Plan revisions.

WATER RESOURCES REGULATORY EXPERIENCE

State of New Jersey Department of Environmental Protection (DEP), Division of Land Use Regulation (DLUR). As Project Engineer with DLUR, responsible for the engineering compliance review of Flood Hazard Area Control Act (FHACA), Stream Encroachment, Stormwater Management, Coastal Area Facility Review Act (CAFRA) and Freshwater Wetland (FWW) permit applications. Responsible for all stages of permit review including: determination of technical and administrative completeness, Engineering Report and Permit Preparation. Utilized extensive regulatory knowledge to work with peers, the public and their consultants to achieve regulatory goals. Also served as project engineer for Sussex County, New Jersey within DLUR, and was responsible for conducting all meetings, reviewing all projects for compliance and serving as main contact to all consultants and constituents from Sussex County.

PUBLICATIONS

Ellis, H.M., Cummings, D., Shannon, J.C., Stanwood, K. and White, T.L. (2009) "An Evaluation of Performance Audit Data to Determine Measurement Errors and to Examine the Need to Calibrate Meteorological Monitoring System Sensors Used in the Wind Energy Industry". Presented at the AWEA WindPower 2009 Conference, Chicago, IL, May 4-7, 2009.

Ellis, H.M., Pan, S., Pinto, A.A, Shannon, J.C., and White, T.L. (2009) "Summary of State Activities Including Control Strategies and Modeling Plans to Attain the New 24-Hour PM_{2.5} NAAQS". Presented at the EUEC Energy and Environment Conference, Phoenix, AZ, February 2-4, 2009.

Ellis, H.M., Shannon, J.C., Pinto, A.A., White, T.L. (2007), "Changes in State and Local Air Pollution Compliance Practices Due to Increased Title V and Other Permit Recordkeeping and Reporting Requirements". Presented at the Air & Waste Management Association 100th Annual Meeting, Pittsburgh, PA, June 22-24, 2007.

Ellis, H.M.; White, T.L., Pan, S., Pinto, A., and Shannon, J., "Summary of State Activities Including Control Strategies and Modeling Plans to Attain the New 24-Hour PM_{2.5} NAAQS", Presented at the EUEC Energy and Environment Conference, February 2009.

EDUCATION

Lafayette College, Easton, PA
Bachelor of Science in Chemical Engineering,
Environmental Specialization

Lafayette College, Easton, PA
Bachelor of Art in International Studies

AFFILIATIONS, ACTIVITIES, SKILLS, TRAINING

Engineer in Training (EIT)
Member of the Society of Women Engineers
Completed Greenhouse Gas Verification Using ISO 14064-3 course
Attended NJ Department of Environmental Protection, Air Quality Permitting Seminar, 2011

GANESH SRINIVASAN, EI**AREAS OF SPECIALIZATION**

Environmental Engineer with over six years' experience in air dispersion modeling, emissions inventory development, air permitting, source sampling and greenhouse gas (GHG) emissions inventory verification.

Experience with national and regional emissions inventories for PM_{2.5} and Ozone Model Attainment Demonstrations (based on EMS2003 and CONCEPT emissions processors). Proficient in air permitting (including preparation of air pollution construction and operating permits for Title V, FESOP and MSOP sources; regulation applicability determinations; permit drafting and permit finalization including response to public comments). Source sampling experience includes conducting isokinetic source sampling on stationary diesel engines. Obtained GHG Verifier certification provided by the Canadian Standards Association.

AIR QUALITY MODELING AND REGIONAL EMISSIONS INVENTORY EXPERIENCE

Conducted regional and local scale emissions modeling using various photochemical (including CAMx and CMAQ) and dispersion models (including AERMOD and CALPUFF) in support of the 8-hour Ozone and Annual/24-Hour PM_{2.5} Model Attainment Demonstrations in the Chicago and Cleveland Nonattainment areas. Analyzed and revised the emissions inventories for the electric generating, motor vehicle and off-road emission sectors as part of the Attainment Demonstration. Performed an Ozone source apportionment study using CAMx to identify various emission source categories (e.g. point sources, motor vehicles etc.) and emission source regions that contribute significantly to Ohio's Ozone non-attainment regions.

Using the AERMOD model, determined the 1-hour SO₂ and NO₂ emission impacts from a stationary source. The study involved the creation of the plant inventory and development of the meteorological and receptor data using AERMET/AERMAP.

Applied the CALPUFF and CALPOST models as part of BART analysis for the assessment of project impacts at nearest Class I area for various industrial sources in Alabama, New York and Alaska. The projects included the creation of meteorological data using the CALMET model. Attended the five day US EPA course titled "Air Pollution Dispersion Models: Theory and Applications" (course included detailed discussion and application of the CALPUFF and CALMET models).

AIR POLLUTION PERMITTING EXPERIENCE

Indiana Department of Environmental Management (IDEM): Permit reviewer for Enviroplan Consulting assisting the state agency in issuance of construction and operating permits for various minor and major sources. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews, compliance assessments for applicable state and federal regulations, review of BACT, MACT, NSPS, and NESHAP analyses, issuing draft and final permits (including special operating conditions), compliance monitoring requirements, testing, record keeping, reporting requirements and responding to comments after the formal public notice period.

Alaska Department of Environmental Conservation (DEC): Permit reviewer for Enviroplan Consulting preparing Title V permits for various facilities in the State of Alaska. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews and compliance assessments with applicable state and federal regulations, reviewing NSPS, and NESHAP, issuing draft and final permits, including special operating conditions (e.g., operating limits for FESOP), compliance monitoring requirements, testing, record keeping and reporting requirements, and response to comments after formal public notice period.

Alaska Department of Environmental Conservation (DEC): Analyzed routine compliance review documents submitted to the DEC including operating reports, annual compliance certifications, test plans, and test reports. The reports are analyzed against the required reporting requirements in Title V and Minor source permits. The submitted data is reviewed against limits found in applicable permits and a determination is made as to the acceptable nature of provided information and documentation.

SOURCE SAMPLING EXPERIENCE

National Institute of Occupational Safety and Health (NIOSH): Under funding from NIOSH, performed isokinetic source sampling (EPA Method 5) on stationary diesel engines as part of a research project studying the effect of engine load on diesel particulate matter. Results from this study were used in constructing a wet electrostatic precipitator in an underground mine.

GREENHOUSE GAS EMISSIONS INVENTORY EXPERIENCE

Performed GHG emissions inventory verification for stationary sources in accord with the Climate Registry reporting protocols. Provided support in the development of a base year GHG emissions inventory for a Midwestern City.

PUBLICATIONS

Ellis, H.M., **Srinivasan, G.**, Ramaswamy, S., Yousuf, A.A. “How can Electric Power Companies respond to the SIPs being developed to attain the 8-Hour Ozone and Annual Average PM2.5 NAAQS: Reactive or Proactive Strategies?”: Presented at the 9th Annual Electric Utilities Environmental Conference (EUEC), Tucson, AZ, January 22-25, 2006.

Ellis, H.M., **Srinivasan, G.**, Ramaswamy, S., Yousuf, A.A., Dittenhoefer, A.C. “Cost Effective Strategies for Conducting PM2.5 Model Attainment Demonstrations”: Presented at the 100th Annual Air & Waste Management Association (A&WMA) Conference , Pittsburgh, PA, June 26-28, 2007.

Ellis, H.M., **Srinivasan, G.**, Ramaswamy, S., Yousuf, A.A. “Strategies for Certifying Continuous Compliance with Opacity Standards”: Presented at the 9th Annual Electric Utilities Environmental Conference (EUEC), Tucson, AZ, January 22-25, 2006 and 99th Annual Air & Waste Management Association (A&WMA) Conference, New Orleans, LA, June 20-23, 2006.

Srinivasan, G., Keener, T.C. “A Pilot Scale Project which uses the In-Situ Particle Formation Reaction between NH₃ and SO₂ to Remove Vaporized Kerosene”: Presented at the 97th Annual Air & Waste Management Association (A&WMA) Conference, Indianapolis, IN, June 22-25, 2004. Awarded the Second Prize in the Masters Level in the Student Paper/Poster Competition.

EDUCATION

M.S., Civil & Environmental Engineering, University of Cincinnati, Ohio
B.E., Instrumentation and Control, University of Madras, India

DANIEL V. STEEN, P.E.

AREAS OF SPECIALIZATION

Mr. Steen is a Senior Principal at Enviroplan Consulting where his primary focus is consultation on planning and design of compliance options for GHG emission limitations. Following his retirement in 2009 as Vice President, Environmental of FirstEnergy Corporation, one of the largest electric utilities in the United States, he joined Enviroplan Consulting on a part time basis. He is former Chair of the Global Climate Change Subcommittee of the Edison Electric Institute.

EXPERIENCE

As Vice President, Environmental for FirstEnergy, Mr. Steen was responsible for developing environmental protection strategies that complied with laws and regulations pertaining to all of the company's generation and T&D facilities in Ohio, Pennsylvania, and New Jersey. He played a key advising role regarding the operation and maintenance of environmental systems throughout the company. He was responsible for technical research including clean coal technology demonstrations.

Mr. Steen directed a variety of air pollution compliance studies from 1987 through 2009, beginning with Title IV acid rain compliance studies for both Phase I and Phase II of the 1990 Clean Air Act Amendments. He oversaw FirstEnergy compliance studies for the generation fleet (coal, gas, nuclear, and pumped storage hydro) for the Ozone Transport Assessment Group (OTAG). He participated in compliance option evaluations for the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR). Both rules have been the subject of significant litigation.

Over the last twenty years Mr. Steen served on numerous industry committees concerning environmental issues. From 2005 to 2009 he chaired the Global Climate Change Subcommittee of the Edison Electric Institute. He was also Vice Chair of the Electric Power Research Institute (EPRI) Environment Council and chair of EPRI's Environmental Delivery and Applications Committee. Mr. Steen was a member of the Pennsylvania Alternative Energy Advisory Council that helped establish the recommended requirements for alternative energy for electric utilities. Until his retirement he was a Board Member of both the Electric Power Generation Association and the Pennsylvania Resources Council and a member of the Environmental Executive Advisory Committee of the Edison Electric Institute.

Mr. Steen began his career as a co-op engineer at Ohio Edison Company in 1966, which merged with Centerior Corporation in 1997 to form FirstEnergy. He has held a variety of engineering and management positions, including substation design, transmission and power supply planning, and power plant operations. He was assistant plant superintendent at the coal-fired, five unit, R.E. Burger Plant in Shadyside, Ohio from 1984 through 1986 where his responsibilities included mechanical maintenance, electrical maintenance and supply chain. Mr.

Steen was promoted to Director of the Environmental Department in 1997 and named Vice President, Environmental in 2005.

PROFESSIONAL CERTIFICATION/DEVELOPMENT

Completed Program for Executive Development at Northwestern University's Graduate School of Management.

Graduate of Advanced School of Power Systems Engineering conducted by Westinghouse/Penn State.

Completed International Environmental Compliance Program sponsored by Westinghouse.

PUBLICATIONS

Various papers and presentations primarily concerning clean coal technologies, air pollution control, and carbon capture and geologic sequestration.

EDUCATION

B.S. Electrical Engineering, University of Akron, 1969

Juris Doctorate, University of Akron, 1972

AFFILIATIONS

Registered Professional Engineer, Ohio.

Licensed Attorney, Ohio.

TANYA WHITE

AREAS OF SPECIALIZATION

Ms. White has over six years of experience in air quality and air permitting consulting across a broad range of industries. Ms. White has developed numerous construction/operating/renewal permits or applications for minor and major sources in several states including Alaska, Indiana, Kentucky, and New Jersey. She also has extensive project experience performing air regulation applicability and compliance determinations, and calculating potential and allowable emissions.

Ms. White has extensive experience preparing emissions inventories for various types emission units, including electricity and heat generating units, fossil-fuel industries, fugitive releases such as venting and flaring from fuel production and leaks from pipes, and industrial processes sector. To date Ms. White has prepared over one-hundred emissions inventories for various types of industries.

Ms. White also assisted in developing a training program in GHG emissions inventory development and verification for assessment teams from ANSI who will accredit independent bodies in the verification of GHG emission assertions. Ms. White has also performed research on the topics of carbon credits and Renewable Energy Certificates.

Ms. White has four years experience in conducting wind resource analyses in support of wind energy projects. She is proficient in using WindPRO to estimate the energy yields for land areas based on the wind resources, orography, and surface roughness of that area. She also is proficient in creating visualizations of wind farms and performing flicker, visibility, and noise impact studies and conducting economic analyses of proposed wind energy facilities using WindPRO.

AIR POLLUTION PERMITTING EXPERIENCE

Alaska Department of Environmental Conservation (ADEC), Indiana Department of Environmental Management (IDEM) and Kentucky Division for Air Quality (DAQ): Permit reviewer for Enviroplan Consulting assisting the state agencies in issuance of construction and operating permits for various minor and major sources. Project involves the review of permit applications for completeness and technical accuracy, calculating potential and allowable emissions, conducting regulatory reviews, compliance assessments for applicable state and federal regulations, NSPS and NESHAP applicability determinations, issuing draft and final permits, compliance monitoring requirements, testing, record keeping, reporting requirements and responding to comments after the formal public notice period.

Private Industry:

Japan Airlines Management Corporation (New York): Project involved preparation of emissions inventories that were submitted to the New York State Department of Environmental Conservation (NYSDEC). Additionally, information prepared in the emissions inventories was used to complete annual compliance reports that were also submitted to the NYSDEC.

Fisk Alloy Wire, Inc. (New Jersey): Project involved a review of air regulations to determine the applicability of state and federal air pollution regulations to a proposed electroplating line. This information along with potential to emit calculations were used to prepare a preconstruction permit and operating certificate application that was submitted to the New Jersey Department of Environmental Protection.

OTHER AIR POLLUTION CONSULTING EXPERIENCE

FirstEnergy: Conducted extensive analyses of PM_{2.5} ambient monitoring data and the conditions under which the highest 24-hour PM_{2.5} concentrations occurred in the Cleveland Nonattainment Area for 2004 to 2007 to see which concentrations should be excluded in calculating Design Concentrations for comparison to the National Ambient Air Quality Standards under the U.S. EPA Exceptional Events Rule.

Gila River Indian Community Department of Environmental Quality: Conducted extensive analyses to support exclusion of PM₁₀ ambient monitoring data from calculation of the Design Concentration for comparison to the National Ambient Air Quality Standards under the U.S. EPA Exceptional Events Rule.

Private Electric Utility Company in Illinois: Conducted AERMOD dispersion modeling for two electric power plants in Illinois to evaluate the impact of the new 1-hour SO₂ and 1-hour NO₂ NAAQS on their coal-fired generating units.

WIND ENERGY DEVELOPMENT EXPERIENCE

Ms. White is certified in WindPRO, a comprehensive software package for design and planning of wind energy projects. Ms. White is also certified in MAPINFO Professional, a Geographical Information System (GIS) computer software package.

Performed visual impact studies for a proposed wind farm in New York. The purpose of the studies was to give visual impressions of the proposed wind farms. The renderings were included in the client's environmental impact statement that were presented to various government agencies and stakeholders. Performed similar visual impact studies for a proposed wind farm in Texas.

Performed wind resource assessments, wind feasibility studies, noise, flicker, shadow, and data analyses including economic analyses for an electric utility company in Indiana for two proposed wind farms.

Performed a wind resource prospecting and feasibility analysis for a wind developer in Puerto Rico.

PUBLICATIONS

Ellis, H.M., Pan, S., Pinto, A.A, Shannon, J.C., and White, T.L. (2009) "Summary of State Activities Including Control Strategies and Modeling Plans to Attain the New 24-Hour PM2.5 NAAQS". Presented at the EUEC Energy and Environment Conference, February 2-4, 2009.

Ellis, H.M., Manousos, P., Pan, S., and White, T.L. (2009) "Electric Power Company Strategy for Attaining the 24-Hour PM2.5 NAAQS by using the U.S. EPA Exceptional Events Rule". Presented at the EUEC Energy and Environment Conference, February 2, 2009.

Ellis, H.M., Pinto, A.A., Shannon, J.C., White, T.L. (2007) "Changes in State and Local Air Pollution Compliance Practices Due to Increased Title V and Other Permit Recordkeeping and Reporting Requirements". Presented at the Air & Waste Management Association 100th Annual Meeting, Pittsburgh, PA, June 22-24, 2007.

Ellis, H.M., and White, T.L. (2008) "Economic Opportunities of Locating Wind Energy Facilities in the Vicinity of Existing Electric Power Plants". Presented at the EUEC Energy and Environment Conference, January 2008.

EDUCATION

B.Sc., Double Major in Environmental Science and Physical Geography, Saint Mary's University, Nova Scotia, Canada, May 2003.

TRAINING COURSES

Title V Air Permitting, Emissions Statements using RADIUS, Fundamentals of Air Dispersion Modeling using ISC3 and AERMOD, and wind resource modeling using WindPRO.

CHARLES J. ZARZECKI

EXPERIENCE

Mr. Zarzecki has over twenty-seven years of professional experience centering on the management and administration of air quality modeling, permitting, emissions characterization, and regulatory compliance studies. This experience includes permitting studies, PSD analyses, fugitive emissions impact analyses, complex terrain modeling, long range transport modeling (including visibility impact assessments), hazardous air pollutant modeling, consequence assessments, emission inventory development, compliance method evaluations, mobile source analyses, model evaluation studies, pollution prevention studies, and facility audits. Experience also includes an on-site assignment at the New Jersey Department of Environmental Protection which concerned the review of air quality modeling analyses submitted in support of air pollution control permit applications. Mr. Zarzecki has extensive experience with current state of the art models, which include, but are not limited to models such as AERMOD, ISCST3, ISC-PRIME, CALPUFF, SCREEN3, TSCREEN, HYSPLIT, TRACE, PHAST, ROOFTOP, INPUFF, CTSCREEN, CTDMplus, and CMAQ.

Air permitting experience has included facility-wide and source specific permitting to satisfy both state requirements and Federal Title V requirements. Of particular note is the development of strategies for several clients which enabled them to minimize emission rates, thereby avoiding additional air pollution controls when filing for facility-wide permits. Mr. Zarzecki also has experience conducting source sampling to estimate emission rates for permitting purposes.

Other principal responsibilities have included advising clients on required air quality analyses and recommended alternative approaches; evaluating air quality study results for compliance with Federal and state regulations; interacting between clients and regulators, preparing air quality permit applications; preparing state emission statement forms. Mr. Zarzecki also has extensive experience advising clients of the ramifications of proposed Federal and state regulations.

Significant project experience includes:

- Provide expertise to industrial plants located in the U. S. on matters relating to air quality modeling studies, state and Federal permitting, regulatory dissemination and advocacy, as well as emissions characterization. The air quality modeling includes the traditional Gaussian methods using state of the art models such as AERMOD, CALPUFF, and ISCST3. Permitting efforts include state permitting, Federal PSD and Title V permitting. Company-wide regulatory alerts are prepared to inform all interested parties of proposed and final regulations. State of the art tools have been utilized in the emissions quantification of various types of air emissions, such as TANKS4, WATER9, TOXCHEM+, Emission Master, PAVE, and MOBILE6, as well as the most recent U. S. EPA and State guidance.

- Assigned to the New Jersey Department of Environmental Protection, Bureau of Air Quality Planning and Evaluation as an on-site principal investigator to review air quality modeling analyses submitted by applicants in support of air pollution control applications.
- On-site Project Manager for a study which included the modeling of all combustion turbines located at 12 sites for the Public Service Electric and Gas Company, the largest public utility in New Jersey. These units had never been modeled before because of their grandfathered status, however, under Title V of the 1990 CAA Amendments, these combustion units needed to be permitted and the utility opted to evaluate their impacts. Also, as a result of Title V, the utility's six coal and oil fired generating stations were modeled.
- Provided technical assistance with regard to fugitive emissions quantification and extensive air quality modeling for a PSD permitting effort. The project involved the construction of a heat recovery coking facility and a cogeneration facility which would generate electricity and steam using waste coke oven and blast furnace gases for a major steel plant on northern Indiana.
- Project manager or key team member on several facility-wide air permitting studies for clients located in northern and central New Jersey. The highlights of these projects involved strategizing with the clients on ways to minimize VOC emissions, thereby avoiding additional air pollution control requirements, and filing for minor source status to avoid Title V permitting requirements.
- Principal investigator for a PSD study at a major Midwest utility which evaluated the impact of fugitive particulate emissions from a new power station. Responsibilities included emissions inventory development, source representation, and air quality modeling of fugitive particulate emissions from coal and lime handling operations associated with the new power station, as well as a nearby complex facility.
- Project team member on a PSD study to evaluate the impact of a new fluidized bed combustion boiler at a paper mill in Chester, Pennsylvania. In this study, the emissions inventory of many background SO₂ sources, including several oil refineries, were prepared and used in air quality modeling.
- Provided final expert review to the Alaska Department of Environmental Management (ADEM) for air quality modeling analyses submitted by industrial applicants. Of particular note, final review was conducted for Best Available Retrofit Technology (BART) visibility modeling analyses submitted for purposes of demonstrating BART exemption, as well as BART engineering analyses.

PROFESSIONAL ORGANIZATIONS

American Meteorological Society

Air and Waste Management Association

PUBLICATIONS

Barton, Catherine A.; Zarzecki, Charles J.; Russell, Mark H.; “A Site-Specific Screening Comparison of Modeled and Monitored Air Dispersion and Deposition for Perfluorooctanoate”, Journal of the Air & Waste Management Association, Volume 60, April, 2010.

Barton, Catherine A.; Butler, Larry E.; Zarzecki, Charles J.; Flaherty, John; Kaiser, Mary; “Characterizing Perfluorooctanoate in Ambient Air Near the Fenceline of a Manufacturing Facility: Comparing Modeled and Monitored Values”, Journal of the Air & Waste Management Association, Volume 56, January, 2006.

Zarzecki, Charles J., “One, Two, and Three Week Precipitation Probabilities for New Jersey and Adjacent Portions of New York, Pennsylvania, and Delaware”, Master’s Thesis, Rutgers University, New Brunswick, NJ, May, 1985.

EDUCATION

M.S., Meteorology, Rutgers University, 1985

B.S., Meteorology, Cook College, Rutgers University, 1982

DAVID S. CUMMINGS

AREAS OF SPECIALIZATION

Vice President and Director, Air Quality Monitoring Division. Responsible for overall management of ambient monitoring operations. Nineteen years experience in project management, quality assurance, ambient air quality and meteorological monitoring. Directed project teams conducting air quality and meteorological monitoring programs ranging in size from \$60,000 to \$2,000,000 for numerous companies in the electric utility, manufacturing, chemical, petrochemical, waste-to-energy, general industry, and public sector.

EXPERIENCE

Project manager responsible for network and station design, installation and monitoring program oversight for complete operation, maintenance, quality assurance, data reduction, validation, reporting, and administration for over thirty different clients and projects. Selected examples follow:

NARSTO: Auditor of NARSTO air quality and meteorological monitoring sites throughout the Northeast. Performance and systems of all air quality monitors operated by NARSTO in the Northeast.

State of Georgia: Technical advisor for contract with State of Georgia Department of Natural Resources Air Protection Branch to operate the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; 29 PM_{2.5} monitors; and about 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Directly responsible for the redesign of QC checklists, sample data sheets and other documentation for the monitoring program. Assisted in preparing the PM_{2.5} monitoring program Standard Operating Procedures and beginning and operating the PM_{2.5} monitoring program for nine months. Work involved full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits.

City of Toledo: Supervised performance and systems audits of their four PM_{2.5} samplers, repaired malfunctioning samplers and conducted training program in proper operation and quality control.

American Electric Power Corp.: Five-station PSD monitoring network, including four SO₂ stations and a 60-meter, multi-level instrumented meteorological tower, operating in support of an Indiana-Kentucky Electric Power Generating Station.

BHP Minerals: Two meteorological monitoring stations, one in Mali, Africa, another located in Zimbabwe, Africa, operated in support of mining and processing facilities at these locations. Parameters monitored supported modeling studies conducted by Enviroplan Consulting to show

compliance with World Bank ambient air quality standards for proposed expansion of these facilities. Parameters include SO₂, wind speed, wind direction, sigma theta, air temperature, net radiation, relative humidity, evaporation, and precipitation.

Bechtel Corporation: A total of five multi-station networks operated in support of PSD permitting requirements for three cogeneration power plants, two of which are located in southern New Jersey and one in Florida. These networks provided both pre- and post-construction air quality study data. Responsibilities included siting assistance and approvals, design, supply and installation of the monitoring stations, and complete program operation and management. Parameters include SO₂, NO- NO_x, PM10, and meteorological monitoring.

Caribbean Petroleum Corporation: Four-station monitoring network, including three SO₂ and one meteorological site operated in support of EPA permitting requirements for a petroleum refinery located in Bayamon, Puerto Rico. Designed and installed real-time alarms to transmit high ambient SO₂ conditions via telemetry to refinery control center for corrective action and process control.

Bath Iron Works: A single-station PSD monitoring network operated in support of operating permit renewals for this shipyard in Bath, Maine. Assisted in station siting and approval by Maine Department of Environmental Protection, in addition to installation, operation, maintenance, and data reporting. Parameters included SO₂, PM10, and meteorological monitoring.

Indianapolis Power and Light: Sited, installed and operated three PSD monitoring networks in support of permit applications for construction of a new fossil-fueled power generation plant to be located in Patriot, Indiana, and expansion of existing capacity at power generating stations in Pritchard and Indianapolis, Indiana. Parameters monitored include SO₂, NO- NO_x, CO, O₃, and PM10.

United Engineers and Constructors: A pre-construction PSD monitoring network, which provided ambient data in support of planned construction of a new fossil-fueled generating plant near Sutherland, Virginia. Parameters monitored include SO₂, NO- NO_x, O₃, PM10, TSP, heavy metals, and meteorological data from a 100-meter multi-level instrumented tower, including wind speed, wind direction, sigma theta, air temperature and temperature difference, dew point, and precipitation.

E.I. DuPont de Nemours: A four-station multi-year monitoring network installed and operated in support of permitting for construction of a rotary kiln waste incinerator and secure landfill for this large chemical facility in southern New Jersey. Parameters include SO₂, NO- NO_x, PM10, TSP, meteorological data, and a multi-media program for air toxics monitoring, including metals, organic matter, VOC's, SVOC's, mercury vapor, dioxins and furans.

The following selected projects are representative of experience managing monitoring programs which include operation, maintenance, quality assurance, data reduction and reporting (no installation):

Central Hudson Gas and Electric: A seven-station PSD network monitoring SO₂, NO- NO_x, PM10, TSP, and meteorological parameters in support of two fossil and gas-fueled power generating plants located in Newburgh, New York.

Pennsylvania Power and Ohio Edison: Four PSD monitoring networks comprised of thirteen separate monitoring stations operated in support of four power generating stations located along the Ohio River in Pennsylvania, West Virginia, and Ohio. Parameters include SO₂, PM10, and multiple meteorological sites.

Orange and Rockland Utilities: A thirteen-station PSD monitoring network operated in support of the coal conversion project for the Lovett generating station in Tomkins Cove, New York. Parameters include twelve SO₂ and five meteorological sites. Unique features of this program included challenging operation and maintenance logistics owing to the sites' location in a state park classified as a primitive area, with access improvements prohibited by law, and real-time data telemetry requirements for all sites to the New York State Department of Environmental Conservation. A special study for air toxics and particulates was also conducted as part of this program.

Cleveland Electric Illuminating: A twenty-station, multiple-network PSD monitoring program operated in support of two fossil-fueled power generating stations. Parameters include SO₂ and multiple meteorological stations incorporating instrumented towers ranging from 10 to 100 meters.

Wisconsin Power and Light: From five to twelve stations operated at various times during this PSD monitoring program in support of a fossil-fueled power generating station located in Sheboygan. Parameters included SO₂, NO- NO_x, O₃, non-methane hydrocarbons, TSP, multiple tall-tower meteorological sites, and acoustic radar to profile atmospheric temperature and stability characteristics.

Northern Indiana Public Service Company: A three-network, eight-station PSD monitoring program in support of three coal-fired power generating plants in northern Indiana. Parameters include SO₂, PM10, and multiple meteorological sites with towers ranging from 10 to 100 meters.

The Turbitrol Company: Designed and installed an ambient monitoring station in support of expansion of a New York City sewage treatment facility located in Coney Island. Parameters included SO₂, H₂S, CO, O₃, NO-NO_x, and six meteorological parameters. The station incorporated real time remote data transmission and calibration status signals. Enviroplan Consulting provided a complete operation and maintenance training program for sewage plant personnel as well.

PUBLICATIONS

Ellis, H.M., Cummings, D., Shannon, J.C., Stanwood, K. and White, T.L. (2009) “An Evaluation of Performance Audit Data to Determine Measurement Errors and to Examine the Need to Calibrate Meteorological Monitoring System Sensors Used in the Wind Energy Industry”. Presented at the AWEA WindPower 2009 Conference, Chicago, IL, May 4-7, 2009.

EDUCATION

Associates of Applied Science in Electronics, University of Hartford, CT
Bachelors of Engineering Technology, University of Hartford, CT
U.S. EPA: Courses completed in a variety of air pollution topics

DAVID ARBANAS**OBJECTIVE**

A position as an Engineering Technician for an organization seeking an individual with a record of providing superior service, the desire to exceed the customer's expectations and motivated to provide timely solutions.

SKILLS

Analog, digital and microprocessor circuitry, circuit and symptom analysis, fault isolate and repair to component level, circuit tuning and calibration, DVOM, oscilloscope, waveform analysis, frequency counter, inductance and capacitance meters, DC 100 MHz sweep generator, wave form generator, photometers, Huntron tracker, pinpoint system , photonics and applications and clean room for optics assembly and maintenance. Instrumentation and measurement. Microsoft Office (Excel, Powerpoint and Word. EMC Station Manager. Citrix IFS(Integrated Financial System) Meteorological instruments and data acquisition systems. Multi-cal Air pressure measurement

EXPERIENCE

Dwyer Instruments
Indiana Highway 212
Michigan City, IN 46360
Electronics Engineering Technician 09/2010-
present

Provide support for new product development, product improvement, materials and component testing. Pilot run assistance, Purchased parts inventory review, vendor data confirmation. Assist design Engineers in product development. Assemble, test and troubleshoot prototype instruments, perform component and instrument environmental tests and document relative and absolute performance. Assemble, test and troubleshoot prototype circuitry. Perform electronic component compliance tests. Operate production pilot run on various products and provide feedback to engineers. Assemble reports and performance data utilizing MS Excel and Word. Utilized, programmed and configured Hall Effect devices for air pressure and rotary position sensor applications. Product testing for performance and build compliance.

Enviroplan Consulting, Inc., Fairfield, NJ 07004 09/2004 –
Present Monitoring Engineer (Part-Time)

Regional Monitoring Engineer for air quality management company. Primary duties are calibration, maintenance, troubleshooting and repair of SO₂ and meteorological monitoring

equipment as well as DAS computer and site infrastructure. Utilized Thermo Electron Instruments Model 43 and 143 SO₂ analysis and calibration system, R.M. Young meteorological instruments and data translators, and Advantech Adam Data Acquisition System. Maintain documentation of work and adhere to schedules as mandated by Indiana Department of Environmental Management and U.S. Environmental Protection Agency. Repair digital and analog electronic circuitry to component level, perform mechanical maintenance to equipment as required, repair or replace structure heating or cooling systems as needed. Provide backup services for other regional monitoring sites as required.

Rockwell Automation
225 West 45th Street
Munster, Indiana, 46321
Technician Analyst

02/2009-08/2010

Analyze, evaluate, repair, and test electronic and electro-mechanical devices of various types, applications, and manufacturers, with or without schematics. Maintain documentation of a product bill of materials, test and repair notes and picture reference files. Utilize standard diagnostic instruments, as well as Huntron tracker, pinpoint computerized diagnostic system. Adhere to Rockwell guidelines to ensure quality and reliability of repair.

AT&T
06/2007 – 12/2008
3102 169th Place
Hammond, IN 46323
Cable Splicing Technician

Test, evaluate, troubleshoot, repair and condition telecom cable pairs. Review and analyze complex schematic drawings to maintain and upgrade telecom system. Use electrical test instruments to determine defective wire or fiber. Repair and maintain outside cable facilities. Have had six weeks specialized training in pole climbing and ladder safety, schematic analysis, first aid, safety and driving, advanced splicing, troubleshooting and resistive fault analysis and specialized equipment training in JDS Uniphase HST 3000 meter.

Smiths Aerospace, Grand Rapids, MI 49512
08/2006
Electronic Analyzer & Tester (Full-Time Contract Position)

04/2006 –

Test, evaluate and troubleshoot to component level electronic assemblies for an international manufacturer of aerospace and defense systems. Adhere to guidelines established for documentation of work procedures, process control and quality control.

Dwyer Instruments
Indiana Highway 212
Michigan City, IN 46360
Electronics Engineering Technician
12/2005

08/2004 –

Engineering Technician in New Product Design Department reporting to the lead project engineer. Assemble, test and troubleshoot prototype instruments, perform component and instrument environmental tests and document relative and absolute performance. Assemble, test and troubleshoot prototype circuitry. Perform electronic component compliance tests. Operate production pilot run on various products and provide feedback to engineers. Assemble reports and performance data utilizing MS Excel and Word. Utilized, programmed and configured Hall Effect devices for air pressure and rotary position sensor applications.

Dage-MTI, Inc., Michigan City, IN 46360
03/2003
Electronics Service Technician:

08/1984 -

Repair, modify, calibrate and test video instrumentation equipment for an international leader in the manufacture of high performance scientific cameras, monitors and image processors utilizing various scan rates, spectral sensitivities, and imaging technologies. Provide technical assistance to customers as required; help solve application, configuration or device incompatibility. Consult with and receive recommendations from other departments when warranted. Utilized working knowledge of applications such as video microscopy, fluorescence microscopy, scanning electron microscopy and semiconductor wafer inspection. Assist in training of customers in operation and basic maintenance of the instruments. Work with quality control and engineering departments to identify potential quality problems. Ensured implementation of engineering change orders as well as any other items requiring special attention. Provide customer quotations and maintain service history of products.

The responsibilities of this position encompassed not only repairing to component level and providing prompt response times, but also the analysis of symptoms performance. Utilize knowledge of application and system parameters to provide specific calibration changes, electronic or mechanical modifications and identify situations that may require additional consultation with customer.

Test Department:
04/1985

08/1984 -

Test, calibrate and quality control inspection. Repair to component level electronic assemblies. Evaluate imaging devices and grade for quality. Set-up and ensure units met quality control standards and sales order configuration prior to shipment to customer.

EDUCATION

Phoenix Institute of Technology, Phoenix, Arizona	06/1977 - 06/1978
Certificate - Electronics Technology	
Electronics theory and circuit theory	
Troubleshooting and diagnostic methods	
Analysis using symptom diagnosis	
Poway High School High School, Poway, California: Graduate	06/1977

WAYNE BIRO

AREAS OF SPECIALIZATION

Mr. Biro is a Monitoring Engineer specializing in the operation and in-field management of air pollution and meteorological monitoring networks. He has three years experience in air quality and meteorological monitoring for most air pollutants for which there are National Ambient Air Quality Standards and over 25 years experience as an electronics technician dealing with electronics instrumentation.

EXPERIENCE

Responsible for the operation and maintenance of ambient SO₂, NO_x, CO, O₃, PM10 and TSP monitors at four sites and one meteorological tower with six meteorological parameters in Delaware. Experience with associated calibration equipment and data loggers. Also responsible for operation and maintenance of -meter meteorological towers with measurements of wind direction, wind speed and other meteorological parameters. Perform scheduled and emergency repairs and calibration checks on equipment and monitoring instruments in accordance with U.S. EPA and Delaware Department of Natural Resources guidelines and protocols. Repair instruments (analog and digital) to component level as required. Perform scheduled preventative maintenance and maintain documentation of work and procedures.

Other experience includes serving as an instructor of computer robotics and electronics at Delaware Tech. He also served as an electronics technician for several manufacturing and services companies and for the U.S. Navy.

EDUCATION

U.S. Navy Electronics Schools courses in basic electronics, advanced digital and analog theory, troubleshooting to component level, and computer programming among others. Computer Technician Certification.

THOMAS FERREBEE III

AREAS OF SPECIALIZATION

Manager, Air Quality Monitoring and Quality Assurance Coordinator with over 13 years experience in air quality and meteorological monitoring. Performs quality assurance audits and acceptability tests on air monitoring instrumentation. Managed and supervised the operation and maintenance of a 40 site/station state air quality monitoring network including 29 PM2.5 samplers. Install, service, troubleshoot, repair and calibrate instrumentation, data acquisition systems and equipment for monitoring air quality. Train and support field operators. Proficient in the operation, maintenance, calibration, service and repair and quality assurance of Andersen Instruments air sampling equipment including General Metal Works (GMW) and Graseby Andersen RAAS PM2.5 Air Sampler, Dichotomous Air Sampler, PM10 Hi-Vol Air Sampler, TSP-1 Air Sampler, AVOCS Sampler, Beta Attenuation Monitor; Thermo Environmental Instruments (TECO) Gas Analyzers: SO₂, CO, NO_x, R&P Partisol PM10 Sampler, TEOM PM10 Sampler; CSI 1700 Gas Dilution Calibrator.

EXPERIENCE

Field engineer/manager with extensive experience troubleshooting air sampling monitors and instrumentation, and problem solving network configurations and applications. Demonstrating flexibility and effectiveness handling complex air pollution projects and multiple air quality network tasks.

All Enviroplan Consulting Air Quality Monitoring Networks: Quality Assurance Coordinator responsible for quarterly performance and systems audits satisfying the requirements of 40 CFR Part 58 and applicable state regulations.

State of Georgia, Georgia Department of Natural Resources (for Enviroplan Consulting): Field Manager and Supervisor for the routine operation of a 40 site/station SLAM Network. The network collected samples and monitored the air for 13 pollutant parameters: TSP Lead, TSP Metals, PUF, VOC TO14, Carbonyl, PM10, PM2.5, SO₂, CO, NO, NO_x, NO_y and Ozone. Trained 12 operators on daily operation, maintenance, and preventive maintenance of samplers and monitors at each site/station. Perform calibrations, precision checks and quality assurance audits on the sampling and measuring instrumentation.

Anderson Instruments, Inc.: Provided technical support to customers and end users of air sampling monitors and instrumentation. Performed nationwide installations, preventive maintenance, calibrations, and field repairs of air sampling equipment for quick start ups and continuous optimum performance. Evaluated and wrote procedures for quality assurance testing, operator and service manuals. Managed the technical and customer service department in the absence of the department managers. Identified customer needs and made system or corrective action recommendations for optimum product applications. Evaluated and tested instrumentation designs, configurations, and applications for compliance with the Environmental Protection Agency Code of Federal regulations.

EDUCATION

Bachelors of Science Degree, Electronic Engineering Technology, Savannah State University

KEVIN RUGGIERO

AREAS OF SPECIALIZATION

Senior Monitoring Engineer in various capacities including data review and quality assurance, operations management of field technicians and technical support, performing network installations and network operations and maintenance.

PROJECT EXPERIENCE

Alaska Department of Environmental Conservation (ADEC). Principal Investigator responsible for the review of numerous Quality Assurance Project Plans (QAPPs) submitted to ADEC for meteorological monitoring programs. Reviews include QAPPs submitted by ExxonMobil, BP Exploration, Alyeska Pipeline Company, Pebble Limited Partnership and Donlin Creek. Reviewed the QAPPs for consistency with Department review checklist and regulatory guidance, and ensured that it meets the quality assurance requirements under a Prevention of Significant Deterioration (PSD) program. Submitted a Draft Finding's report and incorporated any ADEC comments into a Final Report. Also a Principal Investigator on multiple pollutant and meteorological monitoring review contracts to perform detailed reviews of the data sets for validity and accuracy; and report the findings to the Project Manager.

Marathon Petroleum Company. Field Operations Manager involved in the design and installation of four ambient air monitoring stations and two meteorological monitoring stations in and around a refinery in Michigan. Developed the QAPP for the monitoring program and SOPs for the equipment used. Responsible for providing technical and supervision to network operators on a routine and emergency basis to ensure all monitoring activities are performed in accordance with the SOPs and QAPP. Instrumentation supported includes Teledyne-API Model T sulfur dioxide, total reduced sulfur and carbon monoxide analyzers, Met One BAM-1020 particulate monitors, Entech VOC samplers and Climatronics meteorological sensors.

Northern Indiana Public Service Company (NIPSCO). Senior Monitoring Engineer responsible for conducting independent performance audits on Thermo Electron Company SO₂ analyzers and RM Young meteorological monitors for wind speed, wind direction, temperature, temperature difference and dew point. Monitors are installed at multiple levels on tall towers (60 to 100 meters in height).

MeadWestvaco. Senior Monitoring Engineer responsible for conducting semi-annual independent performance audits on meteorological monitors in a paper mill in southern Virginia. Meteorological monitors include Climatronics Corp. sensors for wind speed, wind direction, temperature, dew point and solar radiation.

Valero Delaware City Refinery. Senior Monitoring Engineer responsible for conducting quarterly independent performance audits on air quality monitors for suspended particulate

matter (PM) and meteorological monitoring in and around a refinery in northern Delaware. Monitors audited include continuous R&P TEOM PM10, R&P TEOM continuous TSP, episodic TSP (high-volume samplers) and Climatronics Corp. meteorological monitors for wind speed, wind direction, temperature, dew point and precipitation.

Pollution Finance Control Authority (PCFA). Senior Monitoring Engineer responsible for operation and maintenance of a two-station air quality and meteorological monitoring network located in Warren County, NJ. Monitoring parameters include SO₂ and various meteorological parameters.

BP Wind Energy, North America. Senior technician responsible for design, installation, operation and maintenance of self-contained, mobile power systems for lidar instruments operated at remote field locations. Power systems are battery-based, highly regulated and automatically re-charged via an on-board generator. An integrated microprocessor-based data logger monitors and controls all power system functions.

GENERAL

Responsibilities include oversight of Enviroplan's monitoring network operations, the operations and maintenance of two meteorological monitoring systems, review of data for monthly analysis and data reduction of pollutant sampling, including SO₂, NO_x, CO, O₃, TSP, PM₁₀, and various meteorological parameters. Mr. Ruggiero has been involved with the development of Standard Operating Procedures for Enviroplan's Quality Assurance Program Plans. He possesses working knowledge of monitoring project organization and practical implementation of Quality System principles, as well as familiarity of monitoring system technical specifications and performance related QA/QC elements. Mr. Ruggiero has been trained in, and has conducted performance and systems audits on PSD-quality meteorological and pollutant monitoring systems. Prior to joining Enviroplan, Mr. Ruggiero ran his own construction company for over 12 years performing residential and commercial applications and is licensed by the state of New Jersey. He also has experience in commercial power plant maintenance including power generation and wastewater treatment.

EDUCATION

Bachelor of Science in Finance and a certificate in database programming from Fairleigh Dickinson University

KATHLEEN M. STANWOOD

AREAS OF SPECIALIZATION

Manager of Data Reduction, Processing, and Reporting and Laboratory Operations, Air Quality Monitoring Division. Responsible for Enviroplan Consulting's gravimetric laboratory for analysis of particulate matter samples. Fully versed in all phases of data analysis, reduction and report preparation, including State and Federal regulatory reporting requirements for ambient air quality and meteorological monitoring programs. Responsible for daily acquisition (via telemetry) of all monitoring station digital data, preparation of daily data summary reports in support of field operations management, receipt, organization and archival of all supporting data shipments from the field, and subsequent data analysis and reporting for all currently operating air quality and meteorological monitoring programs.

SELECTED PROJECT EXPERIENCE

Alaska Department of Environmental Conservation (ADEC): Principal Investigator and Project Manager for multiple projects involving the review of ambient air quality and meteorological data and data reports; and review of Quality Assurance Project Plans (QAPPs) submitted by affected sources to ADEC for their respective meteorological monitoring programs. These data are submitted to ADEC by permittees or monitoring contractors in support of existing or future air permits, including for planned projects that will require air dispersion modeling evaluations. All of these projects entailed a rigorous review of the monitored data set(s) to determine if the data met PSD (Prevention of Significant Deterioration) quality criteria by comparing the data and data reports to established ADEC and EPA (Environmental Protection Agency) documents, regulations and guidelines. QAPP reviews also ensured compliance with the Department's QAPP review checklist and QA/QC procedures. Also prepared and submitted Draft and Final Findings Reports documenting all review findings that affect data validity and PSD quality determinations.

APEX Wind Energy, Inc.: Data Manager for the compilation, data processing, quality assurance and reporting of multi-level wind data for a number of meteorological towers for a leading developer of wind energy facilities.

Orange and Rockland Utilities, Inc.: Data Manager for SO₂ and meteorological monitoring data, including the analysis, reduction and validation of this data. Supervised the preparation of the data and prepared monthly, quarterly and annual reports to be submitted to state agencies and the client. Under Air Guide 19 requirements, responsible for weekly contact with New York State Department of Environmental Conservation (NYSDEC) for transmission of Quality Assurance data check information. Supported NYSDEC real-time data acquisition system by retrieval and transmission of network data during NYSDEC system downtime. Assured that calibration data was current, valid and correctly applied to the data sets. The network consisted of twelve remote SO₂ stations, four remote meteorological stations and a 100-meter meteorological tower at a base

station. Data was gathered through a real-time computer-based data acquisition system utilizing radio telemetry with back-up strip chart recorders for missing digital data and validation purposes.

Central Hudson Gas & Electric Corp.: Data Manager for SO₂, NO-NO₂-NO_x, PM₁₀ and meteorological monitoring data, including the analysis, reduction and validation of this data. Responsible for the preparation of monthly and semiannual reports submitted to the client and NYSDEC.

E.I. DuPont de Nemours & Co., Inc.: Data Manager for SO₂, NO-NO₂-NO_x, PM₁₀, TSP and meteorological data and the receipt, organization and analysis of laboratory results of air toxics data, including VOCs, SVOCs, metals, EOM and Dioxins and Furans. Responsible for the preparation of monthly and quarterly reports submitted to the New Jersey Department of Environmental Protection (NJDEP) and DuPont. Developed spreadsheet-based tabular and graphic data reporting formats for over 70 speciated target compounds as analyzed from samples obtained at each of four monitoring site locations. The custom reporting format allowed graphic correlation of the various data sets, enhancing user analysis and presentation of the monitoring program findings.

CIBA GEIGY Corporation: Organized methanol and epichlorohydrin in-vent sampling data for batch processes. Responsible for executing the computer program to organize data into report format. Subsequent review of data to quality assure final results.

GENERAL

Has served as Data Manager for monitoring programs conducted by Enviroplan Consulting on behalf of numerous companies including: ABC Coke, American Electric Power, Bath Iron Works, Baltimore Gas & Electric Company, BHP-Minerals International, Carribean Petroleum Refining Corp., Central Hudson Gas & Electric, Champion International, Cincinnati Gas & Electric, City Public Service Board of San Antonio, Cleveland Electric Illuminating Company, Consolidated Edison Company, Consumers Power Company, Duquesne Light Company, E.I. DuPont, Ford Motor Company, Foster Wheeler, Indianapolis Power & Light, Marathon Oil, Massachusetts Port Authority, Motiva Enterprises, Northern Indiana Public Service Company, Old Dominion Electric Cooperative, Orange & Rockland Utilities, PPG Industries, Steel Dynamics, Westvaco Corp. and Wisconsin Power & Light Company, New England Power Company, Ohio Edison Company, and the City Public Service of San Antonio.

Responsibilities include staff oversight and management for monthly analysis and data reduction of pollutant sampling, including SO₂, NO_x, CO, O₃, TSP, PM₁₀, methane and non-methane hydrocarbons, air toxics pollutants, and various meteorological parameters. Review of data to quality-assure final results. Preparation of monthly, quarterly and annual reports, including PARS, statistical analysis, quality assurance data, wind roses, frequency distribution, data collection efficiencies, moving and non-moving block averages, discussion of the data with respect to regulatory compliance standards, and executive summaries.

EDUCATION

M.A., Environmental Studies, Montclair State College
B.S., Biology, St. Peter's College, Jersey City, NJ

THOMAS W. SURFUS

AREAS OF SPECIALIZATION

Mr. Surfus is a Senior Monitoring Engineer specializing in the installation, operation, and in-field management of air pollution and meteorological monitoring networks. He has about 25 years experience in the operation, maintenance and repair of instrumentation including almost 20 years experience in then operation, maintenance and repair of air quality monitoring instrumentation.

EXPERIENCE

Mr. Surfus has installed, operated, maintained, and provided repair for three air quality and meteorological monitoring networks having flame-photometric and chemiluminescence air monitors, high-volume samplers, and multi-level meteorological tower systems; conducted radiosonde launch programs; and performed systems and performance quality assurance audits.

Mr. Surfus has been the field project manager for a major study conducted by Enviroplan Consulting to develop emissions factors for fugitive dust from coal piles at two electric utility power plants. He also has continuing responsibilities for monitoring equipment research and development for special field studies.

Mr. Surfus is responsible for the operation of a three station air quality and meteorological monitoring network in the Indianapolis, IN area monitoring for SO₂, CO, NO, wind direction, wind speed and temperature.

For ten years, Mr. Surfus was responsible for the operation and maintenance of and air quality and meteorological monitoring network about the Wisconsin Power & Light Co. Edgewater Plant with 14 air quality parameters and 16 meteorological parameters.

Prior to his employment with Enviroplan Consulting, Mr. Surfus was an electronic technician with the Air Pollution Control Monitoring Section of the Wisconsin Department of Natural Resources for more than three years where he conducted installation, maintenance, calibration, repair, and modification of continuous air monitoring instruments.

EDUCATION

Certificate of Proficiency as an Electronics Technician from the United Technical Institute in Milwaukee, Wisconsin

SECTION 5: PUBLICATIONS

The following list of publications illustrates the breadth and extent of the research papers authored and coauthored by members of Enviroplan Consulting's professional staff:

Ellis, H.M., Cummings, D., Shannon, J.C., Stanwood, K. and White, T.L. (2009) "An Evaluation of Performance Audit Data to Determine Measurement Errors and to Examine the Need to Calibrate Meteorological Monitoring System Sensors Used in the Wind Energy Industry". Presented at the AWEA WindPower 2009 Conference, Chicago, IL, May 4-7, 2009.

Ellis, H.M., Pan, S., Pinto, A.A, Shannon, J.C., and White, T.L. (2009) "Summary of State Activities Including Control Strategies and Modeling Plans to Attain the New 24-Hour PM_{2.5} NAAQS". Presented at the EUEC Energy and Environment Conference, Phoenix, AZ, February 2-4, 2009.

Ellis, H.M., Manousos, P., Pan, S., and White, T.L. (2009) "Electric Power Company Strategy for Attaining the 24-Hour PM_{2.5} NAAQS by using the U.S. EPA Exceptional Events Rule". Presented at the EUEC Energy and Environment Conference, Phoenix, AZ, February 2-4, 2009.

Ellis, H.M., Shannon, J.C., Pinto, A.A., White, T.L. (2007) "Changes in State and Local Air Pollution Compliance Practices Due to Increased Title V and Other Permit Recordkeeping and Reporting Requirements". Presented at the Air & Waste Management Association 100th Annual Meeting, Pittsburgh, PA, June 22-24, 2007.

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Ellis, H.M., Thotakura, R., A. Yousuf, (2006) "Strategies for Dealing with Random Emission Standard Exceedances in Certifying Continuous Compliance". Presented at the Electric Utilities Environmental Conference, Tuscan, AZ, January 2006.

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SECTION 6: CLIENT LIST

Following is a list of representative clients to whom we have provided services:

Natural Gas Transmission and Distribution

CNGT

East Ohio Gas

Honeoye Storage

National Fuel Gas Supply

Steel and Coke

ABC Coke

Acme Steel

American Coke & Coal Chemical Institute

Atlantic Steel Industries

Bethlehem Steel

CF&I Steel

CSC

Damascus Bishop Tube

Great Lakes Steel Industries

Gulf States Steel

Laclede Steel

Lukens Steel

LTV Steel

Koppers

National Steel

New Boston Coke

RFE Republic Metals

Shane Steel Processing

Sharon Steel

Shenango

Sloss Industries

U.S. Steel

Weirton Steel

Electric Utilities and Independent Power Producers

Allegheny Power System
American Electric Power Service
Ansaldo Industries of America
Atlantic Electric
Arizona Public Service
Arkansas Power & Light
Babcock & Wilcox
Baltimore Gas & Electric
Bechtel
Centerior Energy
Central Hudson Gas & Electric
Central Illinois Light
Cinergy
Columbus & Southern Ohio Electric
Conectiv
Consolidated Edison
Constellation Energy
Consumers Power
Dayton Power & Light
Delmarva Power & light
Detroit Edison
Dominion Energy
Duquesne Light
FirstEnergy
Fluidized Combustion Services
Foster Wheeler Power Systems
Indeck Energy Services
Indiana Electric Association
Indianapolis Power & Light
Kamine Development
Lansing, MI Board of Water & Light
Long Island Lighting
Midwest Generation
Midwest Ozone Group
Mission Energy
New England Power
New Hampshire Yankee
Niagara Mohawk Power
Northern Indiana Public Service
Ohio Edison

Electric Utilities and Independent Power Producers (continued)

Ohio Power
Ohio Electric Utility Institute
Ohio Valley Electric
Orange & Rockland Utilities
Pagnotti Enterprises
Pennsylvania Power
Pentech
Public Service of New Mexico
Reliant Energy
San Antonio Public Service Board
Sithe Energies
Union Electric
U.S. Generating
Utility Air Regulatory Group (UARG)
Wisconsin Power & Light

Chemical, Petroleum and Pharmaceutical

Allied Signal
ARCO Chemical
Aristech Chemical
Ashland Oil
Caribbean Petroleum
Chemical Manufacturers Association
Chevron
Ciba-Geigy
Coastal Corporation
Dow Chemical
DSM Copolymer
DSM Nutritional Products
Engelhard
Ethyl
Exxon USA
Exxon USA Marketing
Exxon Research & Engineering
Freeport-McMoRan
GAF
The Glidden
W.R. Grace
Hercules

Chemical, Petroleum and Pharmaceutical (continued)

Hoechst Celanese
ICI Americas
Johnson and Johnson
Kawecki Berylco Industries
Marathon Oil
Merck Chemical
Monsanto
Montana De Fibra
Morton Thiokol
Par Pharmaceutical
Placid Refining
Plantation Pipe Line
Premcor Refining Group
Pennzoil
Permacel
Pfizer
Phillips Petroleum
PMC Specialties
PPG Industries
Reckitt & Colman
Reichhold Chemicals
Rhone-Poulenc
Roche
Schering-Plough
Sika
Sun Refining and Marketing
Tenneco Miner
Texaco
Troy Chemical
United Refining
Virginia Chemicals
Yabucoa Sun Oil

General

Agfa
Alcoa
American Cyanamid
American Standard (Steelcraft Division)
Anheuser Busch
Borden (Columbus Coated Fabrics Division)
Campbell Soup
Critikon
Diamond Brands
ENSCO
Firestone Tire & Rubber
Ford Motor
Foster Wheeler
Franklin Industries
General Testing Laboratories
Glenshaw Glass
B.F. Goodrich
Goodyear Tire & Rubber
W. R. Grace
IBM
IT&T
Lederle Labs
Lehigh Portland Cement
Lone Star Industries
Lorbrook
Meadowbrook
Medical Manufacturing
NJV Industrial Services
Owens-Illinois
Pace Industries
PBI Medical Center
Polychrome
Poughkeepsie Asphalt
Procter & Gamble
Pure Air
Revere Smelting & Refining
St. Joe Minerals
The Business Roundtable
Viking Wire
White Consolidated Industries

Pulp and Paper

Dunn Paper
Fort Orange Paper
Hammermill Paper
Kimberly-Clark
Knomark
Marcal Paper Mills
MeadWestvaco
Nekoosa Papers
Procter & Gamble
Scott Paper

Government Agencies

Alaska Dept. of Environmental Conservation
Allegheny County Dept. of Health
Georgia Dept. of Natural Resources
Indiana Dept. of Environmental Management
Indianapolis, IN, Office of Environmental Services
Kentucky Division for Air Quality
Massachusetts Port Authority
Massachusetts Central Artery Project
Morris Township, NJ
New Jersey Dept. of Transportation
New Jersey Dept. of Environmental Protection
New York Dept. of Transportation
Pennsylvania Dept. of Transportation
Port Authority of New York and New Jersey
Texas Commission on Environmental Quality
Two Bridges Sewerage Authority
U.S. Army Corps of Engineers
U.S. Dept. of Energy
U.S. Environmental Protection Agency
U.S. Postal Service
Westchester County, New York