ENVIROPLAN CONSULTING

STATEMENT OF QUALIFICATIONS

Meteorological Analysis and Monitoring Services for the Wind Energy Industry

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SECTION 1: OVERVIEW OF COMPANY AND SERVICES

Enviroplan Consulting is one of the largest exclusively meteorological and air pollution consulting companies in the U.S. This Statement of Qualifications describes our resources for providing meteorological equipment, monitoring services, and wind resource analyses and other meteorological analyses for the wind energy industry. Since 1972, we have conducted over 3,000 meteorological and air pollution studies and monitoring programs for over 350 industrial and governmental clients.

Our current staff members are located in 15 offices and project locations as shown in Figure 1. We have provided our meteorological services in 26 states (Figure 2), Puerto Rico, and two foreign countries.

Our meteorological monitoring services for the wind energy industry include:

- Site evaluation
- System design
- Meteorological system assembly
- Meteorological sensor calibration services
- Equipment supply
- Installation
- Operation and maintenance
- Data acquisition, analysis and reporting
- Quality assurance
- Proprietary portable power supply systems for extended operation of lidar and sodar systems at remote locations

Our wind assessment services include:

- Initial site prospecting for wind farms
- Long-range radar and microwave interference studies for wind turbines

- Identifying sites satisfying wind resource, transmission line infrastructure, and other requirements
- Analyzing wind monitoring data
- Using various Measure Predict Correlate (MCP) algorithms to perform corrections of on-site measured data based on correlation with long-term reference data from a nearby weather station.
- Projecting wind monitoring data to blade environment and other nearby locations
- Optimizing wind turbine site locations while taking into consideration wake losses
- Completion of turbine vendor site suitability forms
- Analyzing wind resources and power output potential for project financing
- Quantifying power output uncertainties
- Conducting Viewshed and Shadow Flicker analyses
- Preparing project visual renderings on landscape photos
- Assessing noise and other environmental impacts
- Certifying results and preparing expert reports

Enviroplan Consulting began offering meteorological analysis services for the wind energy industry in 2007 and has provided similar meteorological analysis services to the electric power industry, other industries and government agencies for over 30 years.

In the wind energy industry, Enviroplan Consulting has supplied meteorological monitoring equipment including lidar-based meteorological monitoring systems with proprietary portable power supplies and provided meteorological analysis and/or wind energy analysis services to wind energy companies for projects in the Midwest, Northeast and Mid-Atlantic regions as well as in Texas and Alaska.

Table 1 provides a summary of selected experience in meteorological monitoring. We have conducted operation and maintenance, quality assurance, data analysis and reporting and auditing of over 140 meteorological towers with 1,079 meteorological parameters for over 3,900 parameter-years. Currently, we are operating monitoring programs including 77 meteorological parameters in 13 monitoring networks.

We provide these services from our Operations Center and Quality Assurance Laboratories in Fairfield, New Jersey and Atlanta, Georgia and with our on-site monitoring personnel located at each monitoring network.

Highly trained monitoring technicians carry out meteorological and air quality 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 Fairfield, NJ headquarters. This laboratory provides the NIST-traceable calibration/certification standards for all meteorological parameters including anemometer drive motors, torque measuring devices, azimuth test fixtures, barometric pressure standards, and thermometer standards.

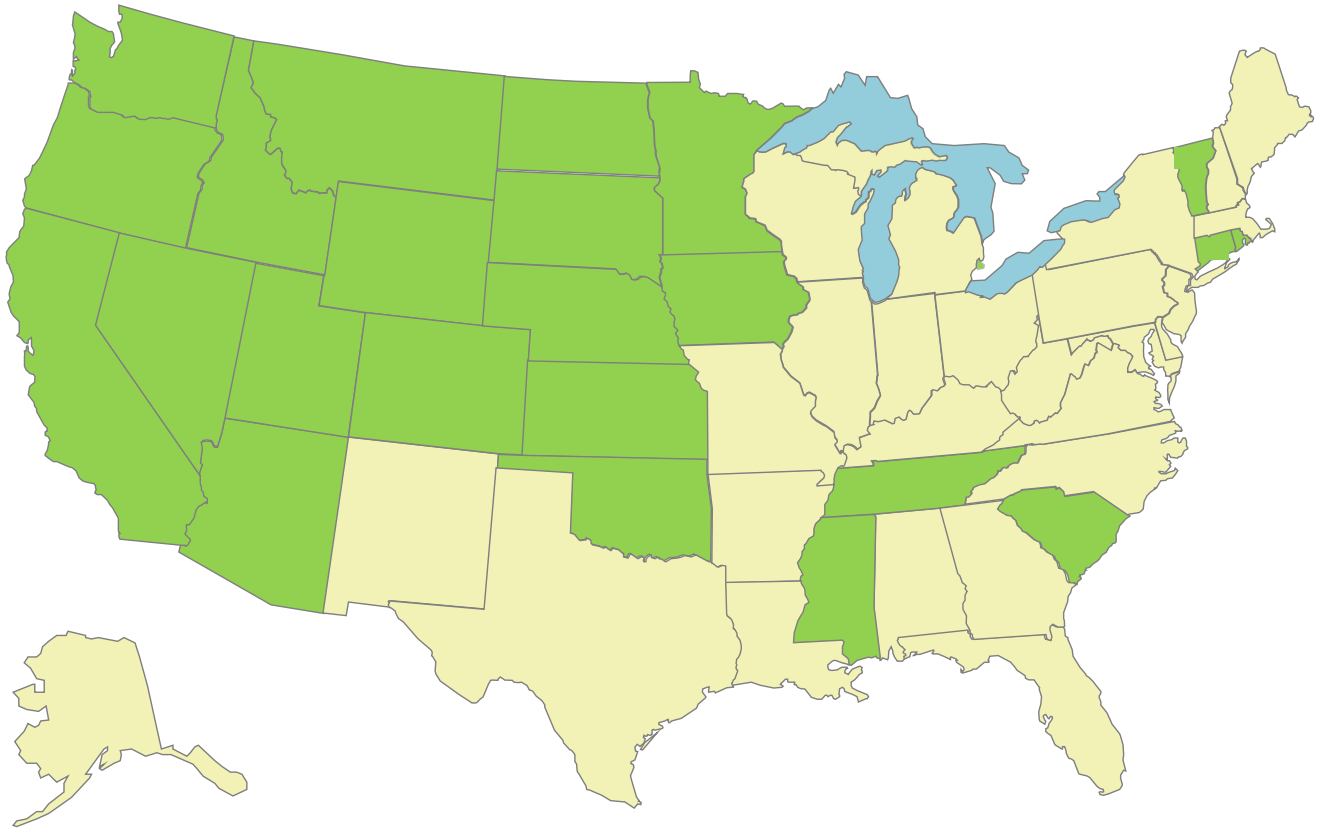
Our over 3,900 parameter-years of experience with meteorological monitoring include instrumentation from every major manufacturer as well as a wide range of state-of-the-art equipment.

The best evidence of the satisfaction of our clients with our meteorological monitoring services is the percent of valid data collection and the period of time our clients continue to use us for their monitoring needs. Every one of the over 140 meteorological towers and over 3,900 parameter-years of meteorological monitoring that Enviroplan Consulting has conducted has achieved or exceeded their valid quality assured data collection requirements and 97% of them continued using Enviroplan Consulting through completion of the contractor monitoring program even though these individual monitoring programs have operated for up to 16 years.

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; Atlanta, GA; Dune Acres, IN; Wheatfield, IN; Michigan City, IN; Detroit, MI; Tarrant, AL; Hueytown, AL; Brazoria, TX.	+
Greenhouse Gas Verification Services	Hingham, MA	●

FIGURE 2: LOCATIONS OF STATES WHERE ENVIROPLAN CONSULTING HAS PROVIDED AIR QUALITY AND METEOROLOGICAL MONITORING SERVICES



States shaded in yellow represent states where Enviroplan Consulting has provided air quality and meteorological monitoring services

Table 1: Number of Meteorological Parameters Monitored and Period of Monitoring				
Revision: 3/28/12				
			Total Number	Number of
	Period of		Meteorological	Meteorological
Network Name	**Operation**	**Years**	**Parameters**	**Parameter-Years**
Currently Operated				
ABC Coke	1998-Present	13	7	91
Apex Wind Energy Project Indiana	2009-Present	2	15	30
Apex Wind Energy Project Oklahoma	2010-Present	1	15	15
Apex Wind Energy Project Oklahoma	2010-Present	1	17	17
Apex Wind Energy Project Nevada	2011-Present	0.3	10	3
Apex Wind Energy Project Nevada	2011-Present	0.3	10	3
Marathon Petroleum	2011-Present	0.3	12	3.6
Walter Coke	2012 Start-Up	N/A	13	
Northern Indiana Public Service Co.	1991-Present	20	26	520
Oak Grove Resources, LLC: Concord Coal Preparation Plant	2009- Present	2	10	20
SubTotal			**135**	**702.6**
Other Networks Operated Since 1998				
BQE Alaska Wind Energy Project	2007-2008	1	9	9
BQE Ohio Wind Energy Project	2008-2009	1	9	9
MeadWestvaco Corporation	1997-2009	12	11	132
Pollution Control Financing Authority of Warren County	2007-2010	3	6	18
Steel Dynamics Bar Products Division	2003-2008	5	4	20
Steel Dynamics Structural Mill Division	2001-2009	8	4	32
Texas Commission for Environmental Quality (TCEQ)	2008-2011	3	6	18
Valero Coke and Flux Handling Facility	2002-2010	8	0	0
Valero Oil Refinery	2000-2006	6	6	36
Warren County NJ Air Monitoring Project	2002-2006	4	10	40
University of Texas at Austin: TexAQS II Monitoring Project	2005-2007	2	41	82
Conectiv Energy	2002-2005	3	0	0
Caribbean Petroleum Refining	1999-2000	1	7	7
City of Toledo, Ohio	2001	1	0	0
Plantation Pipeline	2005-2007	2	4	8
Lion Copolymer	2005-2006	2	2	4
Steel Dynamics -Butler	1998-2001	3	4	12
SubTotal			**68**	**153**
Other Networks Operated Since 1992				
American Electric Power	1992-1995	3	8	24
BHP Minerals - Hartley	1992-1994	2	7	14
BHP Minerals - Mali	1992-1996	4	7	28
Caribbean Petroleum Corporation	1991-1996	5	7	35
Central Hudson Gas and Electric	1987-1998	11	17	187
Chambers Works Cogeneration Project	1993-1994	1	3	3
DuPont Chambers Works-Post Construction	1992-1993	1	4	4
Georgia Department of Natural Resources	1998-1999	1	0	0
Indianapolis Power and Light Company-Marion	1995-1996	1	3	3
Indianapolis Power and Light Company-Partriot	1991-1993	2	0	0
Indiantown Cogeneration Project	1994-1996	2	3	6
Keystone Cogeneration- Post Construction	1993-1994	1	0	0
Long Island Lighting Co. - Keyspan	1992	1	16	16
NARSTO Northeast	1995-1996	1	63	63
Pittsburgh Plate Glass-Circleville	1986-1994	8	7	56
Washington University Medical School	1993	1		0
Texas Air Control Board	1993	1	60	60
SubTotal			**205**	**499**

Network Name	Period of Operation	Years	Total Number Meteorological Parameters	Number of Meteorological Parameter-Years
Other Networks Operated Prior to 1992				
Allegheny Power Systems	1988	1	4	4
Allied Chemical	1980-1981	1	3	3
Arkansas Power and Light	1983-1984	1	5	5
Ashkelon Regional Assoc. of Towns for Env. Quality - Israel	1990	1	0	0
Baltimore Gas and Electric	1980-1981	1	0	0
Bath Iron Works	1990-1991	1	3	3
Breed Corporation	1985	1	0	0
Champion International	1987	1	7	7
Cincinnati Gas and Electric-Eastbend	1978-1985	7	0	0
Cincinnati Gas and Electric-Miami Ft/Beckjord	1975-1983	8	0	0
Cincinnati Gas and Electric-Zimmer	1984-1985	1	11	11
City Public Service Board of San Antonio	1981-1983	2	12	24
Cleveland Electric Illuminating-Avon Lake	1976-1989	13	21	273
Cleveland Electric Illuminating-Eastlake	1977-1982	5	24	120
Cleveland Electric Illuminating-Ashtabula	1976-1984	8	6	48
Cleveland Electric Illuminating-Lakeshore	1976-1984	8	0	0
Cleveland Electric Illuminating-Monitoring/Modeling Validation Study	1980-1981	1	18	18
Consolidated Edison	1979-1982	3	12	36
Consumers Power Company	1984	1	10	10
Cooperative Power	1981-1982	1	9	9
County of Westchester	1986	1	4	4
Dallas Independent School District	1981-1982	1	0	0
Dayton Power and Light	1982	1	4	4
DuPont Chambers Works-Pre Construction	1989-1990	1	4	4
Duquesne Light Company	1980-1984	4	8	32
Ferro Corporation	1987-1988	1	0	0
Ford Motor Company	1986	1	0	0
Foster Wheeler Power Systems, Inc.	1985-1986	1	0	0
SubTotal			**165**	**615**
Other Networks Operated Prior to 1992				
Freeport Sulfur Co./Duval Corp.	1985	1	4	4
Keystone Cogeneration- Pre Construction	1990-1991	1	0	0
Manner Textile Processing	1985	1	0	0
Marathon Oil	1980-1981	1	5	5
Massachusetts Port Authority	1985-1990	5	3	15
New England Power Company	1980-1983	3	12	36
New York State DOT	1974	1	4	4
Ohio Edison- Edgewater	1979-1982	3	20	60
Ohio Edison-Gorge	1979-1982	3	6	18
Ohio Edison-Niles	1982-1983	1	3	3
Ohio Edison Company-Burger/Sammis	1989-1991	2	10	20
Ohio Edison Company-Burger/Sammis	1978-1980	2	22	44
Ohio Edison/Penn Power Company-Mansfield/New Castle	1989-1991	2	22	44
Orange and Rockland Utilities - Bowline	1978-1983	5	20	100
Orange and Rockland Utilities - Lovett	1986-1991	5	0	0
Pennsylvania Power Company-Mansfield/New Castle	1982-1983	1	14	14
Pittsburgh Plate Glass-Barberton	1980-1982	2	2	4
Plaza Humaco Mall	1990	1	4	4
Public Service of New Hampshire	1980-1983	3	8	24
Public Service of New Mexico	1984	1	16	16
Public Service of Indiana	1983-1985	2	20	40
Public Service of Indiana	1981-1982	1	0	0
Taiwan Power Company	1988	1	0	0
Union Electric Company	1986	1	8	8
United Engineers and Constructors	1989-1990	1	11	11
Wisconsin Power and Light Company-Edgewater/Lakeshore	1976-1991	15	16	240
SubTotal			**230**	**714**
TOTALS			**803**	**2,684**

SECTION 2: CAPABILITIES OF KEY PERSONNEL

Following are descriptions of Enviroplan Consulting key personnel in our meteorological consulting and monitoring businesses for the wind energy industry. Table 2 presents a summary of the capabilities and experience of our principal professional staff. Appendix A presents the resumes of key professional staff involved in our wind energy and meteorological consulting and monitoring programs.

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
Jack Kline, CCM (contractor)
John Bewick, D.B.A.
Linda M. Quigley
Julia Shannon, E.I.T.
Ganesh Srinivasan
Tanya White

Monitoring Division

David Cummings, Vice President
Thomas Ferrebee, Quality Assurance Manager
Kathleen M. Stanwood, Data Analysis and Reporting Manager
David Arbanes
William Deramus
Devin Odom
Kevin Ruggiero
Michael Shuman
John Williams

Enviroplan Consulting's 37 years of experience with meteorological consulting and monitoring programs has made clear that the most important key to success in achieving the client's objectives is to have the best staff conducting meteorological consulting studies and directing and operating the meteorological monitoring program, where best is measured by the knowledge, experience, track record of performance, training and education of each staff member as indicated in Table 2.

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Table 2: Enviroplan Consulting Key Personnel							
Name	**Position**	**Years Exp.**	**Education**	**States with Experience**	**Areas of Expertise**	**Registrations and Licenses**	**Office Location**
Environmental Studies Division							
Howard Ellis	President and Project Manager	40	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	Meteorological analyses of wind fields. Senior reviewer for wind resource feasibility studies. Other meteorological modeling.	Qualified Environmental Professional	Wayne, NJ
Allen Dittenhoefer	Senior Vice President and Project Manager	33	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	Reviewer of wind resource assessments. Meteorological modeling. Atmospheric chemistry, aerosol physics, and atmospheric visibility assessments.		Birmingham, AL
Michael Hirtler	Vice President and Project Manager	27	B.S. Meteorology Graduate Courses in 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	Wayne, NJ
Jack Kline	Contractor	30	M.S. Geophysical Sciences B.S. Meteorology	Throughout the U.S.	Certified Consulting Meteorologist (AMS #535) working in the wind energy industry since 1982.	Certified Consulting Meteorologist	Brentwood, CA
John Bewick	Senior Engineer	25	B.S. Engineering Physics, M.S. Nuclear Science, M.B.A., D.B.A	Throughout the U.S.	Development of environmental management processes and systems, environmental assessments and audits, greenhouse gas emissions inventory development. Review of meteorological data and meteorological modeling.		Hingham, MA
Linda Quigley	Staff Scientist	16	B.A. Geography and Environmental Studies	IN	Data analysis and reporting and quality assurance for meteorological and air quality monitoring networks.		Wayne, NJ

Table 2 (continued)

Name	Position	Years Exp.	Education	States with Experience	Areas of Expertise	Registrations and Licenses	Office Location
Environmental Studies Division							
Julia Shannon	Engineer	7	B.S. Chemical Engineering	IN, AK	Meteorological modeling. Meteorological data review. Air quality permit preparation.	Engineer in Training	Wayne, NJ
Ganesh Srinivasan	Engineer	9	M.S. Civil & Environmental Engineering B.E. Instrumentation and Control	FL, OH, IN, IL	Meteorological modeling using MM5 regional meteorological data. Regional air pollution modeling using the CAMX numerical model for modeling 8-hour ozone and 24-hour and annual PM2.5 concentrations.		Indianapolis, IN
Tanya White	Wind Resource Analyst/ Scientist	8	B.S. Environmental Science and Physical Geography	AK, NY, TX, IN	Certified in WindPRO. Certified in MAPINFO Geographical Information Systems (GIS). Performs wind resource assessments, wind project feasibility studies, noise, flicker, and shadow analyses, wind farm photo renderings, and data analysis, radar interference assessments and other analyses for wind energy projects.		Gander, NL (Canada)

Table 2 (continued)

Table 2: Enviroplan Consulting Key Personnel							
Name	**Position**	**Years Exp.**	**Education**	**States with Experience**	**Areas of Expertise**	**Registrations and Licenses**	**Office Location**
Air Quality Monitoring Division							
Dave Cummings	Vice President and Project Manager	27	Associates of Applied Science, Electronics	AK, AL, DE, FL, GA, IL, IN, MA, ME, MI, NH, NJ, NY, OH, PA, PR, TX, VA, WI, WV	Design of monitoring programs, systems and networks; management of monitoring operations; preparation of Monitoring Plans, Quality Assurance Plans and Standard Operating Procedures; liaisons with public, private and regulatory agencies and organizations.		Wayne, NJ
Thomas Ferrebee	Manager	13	B.S. Electronic Engineering Technology	GA, IN, VA, NY, DE, OH, AL	Manages meteorological monitoring operations, performs auditing of monitoring operations, and training in operation of monitoring instrumentation.		Wayne, NJ
Kathy Stanwood	Manager	32	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 wind data analyses and reporting in support of meteorological monitoring.		Wayne, NJ
David Arbanas	Monitoring Technician	6	Certificate-Electronics Technology	IN	Operation and maintenance of meteorological monitoring networks.		Michigan City, IN
Wilbert Deramus	Monitoring Technician	0.5	Associates of Applied Science, Electronics	MI	Operation and maintenance of meteorological monitoring networks.		Dearborn, MI
Devin Odom	Monitoring Technician	0.3		AL	Operation and maintenance of meteorological monitoring networks.		Birmingham, AL
Kevin Ruggiero	Sr. Monitoring Engineer	4	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.		Wayne, NJ
Michael Shuman	Monitoring Technician	0.5	Associates of Applied Science, Electronics (BSEE in progress)	MI	Operation and maintenance of meteorological monitoring networks.	FCC General Radiotelephone Operator/Ship	Dearborn, MI
John Williams	Monitoring Engineer	3	B.S. Electrical Engineering Technology	AL	Operation and maintenance of meteorological monitoring networks.	FCC General Radio and Telegraph	Hueytown, AL

APPENDIX A: RESUMES OF KEY ENVIROPLAN CONSULTING PROFESSIONAL STAFF PROVIDING METEOROLOGICAL CONSULTING SERVICES AND MONITORING PROGRAMS TO THE WIND ENERGY INDUSTRY

Dr. Howard Ellis

David Cummings

Kathleen Stanwood

Michael Hirtler

Kevin Ruggiero

Linda Quigley

Dr. Al Dittenhoefer

Jack Kline

Thomas Ferrebee

Ganesh Srinivasan

Tanya White

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

AREAS OF SPECIALIZATION

President of Enviroplan Consulting. Senior consultant with 40 years of experience including experience in wind resource assessments, turbine site suitability studies and meteorological monitoring programs for wind developers and the electric power industry. Other experience includes air pollution meteorological studies on local and regional scales relating to the dispersion of air pollutants, development and application of atmospheric diffusion models, air pollution permitting, air quality and meteorological monitoring; and development of risk management plans and environmental management systems. Current focus also includes Greenhouse Gas (GHG) emissions inventory development and the validation and verification process for GHG assertions. Also familiar with Renewable Energy Credit assertions and potential for verification for wind energy projects.

EXPERIENCE

Senior executive in overall in charge of meteorological monitoring programs that have been conducted by Enviroplan since 1972 with over 140 meteorological towers and 1,079 meteorological parameters for over 3,900 parameter-years. Currently, we are operating monitoring programs including 77 meteorological parameters in 13 monitoring networks.

Project Manager and Technical Reviewer of several wind resource assessments for wind developers and the electric power industry including wind resource prospecting and full wind resource analyses. Work included wind resource analysis using WindPro for an Enviroplan client's electric power plant site with multiple years of on-site 100 meter meteorological data.

For major wind developer, conducted turbine site suitability analysis using multiple years of meteorological data for use in confirming the turbine to be selected for the site.

Project Manager and Principal Investigator for the American National Standards Institute on a project to develop an ANSI accreditation program for validation and verification bodies for GHG assertions in accord with ISO 14065.

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.

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.

Project manager for contract with state air pollution control agency in the Southeast to operate the majority of the state's air quality and meteorological monitoring program including numerous meteorological towers and 19 continuous monitors for ozone, NOx, SO_2,and CO; 19 PM10 monitors; 29 PM2.5 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 base don consideration of local meteorological conditions 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.

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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 SO_2 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 SO_2 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

Member of The Climate Registry, Expert Panel for Development of the Electric Power Company GHG Emissions Inventory Protocol; 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; Current Member and Former Chairman, Critical Review Subcommittee of Publications Committee, Air and Waste Management Association; Former Chairman, Meteorology Committee, Air and Waste Management Association.

DAVID S. CUMMINGS

AREAS OF SPECIALIZATION

Vice President, Monitoring Division. Responsible for overall management of meteorological and ambient air monitoring projects. Experienced in project management, quality assurance, ambient air quality and meteorological monitoring (all facets).

PROJECT EXPERIENCE

Project Manager responsible for network and monitoring system/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:

APEX Wind Energy, Inc. Project Manager for the design and installation of three multi-level meteorological monitoring systems for wind resource assessment projects. Also Project Manager for data acquisition, data processing, quality assurance and reporting of meteorological data reported from five tall towers for wind energy resource assessment projects at various locations within the US.

BQ Energy. Supplied and installed two NRG 60m XHD meteorological monitoring towers for wind energy resource assessment projects located in Nikiski, AK and Cleveland, OH. Also, Project Manager for data acquisition, data processing, quality assurance and reporting of the meteorological data reported from these towers.

BP Wind Energy, North America. Project Manager for the design, construction and delivery of two portable power systems to provide reliable, continuous power for autonomous, long-term operation of LiDAR instruments operated in remote locations. Additionally has managed LiDAR deployments and supply of on-going field maintenance support services for these instruments.

Marathon Petroleum Company. Project Manager for design, supply, installation, startup and provision of on-going comprehensive support services for a five-station ambient air quality and meteorological monitoring network in support of a major expansion of capacity at the Marathon Petroleum refinery in Detroit, MI. Monitoring parameters at all sites include continuous measurement of SO2, CO, Total Reduced Sulfur (TRS) and episodic sampling of VOCs via US EPA Compendium Method TO-15. Two meteorological monitoring systems monitor wind speed, wind direction, the standard deviation of the wind direction, ambient air temperature, relative humidity and barometric pressure. Support services include complete operation and maintenance, quality control and calibration, quality assurance audits, data management, processing, validation and reporting. Also managed the design and on-going maintenance of a publically-accessible website with near real-time and historical reporting of the data produced by the monitoring network and associated Air Quality Index (AQI) values.

Valero Energy Corp. A six-station monitoring program for PSD in support of a coke-fired power generating plant and petroleum refinery in Delaware. Parameters include SO_2, NO-NO_2-NO_x, CO, O_3, TSP, PM_{10} and various meteorological monitors.

Texas Commission for Environmental Quality. A single continuous air monitoring station (CAMS) in Brazoria County operated for the Texas Commission for Environmental Quality (TCEQ) measuring NO-NO_2-NO_x, O_3 and various meteorological monitors. The station incorporates real time remote data transmission and calibration status signals posted to a website maintained by the TCEQ.

University of Texas at Austin, TX. Over a 14-month interval (2006-2007), supervised and reported results of three separate "rounds" of independent quality assurance audits on 13 monitoring stations representing 11 ozone monitors, 9 nephelometers, 11 relative humidity monitors, and 8 meteorological monitoring systems operated for the Texas Commission for Environmental Quality (TCEQ) in support of the Texas Air Quality Study II (TexAQS II) monitoring project.

NARSTO-Northeast. Auditor of 15 NARSTO air quality and meteorological monitoring sites throughout the Northeastern US and Canada. Planned, conducted and reported results of quality assurance systems and performance audits for all ground- and aircraft-based air quality and meteorological monitors contributing to the NARSTO-Northeast 1995-1996 field campaign.

Plantation Pipeline. Supplied, installed and operated a two-station air quality and meteorological monitoring network. Parameters include two 10-meter meteorological towers; two continuous hydrocarbon (HC) monitors measuring non-methane HC, methane and total HC; and VOC canister samples for which laboratory speciation analysis is conducted for 43 speciated compounds. Monitoring system design included automatic collection of episodic VOC samples when ambient HC concentrations became elevated.

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, SO_2,and CO; 19 PM_{10} monitors; 29 $PM_{2.5}$ monitors; and about 60 air toxics samplers for trace metals, VOC, SVOC, lead and carbonyls. 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, initiating and operating the statewide $PM_{2.5}$ 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 SO_2 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 SO_2, 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, four of which were 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 SO_2, NO-NO_x, PM_{10}, and meteorological monitoring.

Caribbean Petroleum Corporation. Four-station monitoring network, including three SO_2 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 SO_2 conditions via telemetry to refinery control center for corrective action and process control.

E.I. DuPont de Nemours. A four-station, multi-year monitoring study. The network was installed and operated in support of permitting for construction of a rotary kiln waste incinerator and secure landfill to be operated in conjunction with a large chemical facility in southern New Jersey. Parameters include SO_2, NO-NO_2-NO_x, PM_{10}, TSP, meteorological data, and a multi-media program for air toxics monitoring, including metals, organic matter, VOCs, SVOCs (dioxins and furans) and mercury vapor.

Orange and Rockland Utilities. A 13-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 SO_2 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.

GENERAL

Mr. Cummings has directed project teams conducting environmental 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 sectors.

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

MICHAEL F. HIRTLER, CCM

AREAS OF SPECIALIZATION

Vice President with 27 years consulting experience in Enviroplan Consulting's Environmental Studies Division. Areas of specialization include use of meteorological monitoring data in applications to predict air pollution concentrations and, evaluation of suitability of meteorological monitoring stations and selection of best available sites for targeted meteorological analyses including wind resource analyses. 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.

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 PERMITTING EXPERIENCE INCLUDING AIR QUALITY MODELING

Alaska Department of Environmental Conservation. Project Manager to assist ADEC in the evaluation of the adequacy of the meteorological monitoring data collected and being used for purposes of completeness and for purposes of making regulatory determinations in terms of data validity. Such data is used to make major permit decisions involving substantial costs to permit applicants and holders.

FirstEnergy Corp. Project Manager for many air permitting projects over the past 25 years. Many projects involved meteorological tower data site suitability analyses to determine if the monitored data accurately monitored the local meteorological data for use in wind speed, wind direction and air pollution concentration prediction. with projects involving major source modification at an existing power station and a new greenfield power station.

Selected Electric Power Companies. Conducted air quality modeling using up to five years of hourly meteorological data collected either on site or at a nearby location. First evaluated the adequacy of the meteorological data being used.

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 SO_2 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, applicability of available meteorological data, 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.

SELECT AIR QUALITY MODELING EXPERIENCE

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 PM2.5 emitting sources developed for each facility in support of each plant's PM2.5 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.

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 SO_2 SIP allowable emission rates for the W. H. Sammis

Power Plant. Performed detailed interactive modeling of the power plant with other SO_2 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.

Bethlehem Steel Corp. Project Manager for PSD permitting study to modernize melt shop operations and increase SO_2 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 SO_2. 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.

PUBLICATIONS

Ellis, H.M., Thotakura, R., Pan, S. and Hirtler, M. (2004), "Permitting Practices, Resources and Performance of State Air Pollution Control Agencies", Air & Waste Management Association Annual Meeting 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

KATHLEEN M. STANWOOD

AREAS OF SPECIALIZATION

Manager of Data Management Department, Monitoring Division. Fully versed in all phases of data analysis, reduction, validation and report preparation, including wind resource assessment studies and 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

APEX Wind Energy, Inc. Data Manager for data acquisition, data processing, quality assurance and reporting of multi-level meteorological data reported from five tall towers for wind energy resource assessment projects at various locations within the US.

Clipper Wind Development. Review and validation of a five-year set of meteorological data collected from several tall towers located in complex (mountainous) terrain. Following validation, data were analyzed for a wind turbine siting suitability study.

BQ Energy. Data Manager for data acquisition, data processing, quality assurance and reporting of multi-level meteorological data reported from two tall towers for wind energy resource assessment projects located in Nikiski, AK and Cleveland, OH.

Marathon Petroleum Company. Data Manager for a five-station ambient air quality and meteorological monitoring network in support of a major expansion of capacity at the Marathon Petroleum refinery in Detroit, MI. Monitoring parameters at all sites include continuous measurement of SO2, CO, Total Reduced Sulfur (TRS) and episodic sampling of VOCs via US EPA Compendium Method TO-15. Two meteorological monitoring systems monitor wind speed, wind direction, the standard deviation of the wind direction, ambient air temperature, relative humidity and barometric pressure. Data management services include data acquisition, processing, validation, reporting and on-going maintenance of a website with near real-time and historical reporting of the data produced by the monitoring network and associated Air Quality Index (AQI) values.

Alaska Department of Environmental Conservation. Principal Investigator and Project Manager for multiple projects involving the review of ambient air quality and meteorological data, data reports and Quality Assurance Project Plans (QAPPs) submitted by air permit applicants for projects requiring air dispersion modeling evaluation. Work entails comparison of the data against quality control and quality assurance criteria established by ADEC and US EPA

to determine if reported data conform with PSD (Prevention of Significant Deterioration) data quality criteria. QAPP review is performed to ensured compliance with the ADEC and US EPA air quality and meteorological monitoring program QA/QC requirements and guidance. Prepare and submit Draft and Final Findings Reports.

Texas Commission for Environmental Quality. A single continuous air monitoring station (CAMS) in Brazoria County operated for the Texas Commission for Environmental Quality (TCEQ) measuring NO-NO_2-NO_x, O_3 and various meteorological monitors. The station incorporates real time remote data transmission and calibration status signals posted to a website maintained by the TCEQ.

Valero Energy Corp. A six-station monitoring program for PSD in support of a coke-fired power generating plant and petroleum refinery in Delaware. Parameters include SO_2, NO-NO_2-NO_x, CO, O_3, TSP, PM_{10} and various meteorological monitors.

Warren County, NJ Air Monitoring Program. Responsible for the daily acquisition of air quality and meteorological data from 3 sites. Provide the data analysis and the monthly, quarterly and annual reports to the New Jersey Department of Environmental Protection and Roche Vitamins in the Belvidere, NJ area. Parameters measured are SO_2, continuous $PM_{2.5}$, volatile organic hydrocarbons and their speciated compounds, mercury deposition, and various meteorological parameters. 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 being used in a large health effects study.

Georgia Department of Natural Resources. Responsible for the daily acquisition of air quality and meteorological data from 29 sites. Provide the data analysis for continuous parameters and the gravimetric analysis for episodic PM_{10} samplers along with the monthly reports to the Georgia Department of Natural Resources. Parameters included 19 continuous monitors for O_3, NOx, SO_2, and CO; 19 PM_{10} monitors; and 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl.

Plantation Pipeline. Responsible for all daily acquisition of air quality and meteorological data. Provide the data analysis and the monthly, quarterly and annual reports. Parameters include a two station air quality and meteorological monitoring network consisting of two 10-meter meteorological towers; two continuous hydrocarbon (HC) monitors continuously measuring non-methane HC, methane and total HC; and HC canister samples for which laboratory speciation analysis is conducted for 43 speciated compounds.

NiSource. Responsible for the daily acquisition of air quality and meteorological data from 8 sites in 3 different networks in Indiana. Provide the data analysis, gravimetric analysis and the monthly, quarterly and annual reports to Ni Source and the Indiana Department of Environmental Management. Parameters measured are SO2, PM_{10} and various multi-level meteorological parameters.

Westvaco Corporation. Responsible for the daily acquisition of air quality and meteorological data from 3 sites. Provide the data analysis, gravimetric analysis and the monthly and quarterly reports to Westvaco Corporation. Parameters measured are SO_2, H_2S, PM_{10}, TSP and various meteorological parameters.

Orange and Rockland Utilities, Inc. Data Manager for SO_2 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 SO_2 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 SO_2, $NO\text{-}NO_2\text{-}NO_x$, PM_{10} 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 SO_2, $NO\text{-}NO_2\text{-}NO_x$, PM_{10}, 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, Caribbean 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, data processing validation and reporting for numerous meteorological monitoring installations as well as air pollution monitoring stations, including SO_2, NO_x, CO, O_3, TSP, PM_{10}, methane and non-methane hydrocarbons and air toxics pollutants. 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, wind resource assessment studies and executive summaries.

Has overseen development of proprietary software allowing automated quality assurance review of meteorological monitoring data collected in support of wind resource assessment studies.

EDUCATION

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

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

Apex Wind Energy. Design, assemble, test and install three meteorological monitoring systems for wind resource assessment projects. Monitoring systems typically include eight anemometers, two wind direction monitors, ambient air temperature, temperature difference, relative humidity and barometric pressure. Wind and temperature monitors are deployed on retractable booms at multiple levels on 80 to 100 meter tall towers. System includes data acquisition system and data transmission. Project work includes support for data acquisition, data management and data validation.

BQ Energy. Assisted in the supply and installation of a NRG 60m XHD meteorological monitoring tower for wind energy resource assessment projects located in Cleveland, OH.

BP Wind Energy, North America. Assisted in the design, construction and delivery of two portable power systems to provide reliable, continuous power for autonomous, long-term operation of LiDAR instruments operated in remote locations. Also assisted in LiDAR deployments and provided on-going field maintenance support services for these instruments.

Proprietary Software Development. Participated in the development and testing of automated data processing software developed in support of quality-assurance screening for meteorological data collected in conjunction with wind resource assessment studies.

Walter Coke. Installed, tested, performed startup calibrations, trained local field operator and provides on-going supervision of field operations for a single meteorological monitoring station located in Birmingham, AL. Monitoring parameters include horizontal wind speed, vertical wind speed, horizontal wind direction, sigma theta (the standard deviation of the wind direction), ambient air temperature at two heights: 2m and 10m, temperature difference, relative humidity, barometric pressure, solar radiation and precipitation.

Marathon Petroleum Company. Assisted with assembly, testing, installation, startup, training of local field operators and on-going supervision of field operations for a five-station ambient air quality and meteorological monitoring network in support of a major expansion of capacity at the Marathon Petroleum refinery in Detroit, MI. Monitoring parameters at all sites include continuous measurement of SO2, CO, Total Reduced Sulfur (TRS) and episodic sampling of VOCs via US EPA Compendium Method TO-15. Two meteorological monitoring systems

monitor wind speed, wind direction, the standard deviation of the wind direction, ambient air temperature, relative humidity and barometric pressure. Support services include complete operation and maintenance, quality control and calibration, quality assurance audits, data management, processing, validation and reporting.

Alaska Department of Environmental Conservation (ADEC). Principal Investigator responsible for the review of multiple Quality Assurance Project Plans (QAPP) submitted by applicants to ADEC for ambient air, particulate matter and meteorological monitoring programs. Reviewed the QAPP 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.

Texas Commission for Environmental Quality. A single continuous air monitoring station (CAMS) in Brazoria County operated for the Texas Commission for Environmental Quality (TCEQ) measuring NO-NO_2-NO_x, O_3 and various meteorological monitors. The station incorporates real time remote data transmission and calibration status signals posted to a website maintained by the TCEQ.

Northern Indiana Public Service Company (NIPSCO). Senior Monitoring Engineer responsible for conducting independent performance audits on four-station air quality and meteorological monitoring network that includes three SO_2 monitors and meteorological monitors for wind speed, wind direction, temperature, temperature difference and dew point. Meteorological monitors are installed at multiple levels on three tall towers 60 to 100 meters in height. Project work includes data acquisition, supervision of network operation and maintenance, data management and data validation.

Valero Energy Corp. 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 PM_{10}, 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 SO_2 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 SO_2, NO_x, CO, O_3, TSP, PM_{10}, 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

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 SO_2, NO_x, CO, O_3, NMHC analyzers, PM_{10} 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.

ALLEN C. DITTENHOEFER, Ph.D.

AREAS OF SPECIALIZATION

Senior Vice President of the Environmental Studies Division. Dr. Dittenhoefer has 30 years of experience as an environmental consultant in areas including estimation of toxic air emissions and other chemical releases from complex mobile and stationary sources, atmospheric dispersion modeling, long range transport, atmospheric chemistry, aerosol physics, 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, storage tanks, equipment components and surface impoundments; complex area and volume sources; air pollution control systems; licensing of cogeneration facilities, including multi-disciplinary impact assessments; plume transport and diffusion in hilly terrain and in lakeshore environments; dispersion model development and evaluation; ozone chemistry and transport; long range and mesoscale transport; air quality and precipitation chemistry trends; plume sulfur chemistry; and coal sulfur variability. Selected project experience includes:

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 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 Bethlehem Steel, Consolidated Natural Gas Transmission, Acme Steel, Gulf States Steel, Koppers Industries, Sloss Industries, Shenango, Laclede Steel, and ABC Coke.

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.

Several Industrial Companies: Project Manager on numerous projects to conduct equipment leak testing of equipment components, analyze the resulting data, and develop emission rates from these source categories.

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., SO_2, H_2S, 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 SO_2 NAAQS attainment of alternative SO_2 emission limit compliance methods. These studies involved the simulation of short-term SO_2 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 SO_2 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 SO_2 emissions trends in Eastern North America. The objectives of this study were to 1) investigate the relative importance of meteorological versus SO_2 emissions with respect to precipitation sulfate concentrations, 2) examine the relative importance of local versus distant SO_2 source regions on sulfate concentrations, and 3) estimate the degree of linearity between regional SO_2 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 SO_2 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.

PUBLICATIONS

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 PM2.5 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 SOCMI 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 SO_2 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 SO_2 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 SO_2 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
  AB 3 Meteorology Committee
  EI 6 Iron and Steel Committee
  ITF 2.1 Sources and Emission Characterization Committee
American Meteorological Society
Phi Kappa Phi
Chi Epsilon Pi
Sigma Xi

Jack Kline

Certified Consulting Meteorologist
RAM Associates
55 Cloverleaf Circle
Brentwood, CA 94513

SERVICE CAPABILITIES

* Comprehensive wind energy resource assessment.
* Wind prospecting and site selection (experience in USA, Mexico, Honduras, Nicaragua, Costa Rica, Peru, UK, Crete).
* Installation of wind monitoring equipment. Data QA, archival and analysis.
* Wind park micrositing. Array wake effects modeling and analysis.
* Theoretical energy calculations. Turbine array optimization. Long-term energy projections.
* Turbine performance analysis.
* Expert testimony.
* Due Diligence Review

PROFESSIONAL EXPERIENCE

1989 - Present Consulting Meteorologist

1986 - 1989 Meteorologist, Howden Wind Parks Inc., Dublin, CA

* Micrositing expert.
* Wind park annual energy projections.
* Analysis of macro-scale wake effects.
* Wind turbine performance analysis.
* Wind park performance modeling.
* Long-term wind speed modeling based on climatological indicators.
* Wind park wake tests/analysis.
* Turbulence research.

1982 - 1986 Meteorologist, US Windpower, Inc., Livermore, CA

* Detailed resource assessment for USW wind turbine projects.
* Approximately 2000 turbines (~200 MW capacity) sited.
* Wind park energy projections.
* Post-installation wind park efficiency assessment.
* Turbine performance analysis.
* Turbine wake effects analysis.
* Wind plant performance modeling.
* 50+ hourly anemometer data sites operated concurrently.

1981 - 1982 Systems Specialist, Intertech, Jidda, Saudi Arabia

* Maintenance of Objective Analysis meteorological software. * Upgrade of meteorological Graphics software.
* Training of Saudi nationals.

EDUCATION

Master of Science in Geophysical Sciences, Atmospheric Sciences Program - Georgia Institute of Technology, 1981.
Bachelor of Science in Meteorology - Florida State University, 1977.

PUBLICATIONS

J. Kline, “Effects of Tubular Anemometer Towers on Wind Speed Measurements”, Windpower ’02 Proceedings, Portland, OR, May 2002
J. Kline and A. Mikhail, “Field Comparison of the Maximum Cup, Climatronics and Met One Anemometers”, Windpower ’99 Proceedings, Burlington, VT, June 1999
J. Kline and M. Milligan, “An Evaluation of Hourly Average Wind Speed Estimation Techniques”, Windpower ’98 Proceedings, Bakersfield, CA, April 1998
J. Kline, "Recent Experience With the NOABL Model in Highly Complex Terrain", Windpower ’93 Proceedings, San Francisco, CA, July, 1993.
J. Kline, "Revenue Enhancements due to Enerpro Controller", Windpower ’91 Proceedings, Palm
Springs, CA, September, 1991.
J. Kline, "Turbulence Increases due to Wind Turbines on an Operating Wind Park", Windpower ’89 Proceedings, San Francisco, CA, September, 1989.
R. Nierenberg and J. Kline, "Macro-Scale Wake Effects", Independent Energy, April, 1989.
R. Nierenberg and J. Kline, "Macro-Scale Wake Effects", WindStats Newsletter, Spring, 1989.
J. Kline, "Turbulence Characteristics at Howden Wind Park I", Windpower ’88 Proceedings, Honolulu, HI, September, 1988.
J. Kline, "Measurement Realities in the Altamont Pass of California", Proceedings of the BWEA Siting Symposium, East Kilbride, Scotland, September, 1987.
E. Davis, J. Kline and E. McCarthy, "Meteorological and Topographical Influences on Wind Power in the Altamont Pass", Proceedings of the Fourth ASME Wind Energy Symposium, Dallas, TX, February, 1985.

PROFESSIONAL AFFILIATIONS

Certified Consulting Meteorologist - #535 American Meteorological Society; Corporate Member - American Wind Energy Association (AWEA); Member - AWEA Siting Standards Committee; Member - American Meteorological Society.

THOMAS FERREBEE III

AREAS OF SPECIALIZATION

Quality Assurance Coordinator and Senior Air Pollution and Meteorological Monitoring Engineer. Perform quality assurance audits and acceptability tests on air pollution and meteorological 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, Dichotomus Air Sampler, PM10 Hi-Vol Air Sampler, TSP-1 Air Sampler, AVOCS Sampler, Beta Attenuation Monitor; Thermo Environmental Instruments (TECO) Gas Analyzers: SO_2, CO, NO_x, R&P Partisol PM10 Sampler, TEOM PM10 Sampler; CSI 1700 Gas Dilution Calibrator.

PROJECT 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, SO_2, 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

JAMES R. MAHONEY, Ph.D.

AREAS OF SPECIALIZATION

Dr. Mahoney focuses on research in the basic atmospheric sciences; consultation on planning and design of air pollution prevention and greenhouse gas emission limitation systems including wind energy mitigation projects; and international climate management advisory studies conducted in approximately 45 nations throughout the world. Following his retirement in 2006 as Deputy Director of the National Oceanic and Administration as Director of the U.S. Climate Change Science Program, he joined Enviroplan Consulting on a part time basis.

EXPERIENCE

He has committed approximately seven and one half years to the leadership of two major international programs involving key contributions by the government of the United States. He was appointed by President Reagan to be Director of the U.S. Acidic Deposition Assessment Program in January 1988, serving until the completion of the program in early 1991. In 2002 he was appointed by President Bush to be Director of the U.S. Climate Change Science Program, involving thirteen federal agencies and annual budgets of approximately $2 billion through April 2006.

In both the acid deposition program in the 1980's and the climate change studies in the early years of the twenty-first century, Dr. Mahoney was responsible for the overall planning, computer model simulations and international reporting of the findings and national and international implications of these extensive studies. The two major study programs represent the state-of-the-art in the development of regional, national and global scale insights and control strategy development regarding these critically important environmental challenges.

He has five years experience serving as a government administrator and consultant in climate change and environmental sustainability activities and overall 42 years experience in air pollution consulting and other environmental areas.

Climate Change and Environmental Sustainability Activities

2002 – 2006 (March): Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy Administrator of the National Oceanic and Atmospheric Administration (NOAA).

2003 – current. Member and co-chairman (since 2004) of the *Roundtable on Science and Technology for Sustainability* sponsored by the U.S. National Academy of Sciences. The NAS Roundtable has approximately 30 members, including high level scientific and technological corporate officers, the leaders (principally at the Presidential Appointee level) of the relevant federal organizations, leaders of major nongovernmental organizations, and former elected officials. The Roundtable seeks to enhance sustainability within the United States and throughout the world by improving the use of technical information by commercial organizations and government regulatory and planning units. The Roundtable has sponsored case study reviews open to the public, written and verbal sustainability communication programs, and has continued development of the definitions and practices underlying sustainability.

2002 – 2006: Director of the U.S. Climate Change Science Program (CCSP) while serving as Deputy Administrator of NOAA (see above also). CCSP is the largest climate change program in the world, and much of CCSP's $2 billion annual budget supports work by contractors and government laboratories on important sustainability issues. Some examples are: (1) many CCSP programs deal with ecosystem effects of changing climate parameters, and therefore with mitigation and adaptation practices to reduce adverse impacts; (2) the science programs sponsored by CCSP are closely coordinated with the technology development programs sponsored by the related Climate Change Technology Program (CCTP), leading to the development of best engineering and operating practices, and continued improvements in the evaluations of emission rates from industrial facilities; and (3) this CCSP experience is at the leading edge of the development of effective sustainability practices in many geographical regions and industry sectors, with the added advantage that the credibility of the work is enhanced because of its sponsorship by government rather than interested parties.

2002 – 2006: Executive oversight of U.S. Sustainable Fisheries activities. The Sustainable Fisheries Act (1996) assigned to NOAA the responsibility to oversee and implement the nation's sustainable fisheries programs. As Deputy Administrator of NOAA I participated in the "corporate" management and strategy development for these programs, including priority setting, budget development and effectiveness reviews for the programs. NOAA's programs include maintaining healthy fish stocks; eliminating overfishing and rebuilding overfished stocks; and increasing the long-term economic and social benefits to the nation from living marine resources.

2003: Invited speaker at the Delhi Sustainable Development Summit, sponsored by the Government of India. The summit was an "action oriented" follow-on to the World Summit on Sustainable Development sponsored by the United Nations Environment Program in Johannesburg in 2002.

2000 – 2001: Advisor on sustainable development to the Planning Minister of the Hong Kong Special Administrative Region (SAR) of China. This work assignment involved the review of the new Hong Kong 5-year plan for sustainable environmental practices for the SAR and the Pearl River Delta; comparisons with similar sustainability programs established for other regions around the world; and summarizing recommendations in a written report and keynote address to the Hong Kong Sustainability Workshop of 2001.

Other Experience

1979 – 1982: Advisor to the Chief of the Federal District of Mexico (the "Mayor of Mexico City") and the Federal Secretariat of Public Health, to address the unsustainable poor air quality in the Valley of Mexico, under the influence of rapidly growing population, motor vehicle usage and industrialization in the Valley of Mexico. The work involved the recruitment of twelve international experts to develop recommendations and action programs. The program was suspended in late 1982 (at the end of the term of Mexican President Jose' Lopez Portillo), and a new program was initiated in the later 1980's which continues today.

1973 – 1995: Advisor to the government of the Kingdom of Saudi Arabia (continuous from 1973 to 1983 and continuing intermittently from 1984 to 1995). This work involved the comprehensive development of recommendations for the environmental management program for Saudi Arabia, including organizational structure; comprehensive codes of regulations specifying maximum air emission levels, water effluent rates and toxic waste management practices for major industrial, energy and municipal facilities throughout Saudi Arabia; and recommended personnel recruitment and training practices for the national agency.

1999 – 2002 (March): Environmental management consultant serving U.S. and international clients. Topics included insurance recovery for environmental damages, and technical analysis of regional air quality and haze patterns.

1991 – 1999 (July): Senior Vice President of International Technology Corporation, a $1+ billion international engineering and construction company pursuing a broad technical specialty environmental business, combined with field construction activity dealing with restoration of contaminated soil and ground water. From 1997 to 1999 also served as President of the Consulting and Engineering Division of the corporation, responsible for a $200+ million technical business. Also from 1997 to 1999 served as Chairman of the Board and responsible corporate officer for Landbank, Inc., a wholly owned subsidiary addressing the brownfield market by restoring and redeveloping contaminated commercial property sites.

1988 – 1991 (January): Director of the National Acid Precipitation Assessment Program (NAPAP) involving six federal agencies with a combined federal budget of approximately $100 million annually. The position was in the Executive Office of the President, during the final year of the Reagan administration and during the first two years of the administration of President George H. W. Bush.

1987 – 1988 (February): Environmental management consultant serving U.S. and international clients. Topics included environmental management government organization planning for Saudi Arabia, and environmental permitting issues for large Kraft paper plants.

1984 – 1987 (February): Manager of the Environmental Industries Center of the Bechtel Group, Inc. The Environmental Industries Center addressed environmental compliance, planning and engineering matters for Bechtel's major domestic and international clients.

1983 – 1984 (January): Environmental management consultant serving U.S. and international clients. Topics included strategic planning for a large environmental engineering firm, and comparative studies of international environmental regulations.

1968 – 1983 (September): Co-founder and Senior Vice President of Environmental Research & Technology, Inc. (ERT). ERT began as a start-up in December 1968 and by the late 1970's it had grown to become the largest environmental specialty firm in the United States, with offices and laboratories located throughout the United States combined with a substantial international business operating in several countries in both the developed and developing world. Also served as President of ERT International, Inc., a wholly owned subsidiary responsible for ERT's international business from 1975 until 1983.

1966 – 1973 (June): Assistant Professor and Associate Professor (from July 1970) in the School of Public Health at Harvard University, specializing in environmental health management. During the period from December 1968 through June 1973 I served in two positions: the faculty position at Harvard and the Senior Vice President position at ERT, Inc. (see above).

1962 – 1965 (December): Graduate research assistant in the Department of Meteorology at MIT.

1959 – 1962 (June): Graduate student at MIT, supported by fellowship grants.

1956 – 1959 (June): Laboratory assistant and lecturer in the Physics Laboratories at LeMoyne College.

HONORS

2006: Awarded the U.S. Department of Commerce William C. Redfield Award for outstanding public service, presented by Commerce Secretary Carlos M. Gutierrez.

2002: Confirmed by the U.S. Senate (following nomination by President George W. Bush) to be Assistant Secretary of Commerce.

1990: Elected as a Fellow of the American Meteorological Society.

GANESH SRINIVASAN

AREAS OF SPECIALIZATION

Environmental Engineer with ten years experience in use of the MM5 meteorological data base for forecasting wind fields air dispersion modeling, emissions inventory development, air permitting and source sampling.

He has experience working with and revising regional emissions inventories for PM2.5 and Ozone Model Attainment Demonstrations based on EMS2003 and CONCEPT models.

He has also worked on a broad spectrum of air permitting issues 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.

AIR QUALITY MODELING AND REGIONAL EMISSIONS INVENTORY REVISION EXPERIENCE

Analyzed regional and local scale emissions inventories for use in CAMx and AERMOD modeling for the 8-hour ozone and annual PM2.5 Model Attainment Demonstrations in the Chicago and Cleveland Nonattainment Areas. Conducted CAMx control scenario analyses for Model Attainment Demonstrations. Revised the regional emissions inventories for the electric generating unit, motor vehicle and off-road engine emission sectors as part of the Attainment Demonstration.

While employed by the Ohio Environmental Protection Agency (OEPA), assembled the regional emissions inventory data generated by the EMS2003 emissions processor. Performed a source Apportionment study to identify various emission source regions and emission categories that contribute significantly to Ohio's Ozone non-attainment regions using the CAMx Model.

Applied CALPUFF and CALPOST models as part of BART analysis for the assessment of project impacts at nearest Class I area for industrial plants in Alabama and Alaska. Attended the five day US EPA course called "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.

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.

EDUCATION

M.S., Civil & Environmental Engineering, University of Cincinnati, Ohio, 2002 - 2005
B.E., Instrumentation and Control, University of Madras, India, 1998 - 2002

TANYA WHITE

AREAS OF SPECIALIZATION

Ms. White has conducted several 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. She is also proficient tin evaluating the radar interference impacts of proposed or existing wind energy facilities.

Ms. White has extensive experience preparing emissions inventories for various types of GHG emitting sources and 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 over eight 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 for minor and major sources in several states including Indiana, Kentucky, and New Jersey. She also has extensive project experience performing air regulation applicability and compliance determinations, and calculating potential and allowable emissions.

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.

AIR POLLUTION PERMITTING EXPERIENCE

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.

FirstEnergy: Conducted extensive analyses of PM2.5 ambient monitoring data and the conditions under which the highest 24-hour PM2.5 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.

PUBLICATIONS

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, 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 2-4, 2009.

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.

Ellis, H.M., Pinto, A.A., Shannon (Handley), 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.

EDUCATION

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