

# ***STATEMENT OF QUALIFICATIONS***

## ***Greenhouse Gas Consulting Services***

*Rev. 5/19/10*

American businesses, government and non-profit organizations that emit Greenhouse Gases (GHG's) must begin planning now for the growing challenges of dealing with GHG legislation, regulation and public demands for voluntary actions. We believe we can help you turn these requirements into a strategic advantage.

How can we help? We can:

- 1) Develop your baseline and projection year GHG emissions inventory going back to 1990 or earlier.
- 2) Verify and validate the accuracy of your GHG assertions and GHG reductions from mitigation projects.
- 3) Help you hedge against the potentially massive costs of carbon credits in the future by identifying and helping you develop a carbon strategy to acquire carbon credits for future years through mitigation of your own GHG emissions and from other entities.

Enviroplan Consulting has one of the most experienced groups of professionals in the U.S. addressing these areas as described in this Statement of Qualifications. Since 1972 our professional staff has conducted over 3,500 air pollution studies and monitoring programs for over 350 industrial and governmental clients. Our professional staff is located in 14 offices throughout the U.S. as shown in Figure 1.

### **1. The Growing Challenges and Requirements of Dealing with GHG Legislation, Regulation and Public Demands for Voluntary Actions**

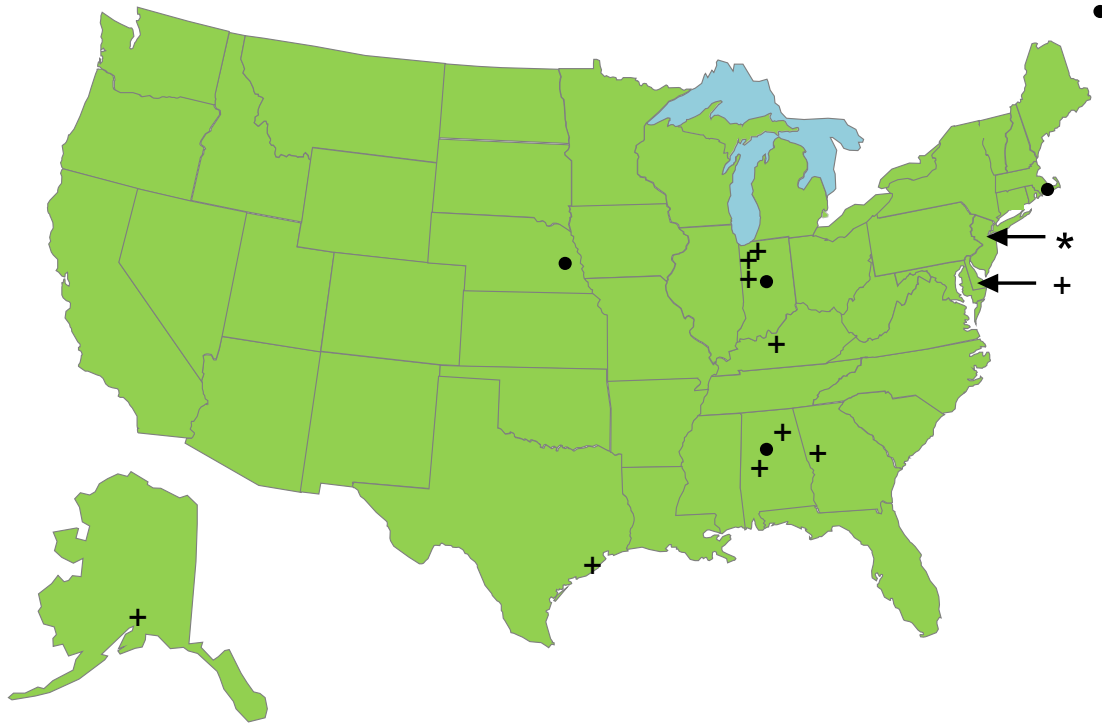
On June 26, 2009, the US House of Representatives passed the American Clean Energy and Security Act, commonly referred to as the Waxman-Markey Clean Energy Bill. The key provisions of the bill include requiring electric utilities to meet 20% of their electricity demand through renewable energy sources and energy efficiency by 2020 and introducing a federal cap-and-trade program to reduce carbon emissions 3% by 2012, 17% by 2020 and over 80% by 2050 compared to 2005 levels.

The bill must now be passed by the Senate, signed by the President and implemented by various agencies. The prospect of Senate passage is greater with the addition of Senator Frankel to the Senate and the announcement by Senator Reid that he plans to bring the bill to the floor for a vote by the full Senate in October, 2009. With the Copenhagen summit looming in December, 2009, pressure will be on the Senate to act before that meeting.

Among its many mandates, the Waxman Markey Bill provides for the following:

- Mandatory caps on GHG emissions starting in 2012
- Use of carbon credit offsets to meet allowances
- Use of accredited verifiers for offset projects.

**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; Fowler, IN; Dune Acres, IN; Wheatfield, IN; Delaware City, DE; Louisville, KY; Michigan City, IN; Tarrant, AL; Hueytown, AL; Brazoria, TX.	+
Wind Energy Client Management Services	Omaha, NE	●
Greenhouse Gas Verification Services	Wayne, NJ	●

Many states now have mandatory GHG emission reporting requirements including: California, Connecticut, Delaware, Florida, Iowa, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Rhode Island, Washington, West Virginia, Wisconsin and Vermont. An additional 23 states have encouraged voluntary GHG emission reporting and have joined The Climate Registry (TCR). In California, the Global Warming Solutions Act requires California to reduce GHG emissions to 1990 levels by 2020.

There are three regional accords among the states to address climate change issues:

- the Regional Greenhouse Gas Initiative signed by seven Northeast states began in 2009 requiring the reporting and reduction of emissions and has conducted its first auction for credits
- In February, 2007 the Mid Western Greenhouse Gas Accord was signed by 6 states with 3 other states as observers.
- In November, 2007, the Western Climate Initiative was signed by 7 states and 3 Canadian Provinces with observers from 6 Mexican states, 6 U.S. states, and 1 Canadian province.

In the U.S., the Chicago Climate Exchange provides a market for trading carbon credits.

For voluntary reporting, The Climate Registry was launched in 2008 with membership by 40 US states, 6 Mexican states and 6 Canadian provinces, offering an opportunity to report GHG emissions using standardized reporting and verification protocols.

Protocols now exist for reporting and verifying/validating GHG emissions and emission reductions from mitigation projects. Mitigation projects can be identified and begun to reduce emissions.

At the Federal level, the U.S. EPA issued its Congressionally mandated, draft GHG Reporting Rule on March 10, 2009 to be finalized in 2009.

Internationally, The Kyoto Protocol is an international agreement of 180 countries related to the United Nations Framework Convention on Climate Change. The protocol established requirements for 37 industrialized countries to reduce GHG emissions by an average of five percent from 1990 levels over the period 2008-2012. It includes reporting requirements, an international cap and trade program, mitigation projects through the Clean Development Mechanism and a global carbon market.

The Kyoto Protocol expires in 2012 and the Copenhagen Climate Summit, scheduled for December, 2009, will seek to develop a new protocol with the US participating this time. Participation by rapidly growing developing nations such as China, India and Brazil is a huge uncertainty that could undermine any agreement. Creation of a global carbon market, as allowed for by the Waxman Markey bill, may play a significant role in the outcome of these negotiations. At the United Nations Climate Change Conference in Bali, Indonesia in December 2008, the governments assembled developed The Bali

Roadmap consisting of a number of decisions that represent various tracks for achieving a secure climate future with a goal of completing this work in 2009.

## **2. Enviroplan Consulting's Services to Address These Challenges and Requirements**

Enviroplan Consulting offers services to help organizations turn these challenges and requirements into strategic advantages with knowledge, planning and action through its professional staff including some of the nation's leading experts on GHG issues. .

We can help you:

1. **Develop** your baseline and projection year **GHG emissions inventory** going back to 1990 or earlier and satisfy your future GHG reporting requirements.
2. Hedge against the potentially massive costs of carbon credits in the future by identifying and helping you **develop a carbon strategy** to acquire carbon credits for future years through mitigation projects.
3. **Verify and validate the accuracy of your GHG assertions** from existing operations and GHG reductions from mitigation projects.
4. **Review and comment on your current carbon strategy**
5. Participate in **preparations for Integrated Resource Planning (IRP) or rate proceedings** where carbon strategies are likely to be an issue

### 2.1 Developing GHG Emissions Inventories

Since 1972, a cornerstone of Enviroplan Consulting's professional services has been the development of air pollution emissions inventories for an extremely wide cross section of industry and government. Under contract to five states and two local governments since 1994, Enviroplan Consulting has been responsible for reviewing and evaluating emissions inventories submitted as part of air pollution construction and operating permit applications and renewals for over 2,500 permits. Therefore, we are very familiar with combustion and other sources of GHG emissions for a very wide cross section of U.S. industry and government and have developed many GHG emissions inventories for our private sector and more recently for our government clients.

Developing a GHG emissions inventory must comply with the applicable protocol established by the GHG program, if any. Enviroplan Consulting's professional staff has been involved in the development/review of The Climate Registry's GHG emissions inventory protocol for the electric power industry as a member of the Electric Power Sector Technical Expert Panel appointed by The Climate Registry to review its draft protocol. Enviroplan Consulting has also applied the following protocols and procedures in developing its GHG emissions inventories: 1) The General Reporting Protocol of The

Climate Registry, 2) U.S. EP GHG emissions inventory procedures, and 3) The World Resources Institute Greenhouse Gas Protocol among others.

Table 1 provides an example of the information included in GHG emissions inventories we develop. This table is part of The Climate Registry General Reporting Protocol. These GHG emissions inventories developed by Enviroplan Consulting are also in conformance with the International Organization for Standardization ISO 14064-1 Standard unless the client requires otherwise.

Enviroplan Consulting has worked under contract to the American National Standards Institute training ANSI professional staff in the ISO 14064-1 Standard for their use in making determinations on accreditation of verification and validation bodies for GHG emissions.

## 2.2 Developing a Carbon Strategy with Mitigation Projects and Quantifying the GHG Emission Reductions from These Projects

Enviroplan Consulting can assist you in developing several different kinds of mitigation projects to reduce GHG emissions. Table 2 provides a list of different types of GHG mitigation projects.

We will identify candidate mitigation projects, quantify the available carbon credits from each type of project in a realistic geographic area that we determine together with you, quantify the costs and cost per ton of carbon credit through implementing each type of project, help you decide which project(s) to develop, provide guidance on the operational implementation of these projects, assist in project development and document the project and its GHG emission reductions in accord with the requirements of the International Organization for Standardization ISO 14064-2 and any additional requirements of the applicable GHG program.

Table 3 provides an example of the information that will be developed in the planning phase of the project.

**Table 1: Example of The Climate Registry GHG Emission Reporting Requirements**
**Table 1.1 Key Registry Reporting Requirements and Options**

<b>Issue</b>	<b>Requirements</b>	<b>Options</b>
Geographical Boundaries (Chapter 2)	Report all emissions in Canada, Mexico and the U.S.	<ul style="list-style-type: none"> <li>• May report worldwide emissions</li> <li>• <b>Transitional Reporters only</b> may limit report to one or more states, provinces or territories</li> </ul>
Greenhouse Gases (Chapter 3)	Report emissions of all six internationally recognized GHGs: CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>	<ul style="list-style-type: none"> <li>• May report additional GHGs</li> <li>• <b>Transitional Reporters only</b> may report fewer GHGs, but must at a minimum report CO<sub>2</sub> emissions from stationary combustion</li> </ul>
Organizational Boundaries (Chapter 4)	<ul style="list-style-type: none"> <li>• Report on a control basis</li> <li>• Also report on an equity share basis <i>or</i> provide list of equity investments</li> </ul>	<ul style="list-style-type: none"> <li>• May report using operational or financial control</li> <li>• Encouraged to additionally report using equity share</li> </ul>
Operational Boundaries (Chapter 5)	<ul style="list-style-type: none"> <li>• Report all Scope 1 and Scope 2 emissions</li> <li>• Report direct emissions of CO<sub>2</sub> from biomass combustion separately</li> </ul>	<ul style="list-style-type: none"> <li>• May additionally report Scope 3 emissions</li> </ul>
Facility-Level Reporting (Chapter 6)	Separately report emissions by facility	<ul style="list-style-type: none"> <li>• May separately report emissions by unit for stationary combustion sources</li> <li>• May aggregate emissions from:               <ol style="list-style-type: none"> <li>a. Commercial buildings (e.g., office buildings)</li> <li>b. Mobile sources (fleets)</li> <li>c. Other special categories (e.g., oil and gas wells)</li> </ol> </li> </ul>
Base Year (Chapter 7)	<ul style="list-style-type: none"> <li>• The first reporting year for which you submit a complete emissions report will be your base year.</li> <li>• Base year emissions must be updated to reflect subsequent organizational and methodology changes, <b>if</b> the impacts of such changes on total entity emissions cumulatively exceed five percent</li> </ul>	<ul style="list-style-type: none"> <li>• May update emissions for intervening years between the base year and the current reporting year</li> <li>• If you do not have the types of data needed to estimate base year emissions for an acquisition using a Registry-approved calculation method, you may use an alternative, simplified estimation method. (If you do not have <b>any</b> data with which to estimate base year emissions for an acquisition, you should not update your base year emissions to reflect the acquisition.)</li> </ul>
Transitional Reporting (Chapter 8)	There is no requirement to report transitionally	<ul style="list-style-type: none"> <li>• May report transitionally for your first two reporting years</li> </ul>
Historical Reporting (Chapter 9)	There is no requirement to report historical emissions	<ul style="list-style-type: none"> <li>• May report historical emissions data for any year preceding your first reporting year as long as: a) your data meets the minimum historical reporting requirements, and b) you provide consecutive years of historical data (no data gaps)</li> <li>• You may import historical data from other programs or registries to the Registry</li> </ul>

**Table 1.1 Key Registry Reporting Requirements and Options (Continued)**

<b>Issue</b>	<b>Requirements</b>	<b>Options</b>
Emissions Quantification Methods (Part III)	Use the Registry-approved methods described in Part III and Appendix E	<ul style="list-style-type: none"> <li>• May use alternative, simplified estimation methods for small emission sources, but total emissions computed using simplified methods cannot exceed five percent of Reporter's total entity (Scope 1 and Scope 2) emissions</li> </ul>
Performance Metrics (Chapter 17)	There is no requirement to report performance metrics	<ul style="list-style-type: none"> <li>• May report performance metrics to show relevant, comparable data that enables tracking of emissions relative to indicators of performance (e.g., output).</li> <li>• May choose which performance metrics to report until sector-specific protocols provide further requirements and methodologies.</li> </ul>

**Table 2: GHG Mitigation Projects**

<b><u>Demand Side Management</u></b>
<ul style="list-style-type: none"> <li>• Energy conservation.</li> <li>• Demand management.</li> <li>• Geothermal energy to provide heat/cool and heat hot water in homes, offices, schools, etc.</li> <li>• Economic dispatch options in which higher cost fuel is sometimes used despite higher costs to meet GHG emission targets.</li> <li>• Smart grid technology to facilitate reduced demand, especially during peak load periods, and to allow greater use of rechargeable batteries for transportation.</li> </ul>
<b><u>Carbon Offsets from:</u></b>
<ul style="list-style-type: none"> <li>• Landfill gas projects</li> <li>• surface cover modifications including afforestation and reforestation projects.</li> <li>• agricultural CH<sub>4</sub> collection/reduction projects</li> </ul>
<b><u>Energy sources</u></b>
<ul style="list-style-type: none"> <li>• Renewable energy: solar, wind, biomass, hydro, geothermal</li> <li>• Fuel supply: gas flaring, coal-bed methane recovery</li> <li>• Efficiency gains: improved processes, technology, T&amp;D losses</li> </ul>



**Table 3: Example of the Information That Will Be Developed in the Planning Phase of a typical GHG Mitigation Project.**

1. Describe the project
2. Identify and select GHG sources, sinks and reservoirs relevant for the project
3. Determine the Baseline Scenario
4. Develop procedures to quantify, monitor and report GHG emissions, removals, emission reductions and removal enhancements

Source: International Organization for Standardization, ISO 14064-2

We help our clients develop their mitigation projects using our own professional staff and a select group of subcontractors with which we have strategic partnerships. Appendix A describes Enviroplan Consulting’s meteorological consulting and monitoring services and qualifications for developing mitigation projects involving wind energy. Appendix B describes the professional services of our strategic partner, Metro Energy Solutions, for conducting energy audits and facility assessments, renewable energy feasibility analyses especially for solar energy, and engineering design and construction management services for mitigation project among other services. Appendix C describes the professional services of our strategic partner, Cummings & Smith, for conducting methane recovery projects from landfills.

2.3 Verification and Validation Services for GHG Emissions and Project Emission Reductions

Enviroplan Consulting’s verification and validation services for GHG emissions and project emission reductions are in accord with the requirements of the International Organization for Standardization ISO 14064-3, the Verification Protocol of The Climate Registry and the verification protocols for other GHG programs including the Regional Greenhouse Gas Initiative.

Figure 2 shows the validation and verification process as summarized in ISO 14064-3.

Enviroplan Consulting is in the process of applying for and becoming accredited by the American National Standards Institute as an accredited verification and validation body under the ISO 14065 Standard.

Enviroplan Consulting understands the importance of impartiality in validation or verification activities, how it manages conflict of interest and how it ensures the objectivity of validation or verification activities.

Dr. John Bewick, Director of Verification and Validation Services for Enviroplan Consulting, is certified as a GHG Verifier Personnel. CSA America is an international professional personnel certification organization.

Dr. Bewick and Stephen Greene are the lead Verifier/Validators for Enviroplan Consulting. Prior to joining Enviroplan Consulting, both of these professionals worked under contract to the American National Standards Institute on Conformity Assessment teams to evaluate applications by a first round of verification and validation bodies to become accredited by ANSI under ISO 14065.

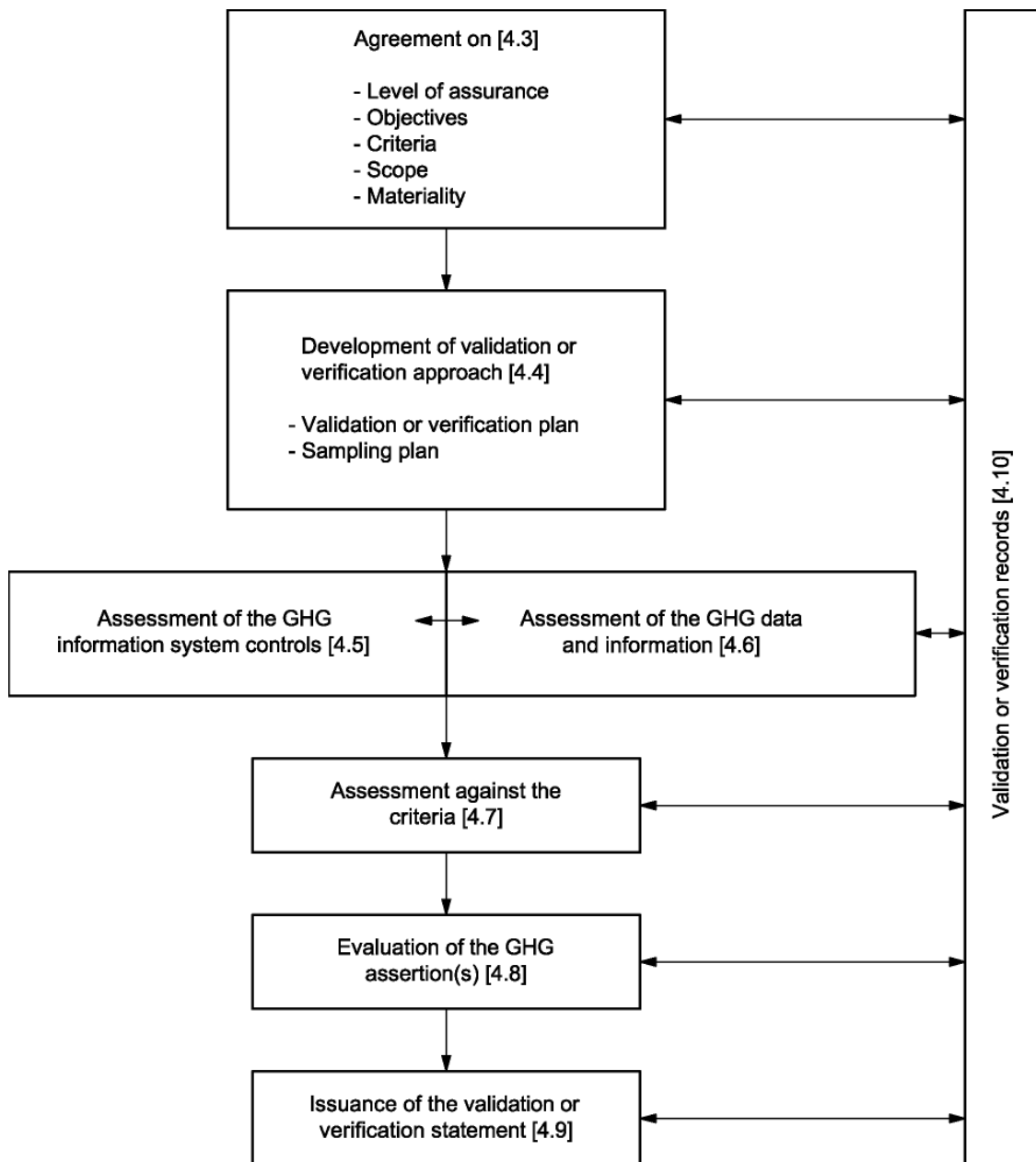
Enviroplan Consulting is especially qualified to provide verification and validation services for GHG emissions and project emission reductions. In July 2007, the American National Standards Institute contracted with Enviroplan Consulting to help ANSI develop the national accreditation program for GHG verification and validation bodies that is currently in place.

The Enviroplan Consulting project team was headed by Dr. Howard Ellis, QEP and included Dr. James Mahoney, Alic Bent, Julia Shannon and Tanya White.

Development of the accreditation program began with a survey of major stakeholders including all GHG programs in the U.S., identifying and participating in negotiations on behalf of ANSI with principals from each major GHG program to have them adopt as a requirement that verification and validation bodies involved in their programs will require ANSI accreditation. GHG programs that have agreed to this include: 1) The Climate Registry, 2) The California Climate Action Registry and 3) The Chicago Climate Exchange. Negotiations are in progress with the Regional Greenhouse Gas Initiative.

Enviroplan Consulting also was retained by ANSI to develop and present major parts of the training program conducted for the ANSI Conformity Assessment Teams that have and continue to evaluate applications by verification and validation bodies for accreditation by ANSI.

**Figure 2: Verification and Validation Process as Summarized in ISO 14064-3**



### **3. Enviroplan Consulting's Professional Resources and Qualifications for Providing These Services**

Appendix E provides the resumes of Envrioplan Consulting's professional staff involved in providing GHG consulting services. Following is a brief description of these professionals.

**Dr. John Bewick** is Director of Enviroplan Consulting's Greenhouse Gas Emissions Inventory Verification and Validation Services. He is certified by CSA America, Inc. as a Greenhouse Gas Verifier. He is directing for a large electric power company the verification of the GHG emissions inventory to be reported to The Climate Registry. He also specializes in conducting environmental assessments and audits. He has over 25 years of experience in the environmental field. For the American National Standards Institute, he was responsible for ISO 14065 Conformity Assessment determinations for GHG verification and validation bodies. Previously, he served as Secretary, Executive Office of Environmental Affairs, Commonwealth of Massachusetts where he directed an agency with 3,600 people and a budget of \$120 million.

**Stephen Greene** is a Principal and a Lead Verifier for Enviroplan Consulting's Greenhouse Gas Emissions Inventory Verification and Validation Services. He is serving as a Lead Verifier on the verification of the GHG emissions inventory of a large electric power company to be reported to The Climate Registry. Prior to joining Enviroplan Consulting, he worked as a contractor for the American National Standards Institute where he was responsible for ISO 14065 Conformity Assessment determinations for GHG verification and validation bodies. Previously for 15 years, he served as Product Stewardship and International Environmental Manager for the Polaroid Corporation. Prior to that for 20 years, he was Strategic Corporate Manager of Environmental Affairs for Digital Equipment Corporation.

**Dr. Howard Ellis, QEP,** is a Senior Principal with 38 years experience in air pollution emissions inventory development on local and regional scales.

His current focus includes GHG emissions inventory development and the validation and verification process for GHG assertions. He is an expert in the General Reporting Protocol and the Verification Protocol of The Climate Registry, the World Resources Institute and World Business Council for Sustainable Development Greenhouse Gas Protocol Corporate Accounting and Reporting Standard and in the International Standards Organization 14063, 14064 and 14065 Standards for developing and validating/verifying GHG emissions and for accrediting bodies who validate/verify GHG emissions. He is familiar with the Clean Air Climate Protection software functionality for developing community and municipal level GHG emissions inventories.

He served as Senior Reviewer for the City of Elmhurst GHG emissions inventory development. He serves as 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 and project reductions in accord with ISO 14065. In this capacity, he initiated and negotiated on behalf of ANSI with The Climate Registry, The Regional Greenhouse Gas initiative, The Chicago Climate Exchange, The California Climate Action Registry to have these GHG programs require verification and validation bodies to obtain ANSI accreditation as a condition to participate in these programs.

He was a member of the Technical Expert Panel of The Climate Registry's Electric Power Sector (EPS) Protocol (for GHG emissions inventories).

**James Mahoney**, Ph.D. is a Senior Principal at Enviroplan Consulting. He focuses on research in the basic atmospheric sciences; consultation on planning and design of air pollution prevention and greenhouse gas emission limitation systems; 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.

**Daniel Steen**, P.E. is a Principal at Enviroplan Consulting where his primary focus is consultation on planning and design of compliance options for GHG emission limitations including the use of wind energy and other forms of renewable energy. Following his retirement in 2009 as Vice President, Environmental of FirstEnergy Corporation, one of the largest electric utilities in the United States, he joined Enviroplan Consulting on a part time basis. He is former Chair of the Global Climate Change Subcommittee of the Edison Electric Institute. He has over 30 years experience in the electric power industry.

**Joe Kwasnik** is a Principal at Enviroplan Consulting where he focuses on assisting development of comprehensive strategic management systems for addressing climate change issues. Joe is the former Head of Global Climate Change at National Grid where he led their international effort to restructure the company to meet corporate emission reduction goals through the year 2050. Joe is the former VP for Environment (US) for National Grid.

**Allen Dittenhoefer**, Ph.D. is Senior Vice President and a Principal at Enviroplan Consulting. Dr. Dittenhoefer has 29 years of experience as an air pollution consultant in areas including estimation of GHG emissions, 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.

Dr. Dittenhoefer has served as Principal Investigator, Project Manager, manager responsible for Quality Assurance for hundreds of air pollution emissions inventory

development, air quality modeling and air permitting projects including several involving development of GHG emissions inventories

**Julia Shannon** is an Engineer with four years experience in air pollution emissions inventory development. She assisted in developing the Scope 1 and Scope 2 Greenhouse Gas emissions inventory for a moderate size Midwestern city using The Climate Registry Reporting Protocol. She also worked on behalf of Enviroplan Consulting in developing a training program in GHG emissions inventory development and verification for Conformity Assessment teams from American National Standards Institute who will accredit independent bodies in the verification of GHG emission assertions

**Tanya White** is an Environmental Scientist with four years experience in air pollution consulting and over two years experience in conducting wind resource assessments for wind energy projects. Ms. White has extensive experience preparing emissions inventories for various types of GHG emitting sources. 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.

**Linda Quigley** is a Staff Environmental Scientist with 15 years of experience specializing in emissions inventory development and other aspects of air pollution consulting. She is currently specializing in methods for reducing methane emissions from agricultural operations. She has extensive experience preparing emissions inventories for various types of GHG emitting sources 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.

**Ganesh Srinivasan** is an environmental engineer with five years experience in emissions inventory development. He is currently specializing in methods for creating carbon credits through application of Smart Grid Technologies and Building Energy Conservation projects.

## **APPENDIX A: ENVIROPLAN CONSULTING'S PROFESSIONAL SERVICES AND QUALIFICATIONS RELATING TO GHG MITIGATION PROJECTS INVOLVING WIND ENERGY**

Our meteorological monitoring services for GHG mitigation projects involving wind energy include:

- Site evaluation
- System design
- Equipment supply
- Installation
- Operation and maintenance
- Data acquisition, analysis and reporting
- Quality assurance

Our wind assessment services for GHG mitigation projects involving wind energy 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
- Projecting wind monitoring data to blade environment and other nearby locations
- Optimizing wind turbine site locations
- 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 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, Alaska and Puerto Rico.

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 12 monitoring networks.



**APPENDIX B: METROENERGY SOLUTIONS' PROFESSIONAL SERVICES FOR GHG MITIGATION PROJECTS INVOLVING ENERGY AUDITS AND FACILITY ASSESSMENTS, RENEWABLE ENERGY FEASIBILITY ANALYSES AND ENGINEERING DESIGN AND CONSTRUCTION MANAGEMENT SERVICES**



**Qualifications Statement**

**Metro Energy Solutions  
1140 Bloomfield Avenue  
Suite 200  
West Caldwell, New Jersey 07006  
Phone: 973-439-7283 x15  
Fax: 973-439-6998  
Web: [www.metroenergysolutions.com](http://www.metroenergysolutions.com)**

**Metro Energy's Ability to Provide Required Services**

Metro Energy Solutions (Metro Energy) is an independent Energy Consulting and Energy Services Company specializing in energy efficient design, engineering, consulting and installation. The company was established in January, 2000 as a limited liability company registered in the State of New Jersey. The company is located in West Caldwell (Essex County), New Jersey and is privately held with the principals of the company controlling 100% of the stock. The company is a registered Small Business Enterprise in New Jersey and has its [New Jersey Business Registration Certificate](#), [Public Works Registration Act Certificate](#), and is a registered [Energy Agent and Aggregator with the NJ Board of Public Utilities](#). In addition, Metro Energy is a [Department of Energy Rebuild America Business Partner](#), a member of the [New Jersey Chapter of the United States Green Building Council for the Leadership in Energy and Environmental Design \(LEED\)](#), a member of the [Mid Atlantic Solar Energy Industries Association](#), a member of the [New Jersey League of Municipalities](#), a member of the [New Jersey Association of Counties](#), a member of the [Association of Environmental Authorities \(AEA\)](#) and a certified [Energy Star Partner](#).

Metro Energy has extensive experience conducting comprehensive energy audits, providing energy engineering design and consulting services, preparing technical bid specifications, administering the project bidding process, and providing project management services in both the private and public sectors. In the public sector, Metro Energy is currently implementing county-wide energy efficiency initiatives with the County of Bergen/Bergen County Improvement Authority (“Rebuild Bergen County”), the County of Burlington, the County of Cumberland, the County of Morris, Burlington County and Somerset County. Metro Energy has also completed work in Essex County and has provided the County of Essex with additional evaluations (Phase 1) of other County-owned facilities for their review. Most recently Metro Energy has completed a Phase 1 energy assessment for the County of Cumberland and is in the midst of the Phase 2 work. All of the projects include engineering and consulting services for the facilitation of county or city-wide energy initiatives and include working with the county as well as municipalities, school districts and water/wastewater utility authorities within each county. Metro Energy has served as the energy engineering consultant for Morris County since 2000, and has enabled the County to save hundreds of thousands of dollars annually. We have performed the energy engineering, design, project management, and utility rebate administration for numerous technologies in virtually every County-owned facility, including an analysis and preliminary design of a photovoltaic system at the Morris County Correctional Facility.

*In 2007, the State of New Jersey selected Metro Energy as part of a team to be the energy efficiency consultant for the State’s facilities.*

**In the private sector, Metro Energy’s clients include some of the world’s most recognized names, such as New York Life Insurance Company, ExxonMobil, ConocoPhillips, Comcast, the New York Yankees, Trump Entertainment Resorts, Radio City Music Hall, Loews Cineplex Entertainment, Tractor Supply Company, and Ricoh Corporation.**

### **Metro Energy Organizational Structure**

Metro Energy Solutions was started in January, 2000 as a Limited Liability Company registered in New Jersey.

### **Metro Energy’s Approach to Providing Comprehensive Energy Services**

Metro Energy is an independent engineering, consulting and energy services company specializing in energy efficient design, engineering, consulting and installation. Metro Energy provides a wide range of services to help our clients reduce their energy costs by managing all aspects of their energy needs. We assist our clients in reducing their energy costs by:

- Engineering, designing, installing and construction managing process improvements that use less energy, and;
- Lowering the unit cost of energy purchased through energy procurement efforts and/or the installation of on-site combined heat and power (cogeneration) systems.

Metro Energy is a leader in the development and implementation of energy-related projects that provide innovative solutions to our clients' high energy costs. Metro Energy will act as an "Owner's Agent" providing consulting services to ensure that our client's energy conservation project will be implemented properly from start to finish.

Our process starts by meeting with representatives from our client to discuss and understand their concerns about their facilities, as well as the financial impact of operating and maintaining those facilities. Once we have established the needs of the Client, we begin to analyze the facilities, starting with the utility bills for each building. After the utility bills have been reviewed for rate tariffs, usage patterns, and errors or abnormalities, we begin to schedule the actual site visits, which allow our engineers to establish an understanding of the operating characteristics of the buildings, which serves as the basis of our recommendations for improvements.

Once the site visits are completed, we begin to compile our report, which outlines each building along with a breakout of equipment in each building and our recommendations for improvements. The report will include annual energy and maintenance savings, estimated project costs, estimated rebate or grant monies available, and a financial analysis with various financing options. This report will provide the Client with the information needed to decide which projects it wants to move forward with and implement.

Metro Energy has a proven track record of providing an outstanding work product, coupled with an unparalleled level of client service, to all of our clients. Our commitment to provide outstanding service to our clients was recently recognized by the United States Department of Energy, which presented Metro Energy with its national Energy Champions Award for Local Government Partnership with Bergen County, NJ. There is only one annual award winner in this category nationally and it is considered one of the highest honors an energy services company can achieve.

### **Sample Client List – Public Sector**

The State of New Jersey (Energy Efficiency Audits)  
The NJ Meadowlands Commission (Energy Efficiency Audits)  
Bergen County Improvement Authority (Energy Conservation Initiative)  
Bergen County Correctional Facility (Cogeneration Project)  
Bergen County Utilities Authority (Cogeneration Project)  
Bergen Regional Medical Center (Cogeneration Project)  
Bergen Regional Medical Center (Energy Efficiency Project)  
Bergen County Community College (Energy Efficiency Audit)  
Burlington County (Energy Analysis – Pemberton Complex)  
Downtown, PA MUA (Energy Efficiency Project)  
Essex County Improvement Authority (Cogeneration Project)  
Essex County (Energy Efficiency Project)  
The City of Orange (Energy Efficiency, Wind Power, Solar Power)  
The Town of Clinton (Lighting Project)  
Clinton Public Schools (Energy Efficiency Audit)  
The Township of Bloomfield (Energy Efficiency Project)  
The Township of Morristown (Energy Efficiency Audits)

The Township of Cedar Grove (Energy Efficiency Audits)  
The Township of Parsippany (Solar Project)  
The Township of Cranbury (Energy Efficiency Project)  
The Township of Randolph (Energy Efficiency Project)  
The Township of West Orange (Energy Efficiency Audits)  
The Township of Harding (Energy Efficiency Project)  
The Township of Edison (Energy Efficiency Project)  
The Township of Maplewood (Energy Efficiency Project)  
The Township of Montclair (Energy Conservation and sustainability initiative)  
The City of Hackensack (Energy Efficiency Project)  
The Borough of Caldwell (Cogeneration Project)  
The Borough of Closter (Energy Efficiency Audit)  
The Borough of Lodi (Energy Efficiency Audit)  
The Borough of Moonachie (Energy Efficiency Project)  
The Borough of Oradell (Energy Efficiency Project)  
The Borough of Park Ridge (Energy Efficiency Audit)  
The Borough of Tinton Falls (Design Review and Analysis)  
The Borough of Woodcliff Lake (Energy Efficiency Audit)  
Caldwell / West Caldwell School District (Energy Efficiency Project)  
Downingtown Area Regional Authority (Energy Efficiency Project)  
Leonia Public Schools (Energy Efficiency Project)  
Orange Housing Authority (Cogeneration Project)  
Somerset County (Energy Efficiency Project)  
Somerset County (Cogeneration Project)  
Bergen County Vocational Technical Schools (Energy Efficiency Audit and Solar Project)  
Burlington County (Energy Efficiency and Cogeneration Project)  
Cumberland County (Energy Efficiency Project)  
Harding Township Board of Education (Energy Efficiency Project)  
Morris County (Multiple Energy Efficiency and Cogeneration Project completed)  
Morris County Improvement Authority (Renewable Energy Projects for all local government units)  
Morris County Municipal Utilities Authority (Energy Efficiency Audits)  
Montclair State University (Energy Efficiency and Cogeneration Project)  
Montclair Board of Education (Energy Efficiency Audit and Solar Project)  
Newark Housing Authority (Energy Efficiency Project)  
Nutley Board of Education (Energy Efficiency Audit)  
Pascack Valley Regional School District (Energy Efficiency Audit)  
Philadelphia Water Department (Renewable Energy Analysis)  
Summit Board of Education (Energy Efficiency Project)  
Trenton Housing Authority (Energy Efficiency Audits)  
Upper Saddle River School District (Energy Efficiency Project)  
Village of South Orange (Energy Efficiency Audit)

### **Sample Client List – Private Sector**

Ricoh Americas Corporation (National Account)  
Loews Cineplex Entertainment (National Account)  
Trump Entertainment Resorts  
Tiffany and Company

L'Oreal  
Radio City Music Hall  
The New York Yankees  
Comcast Cable  
Tractor Supply Company  
Emerson Retail Services  
New York Life Insurance Company  
Marcal Paper Mills, Inc.  
Atlantic Heath Care System  
Fairleigh Dickenson University  
Honeywell International  
Adhisa USA  
Well Luck Company (National Account)  
Dendrite International  
Marina Thermal (Borgata Hotel and Casino)  
Syms Corporation  
Silver Legacy Casino  
The Atlantis - Bahamas  
ExxonMobil  
ConocoPhillips  
Selective Insurance Company  
BL England  
Siemens

### **Metro Energy's Knowledge and Experience**

**Metro Energy has performed work on virtually every type of building system, in virtually every type of facility. Our experience includes lighting systems, HVAC systems, chilled water systems, pumps/motors/drives, digital building controls, steam, cogeneration, geothermal, wind, solar, fuel cells, windows, roofs, insulation.**

### **Sample Project Summaries**

Metro Energy Solutions has been deeply involved in all stages of energy efficiency and renewable project development. The following summarizes some of those projects as well as the firm's active role in implementing these initiatives:

- Atlantic City Convention Center (ACCC) – Metro Energy, in conjunction with Gabel Associates, is assisting the ACCC with all aspects of its solar project. The ACCC is installing a large roof system that is over 2 MW in size -- the largest single-building solar project in the U.S. to date. The team has supported the ACCC with grant attainment, Request for Proposal (RFP) design, RFP evaluation, financial and technical analysis, as well as Power Purchase Agreement (PPA) negotiation.

- Ricoh Corporation – Metro Energy has been providing energy consulting services to Ricoh Corporation for its buildings throughout the United States. Projects have included lighting retrofits, occupancy sensor installation, replacement of rooftop HVAC units, design and installation of a 300 kVa UPS system and 1 megawatt back-up generator system, as well as many other projects on facilities located from New Jersey to California.
- Northwest Bergen Utilities Authority (NWBCUA) – Metro Energy was selected as the solar consultant for NWBCUA’s 500 kW solar project at the Water Treatment Facility. Metro’s responsibilities included financial analysis, preparation of a bid specification, administration of the bid process, and project management, as well as several presentations to the mayor and council at public meetings.
- New York Life Insurance – Metro Energy is assisting NY Life with the development of a 2 MW ground mounted solar system. This is currently the largest ground-mounted solar project in New Jersey. The firm provided a feasibility analysis of the project, as well economic and financial analysis for the project. Metro prepared the RFP document, conducted all of the site visits, handled all questions and answers for the bidders, interviewed a short list of bidders, and evaluated proposals to determine the winning bidder. Metro is also providing project management and commissioning for the entire installation.
- Marcal Paper – Metro Energy conducted a detailed energy audit and cogeneration analysis of Marcal’s manufacturing facility. At the client’s request, this study was conducted under a strict timeframe, and Metro Energy was able to meet the client’s needs.
- State of New Jersey – Metro Energy serves as part of a two company team as the Energy Consultant to the State of New Jersey, through the State’s Office of Energy Savings within the Treasury Department. The firm is providing the State with energy audits of its facilities, formation and administration of bid specifications, project management of recommended projects, and assistance in developing a program to solicit solar vendor offers under a PPA model for multiple State buildings, including project feasibility criteria and RFP terms and conditions.
- Wayne Township Board of Education – Metro Energy, along with its strategic partner Gabel Associates, is providing turnkey development services in connection with the Wayne Township Board of Education’s initiative to install roof-top and potentially ground-mounted solar renewable energy projects on and around the elementary, middle and high schools in its jurisdiction. Turnkey services include: initial feasibility assessments at each of 10 school sites, identify sites where cost-effective projects are feasible, develop RFP terms and conditions; conduct vendor site visits; technical and financial evaluation of vendor bids; negotiation of power purchase agreement between the vendor and Board of Education; and project management during construction phase through project commissioning.

- Trump Plaza – Metro Energy Solutions recently completed a major energy efficiency renovation of Trump Plaza’s electrical, mechanical and water systems at this Atlantic City casino/hotel. Projects included the installation of wireless HVAC controls for the guest rooms, the installation of water conservation devices throughout the guest rooms, and mechanical upgrades to much of the “back of the house” areas.
- Town of Morristown – Metro Energy conducted a thorough energy audit and analysis of Morristown’s facilities, and was further selected as the solar consultant for Morristown’s 550 kW solar project at the Water Treatment Facility. Metro’s responsibilities included financial analysis, preparation of a bid specification, administration of the bid process, and project management, as well as several presentations to the mayor and council at public meetings.
- Township of Parsippany-Troy Hills – Metro Energy was selected as the solar consultant for Parsippany’s 700 kW solar project, to be sited on a landfill and former Superfund site at the Wastewater Treatment Facility. Metro’s responsibilities included financial analysis, preparation of a bid specification, working with the NJ DEP on all permitting issues, and submittal of the solar rebate application through the Office of Clean Energy. The project was approved for a \$1.7 million rebate. Metro was also responsible to coordinate financing through the NJ Environmental Infrastructure Trust Fund.
- Selective Insurance – Metro has been hired to be Selective’s energy consultant. In addition to complete energy audits of Selective’s office campus in Sussex County, Metro conducted a solar feasibility analysis and preliminary design of a 1.8 MW system that will be a combination ground-mount and roof-mount. The project has received preliminary approval by Selective. Upon notice of formal approval, Metro will be preparing bid specifications and providing project management of this installation.
- Philadelphia Water Department – Metro Energy has recently been selected to conduct a solar feasibility analysis and help the Department develop an understanding of the key elements in RFP development for a solar PPA.
- Morris County Improvement Authority – In December, 2008, Metro Energy was selected as the Energy Consultant for the MCIA’s county-wide Renewable Energy Program. This unique program is being funded by the MCIA, and it will allow every local government unit in Morris County to participate at no out-of-pocket cost to the local government unit. Metro Energy will be conducting feasibility analyses of each building, financial modeling, preparing bid specifications, negotiating contracts with bidders, and providing project management for each of the projects.

**APPENDIX C: CUMMINGS & SMITH PROFESSIONAL SERVICES FOR GHG MITIGATION PROJECTS INVOLVING METHANE RECOVERY FROM LANDFILLS**

**Cummings & Smith, Inc.**

**STATEMENT OF EXPERIENCE**

Cummings & Smith, Inc. founded in 1988, is a consulting engineering firm specializing in all facets of solid waste engineering, including landfill design and permitting, source separation and recycling, and resource recovery and alternative energy facilities. The firm's principals have extensive experience as project leaders and have successfully implemented projects in all phases of the solid waste field. The firm and its principals have extensive experience in engineering assistance during project financings, and the principals of the firm have prepared and executed consulting engineer's opinions for in excess of \$800 million of public financings for successful, currently operating solid waste facilities.

The following brief list of projects illustrates both the breadth and depth of the firm's and its principal's experience.

**LANDFILL GAS PROJECTS**

**Lycoming County, PA**

The firm and its principals have provided consulting engineering services for the permitting, design, construction quality assurance (CQA) and operations of this 100 acre lined sanitary landfill's landfill gas collection system since 1987 including:

Design and CQA for a landfill gas collection system, consisting of 6,200 feet of 3" through 16" gas piping, two blowers and two flares, construction value \$954,000 in 1988, with additions to serve landfill cell expansions from 1988 to present.

Design, permitting and CQA for a 1.0 MW landfill gas fired electrical generation facility and cogeneration facility, construction value \$3.75 million. The cogeneration system uses waste heat from the engine generators in the form of hot water to heat the landfill administration and maintenance buildings and leachate treatment process by way of a 2,500 feet long circulating hot water piping system. This facility began commercial operations in 1993 and has been operational at greater than 100% of contracted electrical production each year from 1993 to present.

Preparation of energy sales feasibility study for use of landfill gas to provide energy to the U.S. Bureau of Prisons. Energy production for the federal facility will be 3.6 MW electrical power and 23 mmBTU/hr of thermal energy in the form of pressurized hot water.

Feasibility study and preliminary engineering for conversion of landfill gas to LNG vehicle fuel at a production capacity of 10,000 gallons per day LNG, including production of electrical energy for the operation of the facility.



Preparation of Title V Permit and state air quality permits for the landfill and landfill gas destruction facilities.

**Pollution Control Financing Authority of Camden County Camden County, NJ**

The firm has provided consulting engineering services for the permitting, design, construction quality assurance and operations of the landfill gas collection system and energy production facility at this urban sanitary landfill located in the Philadelphia suburbs, including the following projects:

Design, permitting and CQA of five separate landfill gas collection system construction projects from 1996 through 2005 which include more than 150 vertical gas collection wells, horizontal gas collection systems and flares for gas destruction.

Preparation of feasibility studies for the direct combustion of landfill gas in several neighboring industrial facilities including an aluminum smelter and paper mill.

Preparation of site designs, preliminary engineering, air quality permitting and contract negotiation with a private landfill gas system operator for the construction of a 3 MW electric generation facility which provides power to the adjacent aluminum smelter and the local electrical grid.

Preparation of Title V air quality permit and state air quality permits for the landfill gas system and the landfill gas to energy facility.

Conducted two series of Tier 2 landfill gas production tests in 2001 and 2005 to confirm NMOC production is below federal permitting limits.

Weekly landfill gas system monitoring and gas collection system operations control of the gas collection system to optimize energy production and minimize off-site gas migration from 2006 to the present.

**Clinton County Solid Waste Authority  
McElhattan, PA**

Design, permitting and CQA for landfill gas collection and flaring system for this 40 acre lined landfill, including Title V and other state permits.

Conducted Tier 2 landfill gas production tests in 2001 to confirm NMOC production is below federal permitting limits.

Design, permitting and CQA for landfill gas pressurization, dehumidification and 15,000 LF pipeline for landfill gas sales to adjacent steel mill, and assisted in negotiations with steel mill for sale and purchase of landfill gas.

**Greater Lebanon Refuse Authority  
Lebanon, PA**

Provided design, permitting and operations consulting services for both landfill gas collection systems for the Authority's closed landfill and currently operating landfill.

EPA Tier 2 landfill gas testing and reporting (2 projects, 5 years apart).

***Southern Ocean County Landfill, New Jersey***

Cummings & Smith, Inc. prepared a landfill gas generation feasibility study for the Southern Ocean County, New Jersey Landfill. The feasibility study used gas generation predictions assuming various waste disposal scenarios and annual landfill waste filling rates, cost estimates for a landfill gas collection system, and projections of energy prices in order to model project economics for various landfill gas utilization scenarios and to develop recommendations for landfill planning purposes.

***Chrin Brothers Sanitary Landfill, Easton, PA***

Cummings & Smith, Inc. prepared a Title V Operating Permit Application which included estimates of landfill gas emissions as well as emissions from existing gas collection system flares, engine drive units and other miscellaneous sources based on AP-42 emission factors. Cummings & Smith, Inc. also prepared a conceptual design report and plans for the evaluation of a landfill gas treatment and transport piping system for gas sales to local industries. The project evaluation included cost estimates as well as estimated rates of return for various gas sales scenarios.

***Penn Pikt, LLC***

Cummings & Smith, Inc. prepared a landfill gas generation projection study for Waste Management's Arden Landfill in Washington Township, PA as part of a project feasibility study for a tomato greenhouse project. The planned project would utilize landfill gas as a fuel for heating a greenhouse. As part of the landfill gas study, Cummings & Smith, Inc. prepared projections of the energy which would be available annually from the gas.

**LANDFILL PROJECTS**

**Lycoming County, PA**

The firm and its principals have been responsible since the early 1970's for the site selection, permitting, design, construction observation and quality assurance monitoring and operations consulting for this 1,300 ton per day landfill located in central Pennsylvania. This landfill was awarded an EPA grant as a demonstration project for the installation of synthetic liners and was the first synthetic lined landfill in Pennsylvania. The list of services for this project includes:

Site selection, permitting and initial facility design.

Construction observation of the initial facility construction (Fields 1 & 2 and all common -6-facilities), approximately \$3.7 million. The initial landfill consisted of 20 acres of 20 mil PVC liner, leachate collection and gas collection facilities.

Design, construction quality assurance (CQA) of landfill Field 3 - 10.5 acres of 20 mil PVC liner, leachate collection and gas collection facilities, construction value \$752,000.

Design and CQA of landfill Field 4 - 9.2 acres of 30 mil PVC liner, leachate collection and gas collection facilities, construction value \$1,060,000.

Design and CQA of landfill Field 5 - 5.6 acres of 50 mil PVC primary liner 30 mil PVC secondary liner, leachate collection and gas collection facilities, construction value \$975,000.

Design and CQA of landfill Field 6 - 11.6 acres of double 100 mil HDPE liner, leachate collection and gas collection facilities, construction value \$3.7 million.

Design and CQA for the reconstruction of two leachate storage lagoons, 66,000 s.f. of double 100 mil HDPE liner, and ancillary facilities, construction value \$1.2 million.

Permitting (actually re-permitting) of the entire site in 1988-90 to comply with the revised Pennsylvania DER regulations.

Permitting, design and CQA for a 65,000 gpd leachate treatment and septage management facility.

Annual operations consulting for 15 years (1978 through present) including annual site volume assessments, annual economic studies for rate setting, operations consulting, litigation assistance. Closure plan preparation and CQA for closure of Fields 1-4.

Off-site borrow area planning, permitting and design.

NPDES permitting for leachate treatment discharge to Susquehanna River, NPDES Storm Water permitting for the facility.

Permit modifications for use of foam as a daily cover, and other various operations changes.

Assistance in preparing amendments to the County solid waste management plan.

Planning assistance for new site acquisition.

Design and construction quality assurance of landfill fields 7, 8, 9 and 10, double lined 100 mil HDPE with GCL composite liner system, 40+ acres, construction value \$18 million.

Permitting, design and construction quality assurance of 61,000 s.f. recycling processing building, construction value \$10 million.

Permitting, design, and construction quality assurance for construction of water supply wells, 500,000 gallon storage tank and 12" water distribution system for the facility.

Permitting, design and construction quality assurance for construction of additions to the small vehicle self-dump facility, 2003.

Permitting, design and construction quality assurance for construction of a wood mulch production facility.

Design and construction quality assurance for the re-paving of the facility access roads.

Engineering planning and design for state of the art anaerobic composting facility for MSW, pilot scale, and demonstration scale facilities.

Permitting engineering for minor permit amendments during facility operations.

Permitting engineering for NPDES storm water permit for the facility.

Permitting engineering for facility expansion of 500,000 CY in 2001.

Permitting engineering for the facility's major permit renewal (required every 10 years).

Permitting, design and construction CQA for tire storage facilities.

Permitting engineering for radiation monitoring at the facility.

Permitting, design and CQA for expansion of the facility shale borrow area.

Permitting, design and CQA for new long term cover material stockpile.

Permitting, planning and design for conversion of facility long term cover borrow area to industrial park.

Preparation of annual DEP space utilization reports, annual compaction studies, annual long term economic viability studies and monthly density surveys.

Preparation of major solid waste permit application for site boundary expansion and for improvements to storm water management facilities in 2005-6.

Preparation of application for wetlands mitigation, and design and construction monitoring of wetlands mitigation construction in 2006.

Preparation of major solid waste permit application for facility 5,000,000 ton capacity expansion, air permit modification, leachate treatment contract negotiations in 2007-2008.

### **Clinton County (PA) Solid Waste Management Authority**

Cummings & Smith, Inc. and its principals have provided engineering services to this 500 ton per day double lined landfill since 1982, including the following efforts:

Operations assistance since 1982 in operating the existing "natural renovation" landfill.

Permitting for a new 35 acre double lined landfill, expandable to 44 acres, to meet the 1988 Pa DER regulations (double liners, leachate and gas collection).

Preparation of closure plan and design and CQA for the closure of the natural renovation portion of the site using a synthetic cap.

Design and CQA for lined landfill site preparation, including 75,000 cy of earth excavation, storm drainage and erosion control facilities, construction value \$535,000.

Design and CQA for Field 1 construction, 6.8 acres of double 100 mil HDPE liner, geonet, bentonite sheet, geotextiles, leachate collection piping and gas vents, construction value \$2.7 million.

Design and CQA for Field 2 construction, 6.8 acres of double 100 mil HDPE liner, leachate collection and gas vents.

Permitting, design and CQA for 36,000 gpd leachate treatment facility.

Preparation of County Solid Waste Management Plan and amendments.

Demolition landfill siting study and permitting assistance.

Design and CQA for lined landfill cell construction for Fields 3 through 10, consisting of 100 mil HDPE liner, geonet, GCL, geotextiles, leachate and landfill gas collection systems.

#### **Greater Lebanon County (PA) Solid Waste Authority Lebanon County, PA**

Provided design services for modifications to landfill gas collection system to meet DER and EPA proposed design criteria.

Construction quality assurance for cells 4-6 double composite lined landfill cell.

Construction quality assurance for cells 5-7 double composite lined landfill cell in 2007.

EPA Tier 2 landfill gas testing and reporting (2 projects, 5 years apart).

#### **Pollution Control Financing Authority of Camden County Pennsauken Sanitary Landfill, Pennsauken, NJ**

Provided construction quality assurance services monitoring construction of an approximately 15 acre double composite lined sanitary landfill (4 projects).

Permitting, design, construction quality assurance for 5 separate landfill gas collection projects including wells, 16" HDPE and smaller collection piping, gas extraction blowers, flares and related facilities.

Performed EPA Tier 2 landfill gas testing and prepared Tier 1 and 2 test reports to meet New Source Performance Standards of U.S. EPA and NJDEP.

Design and construction quality assurance for construction of litter fence surrounding the facility.

Prepared bidding documents for the purchase of landfill heavy equipment, 4 projects.

Prepared NJDEP Title V permit application for the facility.

Assisted in contracting for landfill gas to electricity project by private entity and provided engineering site planning and design services for the private facility.

Conducted EPA Tier 2 Landfill Gas Emissions testing and reporting in 2006.

Prepared permitting, design and construction administration of new scale house, scales and entrance road improvements to landfill.

Provides weekly landfill gas system monitoring and adjustment of landfill gas system for the PCFACC's private electrical energy production company.

#### **Southern Ocean Landfill, Lacy Township, Ocean County, NJ**

Prepared feasibility study for re-opening this closed landfill to provide economic relief for the state escrow fund for site closure.

Prepared feasibility study for landfill gas collection and energy utilization.

Provide certification to NJDEP (formerly NJBPU) for ongoing closure costs. Provide technical assistance in litigation.

#### **Privately owned equipment company, Landfill Compactor Field Density Tests**

Provided engineering documentation of full scale compaction tests comparing Bomag and Caterpillar landfill compactors for a private equipment manufacturer.

#### **White Pines Landfill, Milton, PA**

Provided CQA services for the construction of storm water management facilities.

#### **Sussex County MUA Landfill, Lafayette, NJ**

Provided CQA for Phase 2A double composite landfill cell expansion.

Provided CQA for Phase 2B double composite landfill cell expansion.

#### **Warren County Pollution Control Financing Authority Landfill**

Provided CQA for NJDEP for double composite landfill cell construction.

**Gloucester County Improvement Authority Landfill, Woodbury, NJ**

Provide Construction Quality Assurance services for Authority and NJDEP for construction of Cell 10A construction.

**Frey Farm Landfill Lancaster, PA**

Provides landfill gas system monitoring and operations consulting services for private landfill gas to energy operator at this site.

**RECYCLING, COMPOSTING AND OTHER FACILITIES****Center County (PA) Recycling Facility**

Prepared design study and layout for multi-material recycling facility.

**City of Tampa (FL) Recycling Program**

Provided assistance in preparing and implementing the recycling program for this major city.

**Superbowl XXIV Recycling Program**

Provided engineering for the recycling program for the NFL Superbowl held in Tampa.

**Private Company Recycling Facility**

Provided siting and preliminary design for private recycling facility in northern NJ.

**Sarasota County (FL) Recycling Program**

Provided assistance in planning and implementing the recycling program for this County.

**Clinton County (PA) Recycling Program**

Provided planning, design and implementation assistance for this curbside collection and dropoff program, with baling facility for residential/commercial/office and yard waste recycling.

**Clearfield Boro (PA) Recycling Program**

Provided engineering assistance in development of recycling program for this municipality.

**Volusia County (FL) Solid Waste Management Program**

Provided engineering studies for waste destination survey and feasibility studies for per bag collection charge system.

**Brooksville, FL Recycling and Composting Facility**

Provided engineering designs for a recycling and solid waste composting facility for this central Florida community.

**Central NJ Composting Facility**

Provided site engineering and permitting for a privately owned leaf and food waste composting facility.

**Newark, NJ Composting Facility**

Provided engineering designs for this 400 tpd proposed sludge and food waste composting facility.

**County Conservation Co, Gloucester County, NJ**

Provided permitting and engineering for Class B and Class C recycling facility.

Provided engineering design and permitting for facility expansion of Class B and Class C recycling facility.

**Lycoming County (PA) Recycling Facility Montgomery, PA**

Provided design, permitting, construction monitoring, startup assistance, and operations consulting for a 62,000 square foot multi-materials recycling facility in central Pennsylvania.

**Private Recycling, Facility Southern New Jersey**

Provided site planning design, facility planning and materials for acceptance in County Solid Waste Plan for 1,000 ton per day materials recovery facility.

**Private Recycling Facility**

Provided engineering design and permit plans for Class B recycling facility and transfer station in Camden, NJ.



**APPENDIX D: FUTUREPAST PROFESSIONAL SERVICES FOR GHG MITIGATION  
PROJECTS INVOLVING REFORESTATION, AFORESTATION AND OTHER  
MODIFICATIONS OF SURFACE COVERINGS**

**FUTUREPAST: INC.  
STATEMENT OF QUALIFICATIONS**



2111 Wilson Boulevard, Suite 700 | Arlington, VA 22201 USA | Tel: +1 703 358-9127 | Fax: +1 703 358-9566 | [Count.Carbon@futurepast.com](mailto:Count.Carbon@futurepast.com)  
[www.futurepast.com](http://www.futurepast.com)

## **I. Technical Capabilities**

Futurepast: Inc. helps organizations manage climate change risks and opportunities. We divide our services in four categories:

- Consulting to management on carbon risk management, including disclosure strategies and environmental claims;
- Accounting for greenhouse gas emissions and emission reductions with emphasis on surface cover modification and methane management projects,
- Verifying greenhouse gas accounts and reports, and
- Integrating greenhouse gas management into an organization's overall management system.

### **A. Greenhouse Gas Consulting**

Futurepast assists organization to identify and address strategic issues related to climate change.

#### **1. Carbon Risk Management**

Climate change presents organization with a number of risks, including changes in consumer preferences, regulatory risks, direct and indirect impacts from the effects of climate change, and reputational risk. Organizations may seek to mitigate carbon risks through energy efficiency improvements, the acquisition of carbon financial instruments, and new product and service development.

#### **2. Disclosure**

Futurepast assists organizations with the decision on what to disclose and how to disclose greenhouse gas information. Some requests for disclosure are voluntary, such as through the Carbon Disclosure Project or The Climate Registry. Other disclosures are mandated, such as SEC filings. Organizations should ensure that their public and regulatory disclosure strategies are consistent, coordinated and backed up by sound accounting evidence.

#### **3. Environmental Claims**

With increased consumer interest in greenhouse gas information and climate change mitigation, companies are increasingly asked to quantify greenhouse gas emissions applicable to particular products or services. We use the tools of life cycle assessment to develop a "carbon footprint" that can withstand both public and regulatory scrutiny.

### **B. Greenhouse Gas Accounting**

Futurepast assists organizations to establish and report information from greenhouse gas inventories, for either internal management purposes or for purposes of public, regulatory or supplier disclosure. We assist in the development of internal tracking tools or in the implementation of enterprise solutions for tracking greenhouse gas information.

### 1. Project Quantification, Monitoring and Reporting

Futurepast assists organizations meet requirements of emission reduction project protocols such as those published by the Climate Action Reserve or the Voluntary Carbon Standard. **Futurepast works primarily in the forestry and methane management sectors.** We work as consultants to the owners of rights to greenhouse gas emission reductions and seek assurance that all aspects of the project are carried out in accordance with applicable protocol requirements.

### 2. Carbon Footprint of Products

Consumers and suppliers increasingly want to know what the carbon “footprint” is of the products and services they consume. Carbon footprints quantify the greenhouse gas emissions that are associated with a process, a system of processes or a product system for the purpose of indicating their contribution to climate change. For example, a food manufacturer may make an environmental claim that the greenhouse gas emissions associated with a processed food product (including its associated transportation and packaging to the point of purchase through consumption and package disposal) amount to 100 grams per package. The application of life-cycle assessment techniques provide a substantive basis for such claims. The methodology can be applied equally to services such as an airline trip or annual meeting of an association.

### 3. Organizational Inventory Quantification and Reporting

Futurepast helps organizations establish and maintain accurate, reproducible and robust inventories of greenhouse gas emissions and removals. We help organizations identify who has what information and how that information can be collected and managed once for the benefit of both the financial accounting system and the greenhouse gas accounting system. Futurepast helps organizations comply with greenhouse gas regulations at both the state and federal levels, as well as with the accounting of information intended for voluntary disclosure.

## C. Greenhouse Gas Verification

Futurepast provides greenhouse gas verification services to satisfy an organization’s requirements for internal auditing of the greenhouse gas information and information systems. Our services are also available to organizations that wish to verify the greenhouse emissions information and management systems of their supply chain. Futurepast verifies greenhouse gas information at the professional level of accredited independent third-party greenhouse gas verification bodies.

### 1. First-Party Verification (Internal Audits)

Organizations have many reasons to verify greenhouse gas emissions. Whether the information is collected for management purposes or regulatory compliance, greenhouse gas inventory reports can be complex and highly technical. Some regulatory programs explicitly require “internal auditing” of greenhouse gas inventory information. Others require measure of “quality assurance/quality control” which are often understood to include internal auditing. As

consultants, we are not only able to provide expert, clear and insightful verification audit reports, but we are also able to help organizations resolve any problems or issues that arise as a result of the audit.

## 2. Second-Party Verification (Supplier Audits)

As more and more manufacturers and distributors are asked for greenhouse gas information related to products, the need for verification of supplier greenhouse gas information will continue to grow. Futurepast provides an outsourced solution for organizations needing second-party greenhouse gas and environmental management audit services at a high professional level.

## D. Management System Implementation and Auditing

Futurepast assists organizations with implementation and maintenance of environmental management systems, Responsible Care management systems in the chemical and transportation industries, and integrated health-safety-environmental management systems in all industries.

### 1. Environmental Management Systems (ISO 14001)

Organizations that manage environmental aspects, including greenhouse gas emissions information, can streamline their operational control and enhance improvement of their processes through the implementation of an environmental management system. The essence of the management system is the Plan-Do-Check-Act cycle of continual improvement pioneered by Edward Deming, and it has proven successful for all types of organizations in all economic sectors around the world.

### 2. Responsible Care Management Systems (RC14001, RCMS)

In response to the special needs of the chemical industry, the American Chemical Society spearheaded the establishment by its members of integrated safety-health-environment management systems adapted to the particular needs of the chemical industry. Futurepast helps organizations, including Partner organizations providing chemical transport services, to meet these high standards.

### 3. Integrated Health-Safety-Environmental Management Systems (OHSAS 18001–ISO 14001)

Futurepast helps organizations integrate safety-health-environmental management systems to improve system performance and streamline processes in organizations with a need to demonstrate separate conformity to both the OHSAS 18001 and ISO 14001 management system standards.

### **III. Futurepast Experience**

Futurepast was founded in the State of Washington in the mid 1980s. Its current Virginia incorporation dates to 1994.

#### **A. Greenhouse Gas Management and Verification**

Futurepast has delivered greenhouse gas management consulting since 2002 when it advised the New Jersey Transit System on recent developments in greenhouse gas reporting regulations. In 2005 NSF-ISR, a subsidiary of NSF International, engaged Futurepast to develop a greenhouse gas validation and verification body that would meet all applicable international standards for operational performance. It subsequently charged Futurepast with obtaining recognition from various greenhouse gas programs (e.g. the California Climate Action Registry) and later with obtaining accreditation from the American National Standards Institute (achieved December 2008).

Futurepast personnel assigned to work with NSF-ISR have developed a high level of technical expertise in validation and verification of greenhouse gas projects and verification of greenhouse gas inventories. Work performed under contract to NSF-ISR includes the following types of activities: program management, training and supervision, and validation and verification.

Sectors in which Futurepast personnel have performed technical greenhouse gas work include:

- Forestry
- Electricity generation
- Food and beverage
- Landfill gas and livestock methane management
- Manufacturing
- Media and entertainment
- Oil and gas exploration and development
- Petroleum refineries
- Public utilities
- Service sector.

#### **B. Management System Implementation and Auditing**

Futurepast has provided information and training on ISO 14001 since the standard's earliest stages of development (1994). After its publication, Futurepast assisted organizations with the implementation of management systems and with their assessment through auditing. Futurepast assisted customers in the following sectors implement or improve their ISO 14001 –based environmental management systems:

- Chemical/pharmaceuticals
- Oil and gas
- Manufacturing
- Service

- Transportation.

Futurepast has provided auditor personnel to conduct both first-party in cases where the organization chose to outsource internal audits. Working through such organizations as ABS Quality Evaluations, Lloyd's Register Quality Assurance, and NSF-ISR, Futurepast has provided audit personnel with the qualifications and capability to conduct accredited third-party audits for purposes of granting certification.

Futurepast has provided management system consulting and auditing to organizations based in the following countries:

- United States
- Angola
- Canada
- Chile
- Colombia
- France
- Mexico
- Panama
- Trinidad
- Ukraine.

### **C. Training Design and Delivery**

Futurepast has delivered training to management and organizational personnel on a wide variety of topics related to environment, safety and health, business management and marketing, and greenhouse gas policy and management.

Futurepast's training in environmental management or integrated safety-health-environment management transfers skills in management systems implementation, maintenance and auditing to the staffs of Futurepast's client organizations. Typical training courses may include:

- Understanding and Implementing ISO 14001<sup>1</sup>
- Documenting an Environmental Management System
- Auditing an Environmental Management System.

In the 1990s Futurepast developed tailored training courses for the US State Department and US Agency for International Development as those bodies provided assistance to the states of the former Soviet Union. The training was designed to assist policy makers and high- and mid-level managers' transition to a market based economy while preserving environmental objectives and protections.

Since 2002 Futurepast has provided training in greenhouse gas policy, inventory and project quantification, and verification to organizations in both the public and commercial sectors.

---

<sup>1</sup> Course descriptions can be found on Futurepast's website, [www.futurepast.com/semtrain.htm](http://www.futurepast.com/semtrain.htm).

## Statement of Qualifications

Countries where Futurepast has delivered training programs include:

United States  
Angola  
Armenia  
China  
Czech Republic  
Djibouti  
France  
Panama  
Trinidad  
Russia  
Ukraine.

### D. Futurepast's Involvement in Standards Development

Futurepast's president has participated in standards development at both the United States and international levels. As a member of the US Technical Advisory Group (US TAG) to ISO TC 207 since 1998, he helps develop US positions on new and existing international standards like ISO 14001. As an expert designated by the US TAG, he represents the United States on various ISO technical committees and working groups.

Futurepast has in this way contributed to the development and or maintenance of the following International Standards:

- ISO 14001:2004 (Environmental management systems)
- ISO 19011:2002 (Quality and environmental management systems auditing)
- ISO 14064:2006 (Greenhouse gas management in three parts: inventory, projects and validation/verification)
- ISO 14065:2007 (Requirements for greenhouse gas validation and verification bodies)
- ISO/DIS 14066 (Competence of greenhouse gas validation teams and verification teams)
- ISO/WD 14067 (Carbon footprint of products).

Futurepast's president currently serves as a co-chair of the US TAG's SubTAG 7 on greenhouse gas management. At the international level, he serves as liaison between ISO TC 207's Subcommittee 2 on Auditing and Subcommittee 7 on Greenhouse gas management. He has received two "Outstanding Service in International Standards Development" awards from the US TAG.

### E. Quality Management System

Futurepast's work is guided by the provisions of its quality management system which is based upon the requirements of ISO 9001:2000. Key documents in Futurepast's quality management system can be accessed at [www.futurepast.com/q\\_policy.htm](http://www.futurepast.com/q_policy.htm).



**APPENDIX E: RÉSUMÉS OF ENVIROPLAN CONSULTING PROFESSIONAL  
STAFF PROVIDING GREENHOUSE GAS CONSULTING SERVICES**

Dr. John Bewick

Stephen Greene

Dr. Howard Ellis, QEP

James Mahoney, Ph.D.

Daniel Steen, P.E

Joseph Kwasnik

Al Dittenhoefer, Ph.D.

Julia Shannon, E.I.T.

Ganesh Srinivasan, E.I.

Tanya White

Linda Quigley

**JOHN A. BEWICK, D.B.A.**

**AREAS OF SPECIALIZATION**

Dr. Bewick is Director of Enviroplan Consulting's GHG Emissions Inventory Verification Services. He is a Certified Greenhouse Gas Verifier as certified by CSA America. He also specializes in conducting environmental assessments and audits. He has over 25 years of experience in the environmental field.

**EXPERIENCE**

For the American National Standards Institute, responsible for ISO 14065 Conformity Assessment determinations for GHG verification and validation bodies

Developed environmental management systems based on ISO 14000 principles for industrial compliance with environmental, health and safety regulations. The systems identify all compliance actions required each year (typically 200-300), who is responsible and due dates and creates documentation of task completion and checklists for management tracking by month of compliance status.

Provided expertise in assessing sites involved in real estate transactions for hidden environmental liabilities such as hazardous waste dumping or leaking underground storage tanks.

Secretary, Executive Office of Environmental Affairs, Commonwealth of Massachusetts:

- Directed agency with 3600 people, budget of \$120 million
- Developed innovative approach to siting of hazardous waste facilities
- Developed national model for protection of barrier beaches
- Initiated major capital program of sewer and water system restoration
- Promoted Heritage Park program in urban settings
- Launched project to restore nesting of bald eagles in state
- Promoted multi-community solid waste disposal projects

Studied risks of serious accidents involved in Liquefied Natural Gas Imports, particularly for large LNG terminal on Staten Island. Directed external relations program associated with LNG projects. Responsible for economic analyses of gas investment projects.

Executive Assistant to Director, WASH-1400 Study of Nuclear Accident Risks Atomic Energy Commission. Director, Project to develop benefit-cost guidelines for Environmental Impact Statements.

Bettis Atomic Power Laboratory, Westinghouse Electric Corporation - Reactor Physics Group: Worked in the Reactor Physics Group with responsibility for developing the physics analyses of design concepts for navy nuclear reactors. Co-authored several papers on neutron flux synthesis methods.

## **PROFESSIONAL CERTIFICATION**

Certification by CSA America, Inc. as a Greenhouse Gas Verifier

## **PUBLICATIONS**

John Bewick, “Greenhouse Gas Compliance Complexities”, Public Utilities Fortnightly, February, 2008.

John Bewick, Enviroplan Consulting, Verification and Validation of Greenhouse Gas Emission Assertions and Project Reductions Under the American National Standards Institute Accreditation Program, EUEC Energy and Environment Conference, Phoenix, AZ, February 2009.

## **EDUCATION**

Bachelor of Engineering Physics, Cornell University

Master of Nuclear Science, University of Michigan

Masters in Business Administration and Doctorate in Business Administration (Major in Statistical Decision Theory) Harvard University, Graduate School of Business Administration

**STEPHEN H. GREENE**

## **AREAS OF SPECIALIZATION**

Senior environmental consultant currently specializing in providing independent GHG verification and validation services. Provides expert international regulatory knowledge and establishes a proactive relationship with regulatory authorities and NGOs on air pollution and other environmental issues.

## **EXPERIENCE**

Environmental Consulting (2004-present. Started with Enviroplan Consulting in 2008)

- For the American National Standards Institute, responsible for ISO 14065 Conformity Assessment determinations for GHG verification and validation bodies
- Independent consultant on product environmental requirements and sustainable business practices
- Corporate Manager for Fortune 40 and 200 Multinational Companies
- Product Stewardship, Design for the Environment, Take Back, RoHS/WEEE, REACH Management
- Sustainable business practices and reporting
- Environmental legislation development and regulatory negotiations
- Critical permits, projects and multidisciplinary task force management
- Chairman of national and state environmental committees and work groups
- Environmental and risk management cost savings
- Environmental Management and Information Management Systems
- Environmental issues germane to mergers, acquisitions and divestitures
- Specializing in product stewardship and international product environmental requirements for the electronics sector advising on integrating new requirements like WEEE, RoHS and REACH into business plans and practices. Specific experience:
  - Development of strategic plan and presentation content on impact of international environmental product regulations for primary and finished goods electronics product manufacturers
  - WEEE RoHS and REACH Roadmaps and consultation for specialty electronics and electrical manufacturing companies
  - International product environmental regulatory impact awareness training and consultation on both consumer and business electronics manufacturers
  - Presentations and articles on the paradigm shift caused by product environmental regulations.

Polaroid Corporation (1990-2004)

Product Stewardship and International Environmental Manager

Corporate Environmental Manager, providing worldwide policy direction and technical advice for product stewardship, design for the environment, environmental management and product development. Specific experience:

- Integrated environmental requirements into Polaroid's environmental information systems
- Managed critical environmental requirements and product design for the EU directives on RoHS and WEEE
- Managed permit applications and regulatory negotiations which impacted the whole Corporation
- Integrated business and environmental regulatory needs into common management practices
- Active in industrial and regulatory working groups negotiating regulations and long-term policy
- Led multidisciplinary groups involved in design for the environment and environmentally sound end-of-life product management
- Routinely interpreted and communicated regulatory trends and impacts on the Company's products and operations to senior management
- Conducted site investigation, remediation and real estate due diligence
- Trained line and operational environmental staff
- Managed international environmental issues which impacted products and business operations
- Chaired Polaroid International Health, Safety and Environmental Committee for implementation of an ISO 9000/14000 compatible HSE management system.
- Member of the US TAG on International Environmental Management System Standards and other advisory committees

Digital Equipment Corporation (1981-1990)

Corporate Environmental Affairs

Strategic Corporate Manager of Environmental Affairs with worldwide responsibility for environmental programs in the areas of air, water, hazardous waste management, waste minimization, community right-to-know, toxic substance controls and Superfund. Specific experience:

- Interfaced with all levels of management for cost effective compliance through problem elimination. Managed program development, regulatory interpretation, impact analysis, long-term planning, liability reduction, risk management/financial guarantees, training, and extensive communication
- Managed projects with significant legal and financial corporate exposure
- Provided regulatory advice to a wide variety of facility personnel for day-to-day compliance in a rapidly changing regulatory arena
- Worked with various corporate and facility functions to assure cost effective compliance for both short term and long term regulatory impacts
- Obtained permits with multi-year lead times. Closed out unneeded permits
- Provided corporate oversight for compliance documentation
- Instrumental in creation of the Corporate Environmental Health and Safety Audit Program
- Negotiated regulatory issues with federal and state environmental agencies including a RCRA clean closure of a hazardous waste lagoon and avoided Superfund listing of a spill site
- Was an active participant in Massachusetts Department of Environmental Protection advisory committees and Associated Industries of Massachusetts environmental committees
- Worked with Corporate Purchasing for national ordering agreements that provided cost effective disposal, reduced long-term liability for hazardous waste disposal including reclamation of metal sludges, asset recovery/recycling and supply chain management

Environmental Scientist, JBF Scientific Corporation (1971-1980)

Senior Environmental Scientist and Director of Field Operations. Worked predominantly on environmental problems relating to hazardous and non-hazardous wastes. Established a state certified analytical laboratory and was the Radiation Officer. Conducted experiments, field research, sampling, and in situ measurements. Developed equipment and methodologies to handle unique research problems.

**EDUCATION:**

M.A. Marine Biology  
Boston University

B.A. Biology  
Boston University

**PROFESSIONAL AFFILIATIONS:**

Member, American Association for the Advancement of Science

Co-Chair of Associated Industries of Massachusetts' Environmental Health and Safety Council

Chair of the Massachusetts Water Resource Authority Wastewater Advisory Committee

Chairman of the Board WasteCap of Massachusetts

Past Member, The Interconnect and Packaging Committee, Environmental Committee Chairman

Semiconductor Industry Association, Environmental Committee and Waste Minimization Work Group Chairman

American Electronics Association Environmental and Occupational Committee, RCRA and Product Take Back Co-Chairman, Waste Minimization Task Force Chairman

Member of the Microelectronics and Computer Technology Corporation Electronics

Chair of the Environmental Roadmap Task Force, Regulation and Standards Section

Member of the National Microscale Chemistry Center Advisory Committee

Member and Co-chair of the MWRA's Mercury Work Group

President of the New England Chapter of the National Association for Environmental Management

Member of the Boston University Medical Center Safety Committee

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

## **AREAS OF SPECIALIZATION**

President of Enviroplan Consulting. Senior consultant with 36 years experience in air pollution emissions inventory development on local and regional scales, 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 includes GHG emissions inventory development and the validation and verification process for GHG assertions. Expert in the World Resources Institute and World Business Council for Sustainable Development Greenhouse Gas Protocol Corporate Accounting and Reporting Standard and in the International Standards Organization 14063, 14064 and 14065 Standards for developing and validating/verifying GHG emissions and for accrediting bodies who validate/verify GHG emissions. Familiar with the Clean Air Climate Protection software functionality for developing community level GHG emissions inventories.

## **EXPERIENCE**

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.

Senior Reviewer of various projects to develop GHG emissions inventories and mitigation measures.

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

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



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

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

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

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

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

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

Designed and developed Enviroplan Consulting's Power Plant Siting Database which includes analyses of the PM<sub>2.5</sub> monitoring data collected nationally for 1999 through 2002.

Directed large scale field studies and research programs to quantify the most extreme vertical dispersion rates governing plume dispersion based on remote plume sensing data and air quality and meteorological monitoring data. He has developed models for plume transport in complex terrain based on aerial tracer studies. He has also participated in the development of models for treating building-effect downwash and fumigation due to gradient onshore flows from water bodies. He has served as a consultant to various electric utilities on studying the variability in SO<sub>2</sub> emission rates from coal-fired power plants and on developing proposed compliance methods for SO<sub>2</sub> emission limits.

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

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

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

Responsible for administrative oversight and general management of large contract for state air pollution control agency over six year period to prepare construction permits and more recently Title V operating permits for large cross section of industry.

Project manager for contract with state air pollution control agency in the Southeast to operate the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO<sub>x</sub>, SO<sub>2</sub>, and CO; 19 PM<sub>10</sub> monitors; 29 PM<sub>2.5</sub> monitors; and 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Work involved full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits.

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

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

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

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

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

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

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

### **PUBLICATIONS**

Ellis, H.M., 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 PM<sub>2.5</sub> 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 PM<sub>2.5</sub> 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., Handley, J.C., Pinto, A.A., White, T.L. (2007) "Changes in State and Local Air Pollution Compliance Practices Due to Increased Title V and Other Permit Recordkeeping and Reporting Requirements". Presented at the Air & Waste Management Association 100th Annual Meeting, Pittsburgh, PA, June 22-24, 2007.

Ellis, H.M., Yousuf, A.A., Bent, A., Roy, Seema, Thotakura, R., Ogunsola, F. (2004) "Projected PM<sub>2.5</sub> Attainment Status of Each County in the U.S. and Strategies for Dealing With Nonattainment Designations and With the Proposed Interstate Air Quality Rule". Presented at the Air & Waste Management Association 97th Meeting, Indianapolis, IN, June 22-24, 2004.

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

Yousuf, A.A., Hydari, N.H., Earls, P.A., Ellis, H.M. (2003) "Second Annual Survey of the Most Recent BACT/LAER Determinations for Combustion Turbines by State Air Pollution Control Agencies". Presented at the Air & Waste Management Association 96th Annual Meeting, San Diego, CA, June 22-26, 2003.

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

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

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

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

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

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

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

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

Ellis, H. M., Plante, V., Arruda, C. (1995) "Successful Service Support Strategies for 40CFR75 CEM Systems", Presented at Air & Waste Management Association International Conference: Continuous Compliance Monitoring Under the Clean Air Act Amendments, Chicago, IL, October 25-27, 1995.

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

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

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

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

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

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

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

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

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

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

Ellis, H.M., Liu, P.C., Bittle, C.R., and Deland, R., Enviroplan, Inc., Lyons, W.A., Mesomet, Inc., and Parker, K., Wisconsin Power & Light Co. (1979) "Development and Validation of a New Prediction Model for Treating Gaussian Dispersion, Aerodynamic Downwash, and Fumigation Due to Lakeshore Meteorology," Fourth Symposium on Turbulence, Diffusion and Air Pollution, January 15-18, 1979, Reno, Nevada.

Ellis, H.M. and Liu, P.C. (1977) "Comparison of Maximum Measured and Maximum Predicted SO<sub>2</sub> 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<sub>2</sub> 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.

**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 GHG emission limitation systems; 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.

**DANIEL V. STEEN, P.E.**

## **AREAS OF SPECIALIZATION**

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

## **EXPERIENCE**

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

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

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

Mr. Steen began his career as a co-op engineer at Ohio Edison Company in 1966, which merged with Centerior Corporation in 1997 to form FirstEnergy. He has held a variety of engineering and management positions, including substation design, transmission and power supply planning, and power plant operations. He was assistant plant superintendent at the coal-fired, five unit, R.E. Burger Plant in Shadyside, Ohio from 1984 through 1986 where his responsibilities included mechanical maintenance, electrical maintenance and supply chain. Mr. Steen was promoted to Director of the Environmental Department in 1997 and named Vice President, Environmental in 2005.

**PROFESSIONAL CERTIFICATION/DEVELOPMENT**

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

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

Completed International Environmental Compliance Program sponsored by Westinghouse.

**PUBLICATIONS**

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

**EDUCATION**

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

Juris Doctorate, University of Akron, 1972

**AFFILIATIONS**

Registered Professional Engineer, Ohio.

Licensed Attorney, Ohio.

**JOSEPH KWASNIK****AREAS OF SPECIALIZATION**

Mr. Kwasnik is a Senior Principal at Enviroplan Consulting where his primary focus is consultation on planning, design, and implementation of corporate management systems for addressing Climate Change initiatives. Following his retirement in 2009 as Head, Global Climate Change, National Grid, one of the largest electric and natural gas utilities in the world, he joined Enviroplan Consulting on a part time basis.

**EXPERIENCE**

An experienced executive with 30+ years of experience in the utility environmental arena having managed air and water quality issues and permitting programs for utility generation, transmission and distribution infrastructure, operational environmental compliance activities (RCRA, TSCA, CERCLA, etc), waste site remediation of legacy utility manufactured gas plant, PCB and ash sites, management of large environmental teams and, most recently, architect of the Climate Change Initiative for National Grid.

Mr. Kwasnik also has:

- Proven management ability to lead large and small environmental teams
- Practical industry knowledge of electric distribution and transmission systems with a focus on their environmental impacts
- Interaction with Demand Side Management and interruptible load management teams
- Cutting edge knowledge of climate change issues
- Skilled and knowledgeable in waste site remediation
- Mature interpersonal skills
- Well developed knowledge of UK and EU environmental issues
- Traveled extensively in UK and EU
- Former Licensed Site Professional-Massachusetts

**Environmental Management**

Mr. Kwasnik developed the Climate Change Initiative for National Grid which included the adoption of the 80% reduction of GHG emissions by 2050, development and implementation of carbon budgets across each of National Grid's Lines of Business and linking of these budgets to management compensation. This position also required the management of the GHG inventory process for the entire scope of Grid operations, communication of the Initiative to employees, investors, legislators and government policy makers and formation of a team to drive necessary changes within the National Grid organization to achieve the adopted climate change targets.

As VP of Environment US 2002-2007 Westborough, MA, he oversaw the environmental compliance activities at National Grid including ISO 14001 certification, site remediation (\$60 million annual budget), project licensing and permitting, RCRA/TSCA/CERCLA compliance activities, management of over 80 engineers and scientists including department budgets and personnel administration. In addition, he conducted all acquisition due diligence investigations for National Grid including the former EUA companies and Keyspan Energy.

As Director of Environment and Safety 1996-2002 Westborough, MA this position included the same responsibilities as the VP role and management of all US safety activities.

As Manager of Remediation and Safety, Health and Environmental Audit 1993-1996 Westborough, MA, Mr. Kwasnik organized the initial response of National Grid to the Manufactured Gas Plant (MGP) liabilities resulting from the Boyd litigation in Lynn, MA. The response included formation of the first MGP management team, litigation support and site discovery and notification activities to regulatory agencies. In addition, the internal environmental and safety audits were managed from this position.

Manager of Water and Waste Programs 1987-1993 Westborough, MA, this position involved the management of the NPDES permitting and monitoring program for the thermal and hydro generating stations of National Grid and managed the solid and hazardous waste programs of the company.

Various Environmental Positions 1978-1987

Geophysicist, Texaco, Inc., 1974-1975

## **EDUCATION**

MS in Environmental Engineering, University of Massachusetts-Amherst, 1975-1978

BA Geology, University of Connecticut-Storrs, 1970-1974

## **AFFILIATIONS**

VP of Massachusetts Brownfield Association 2004-2006

**ALLEN C. DITTENHOEFER, Ph.D.**

## **AREAS OF SPECIALIZATION**

Senior Vice President of the Environmental Studies Division and Director, Southeast Regional Office in Birmingham, AL. Dr. Dittenhoefer has 29 years of experience as an environmental consultant in areas including estimation of GHG emissions, 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.

## **EXPERIENCE**

Dr. Dittenhoefer has served as Principal Investigator, Project Manager, manager responsible for Quality Assurance for hundreds of air pollution emissions inventory development, air quality modeling and air permitting projects including several involving development of GHG emissions inventories. This work has included estimating and measuring emissions from complex source groups such as coke batteries, storage tanks, equipment components and surface impoundments; complex area and volume sources. It has also included 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:

Coke Plant. Developed complete GHG emissions inventory for all stationary sources and mobile sources for use in voluntary reporting of GHG emissions. Developed inventories for several years.

Glass Wool Plant. Developed comprehensive GHG emissions inventory for all sources of GHG emissions for use in the company communications to shareholders. Developed inventories for several years.

Steel Company: Developed 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<sub>x</sub> 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<sub>2</sub>, H<sub>2</sub>S, 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<sub>2</sub> NAAQS attainment of alternative SO<sub>2</sub> emission limit compliance methods. These studies involved the simulation of short term SO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> emissions trends in Eastern North America. The objectives of this study were to 1) investigate the relative importance of meteorological versus SO<sub>2</sub> emissions with respect to precipitation sulfate concentrations, 2) examine the relative importance of local versus distant SO<sub>2</sub> source regions on sulfate concentrations, and 3) estimate the degree of linearity between regional SO<sub>2</sub> 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<sub>2</sub> 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 PM<sub>2.5</sub> 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 SOCOMI 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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

**JULIA SHANNON****AREAS OF SPECIALIZATION**

Chemical Engineer with two years experience in water resource regulatory review and two years experience in air pollution consulting including preparation of Minor Source Operating Permits, new Source Construction Permit, Federally Enforceable, Title V-Synthetic Minor Operating Permits, and Title V Permits and work related to GHG emissions inventory development and verification.

**AIR POLLUTION PERMITTING AND GREENHOUSE GAS EMISSIONS INVENTORY DEVELOPMENT EXPERIENCE**

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

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

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

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

Kentucky Division for Air Quality (DAQ). Aided permit reviewer from Enviroplan Consulting assisting the state agency in issuance of construction and operation permits where specialized in Remote AIMS Data Input User System (RADIUS) system use and data entry. Aided in calculation of potential emissions and verified accuracy of RADIUS system input and output to expedite permit review and submittal process.

## **WATER RESOURCES REGULATORY EXPERIENCE**

State of New Jersey Department of Environmental Protection (DEP),

Division of Land Use Regulation (DLUR):

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

## **PUBLICATIONS**

Ellis, H.M., 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 PM<sub>2.5</sub> NAAQS". Presented at the EUEC Energy and Environment Conference, February 2-4, 2009.

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

## **EDUCATION**

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

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



**AFFILIATIONS, ACTIVITIES, SKILLS**

Engineer in Training (EIT)  
Member of the Society of Women Engineers  
Functionally Fluent in Spanish

**GANESH SRINIVASAN, E.I.**

### **AREAS OF SPECIALIZATION**

Environmental Engineer with over five years experience in air dispersion modeling, emissions inventory development, air permitting and source sampling.

He has experience working with and revising regional emissions inventories for PM<sub>2.5</sub> and Ozone Model Attainment Demonstrations based on SMOKE, EMS2003 and CONCEPT models.

He has extensive experience in the application of the CAMx and CMAQ Models and their utility programs for making Model Attainment Demonstrations and identifying source contributions to predicted concentrations. He has also used these models to evaluate various control strategies for attaining the PM<sub>2.5</sub> and Ozone National Ambient Air Quality Standards.

He is versed in the Reporting Protocols and Verification Protocols of various Greenhouse Gas Programs including The Climate Registry. He has widespread experience in developing emissions inventories for a variety of industries.

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 PM<sub>2.5</sub> 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 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 four 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.

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

**AIR POLLUTION PERMITTING EXPERIENCE**

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

Private Industry:

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

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

### **OTHER AIR POLLUTION CONSULTING EXPERIENCE**

FirstEnergy: Conducted extensive analyses of PM<sub>2.5</sub> ambient monitoring data and the conditions under which the highest 24-hour PM<sub>2.5</sub> 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.

### **WIND ENERGY DEVELOPMENT EXPERIENCE**

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

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

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

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

## **PUBLICATIONS**

Ellis, H.M., Pan, S., Pinto, A.A, Shannon (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.

## **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.

LINDA M. QUIGLEY

### **AREAS OF SPECIALIZATION**

Staff Environmental Scientist with 15 years of experience specializing in emissions inventory development and other aspects of air pollution consulting. She has extensive experience preparing emissions inventories for various types of GHG emitting sources and is currently specializing in methods for reducing methane emissions from agricultural operations.

Seven years experience with Enviroplan's Environmental Studies Division, specializing in Part 70 (Title V) air permitting, state and federal New Source Review (NSR) air permitting, Minor Source air permitting, point source and fugitive emissions inventory development.

Seven years experience with Enviroplan's Monitoring Division, specializing in air 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.

### **EMISSIONS INVENTORY DEVELOPMENT AND METHODS FOR REDUCING METHANE EMISSIONS FROM AGRICULTURAL OPERATIONS**

She has extensive experience preparing and reviewing emissions inventories for various types of GHG emitting sources 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. She is currently specializing in methods for reducing methane emissions from agricultural operations including identification of the different approaches, their effectiveness and their costs.

### **AIR PERMITTING EXPERIENCE**

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: 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.

### **DATA REDUCTION AND VALIDATION EXPERIENCE**

Has extensive experience in the analysis, reduction and validation of air quality and meteorological measurement data in accordance with State and EPA protocols for ambient air monitoring, including PSD. Prepare detailed quarterly, semi-annual and annual reports summarizing monitoring program and meteorological audit results submitted to federal or state agencies and clients.

### **QUALITY ASSURANCE EXPERIENCE**

Assist 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. Assure that calibration data is current, valid and correctly applied to the data sets. Regularly reviews documentation associated with field checks on monitoring equipment to ensure accuracy of reported test results.

### **FIELD AUDITING EXPERIENCE**

Has extensive prior experience in conducting systems audits of network field activities and performance audits of air quality and meteorological monitoring systems, including SO<sub>2</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, NMHC analyzers, PM<sub>10</sub> 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. Generate written reports summarizing audit findings and recommendations.

**EDUCATION**

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