



**Sonoma Technology, Inc.**  
*Air Quality Research and Innovative Solutions*

# **Baldwin Hills Air Quality Monitoring Study**



## **Business Proposal**

In Response to the RFP Released January 17, 2012

Prepared for the  
Los Angeles Department of Regional Planning  
Los Angeles, California

February 2012



# Baldwin Hills Air Quality Monitoring Study

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In Response to the RFP Released January 17, 2012  
STI-712006

### Prepared for

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## A. Executive Summary

The Sonoma Technology, Inc. (STI) team is pleased to submit this proposal in response to the Los Angeles Department of Regional Planning's (the Department) Request for Proposals (RFP) for a Baldwin Hills Air Quality Monitoring Study, issued January 17, 2012. The objective of the proposed air quality study is to assess air toxic emissions from the Inglewood Oil Field (Oil Field) and estimate their associated health risks to the surrounding community. STI is an air quality consulting company that has been implementing air quality monitoring studies and air toxic assessments, such as those requested by the Department for the Oil Field, for three decades. Our strong reputation is based on providing clients excellent science and effectively communicating results to address project objectives. STI's expertise in designing and managing large field studies, coupled with state-of-the-art analysis, will result in unbiased, science-based conclusions that speak directly to stakeholder concerns.

As summarized in the Baldwin Hills Community Standard's District Environmental Impact Report (Marine Research Specialists, 2008), there are a number of air toxics of concern, including diesel particulate matter (DPM), gaseous volatile organic compounds (VOCs), and trace metals. These different pollutants cannot be measured with a single device, so multiple monitoring and analytical methods are needed. To assess chronic risk from the air toxics of concern, long-term averages that are representative of annual concentrations are needed. To assess acute risk and quantify air toxics emissions from the oil field, short duration samples are needed. Characterizing short- and long-term concentrations across the large number of air toxics emitted from the Oil Field requires a prioritization of the air toxics of greatest concern. In addition, we must also account for hourly and seasonal variations in meteorological patterns, which influence the dispersion and transport of Oil Field emissions to the surrounding community. The challenge of requiring multiple measurement methodologies and sampling durations, while accounting for variable meteorology, is a common but difficult one.

We have experience in many similar studies, during which we worked with the clients to develop a robust scientific approach within budget limitations. For example, we have designed multiple studies to apportion the impact of emissions from freeways, landfills, industrial areas, and ports on surrounding neighborhoods. As part of these projects, we worked closely with the client to effectively communicate the science and results to the public while adhering to high scientific standards. For this project, we propose to gather hourly air quality data to best characterize emissions of DPM and toxic metals from the Oil Field, as well as to quantify gaseous toxics gradients in and around the Oil Field using longer-term samples. We propose to characterize the concentrations of the air toxics emissions from the Oil Field that are of most importance to human health, basing the selection of these toxics on emissions listed in the Environmental Impact Report (EIR) and the relative health risks of each species.

Our analysis shows that DPM emissions rank highest among the air toxics of concern that are associated with activities at the Oil Field. We will target DPM by measuring its surrogate, black carbon (BC), at multiple locations every hour. Several metals rank next, but they are difficult and relatively expensive to monitor at a time resolution high enough to ascertain the impact of Oil Field emissions. We propose to conduct an intensive monitoring campaign using a specialized instrument (XACT 625) that will quantify a suite of metals on an

hourly basis, enabling us to determine the impact of metal emissions from the Oil Field on the surrounding community.

Gaseous species such as benzene, formaldehyde, and acetaldehyde are also important from a health standpoint, and gradients of these species around the Oil Field will be determined by using a series of passive samplers. With results from these samplers, we can determine whether there is a “hot spot” of emissions of these gaseous air toxics at the Oil Field compared to the concentration levels existing in the larger Los Angeles area.

We believe this approach of combining high time resolution and specialized instruments yields the best chance of meeting the scientific objectives specified in the RFP. Alternative approaches that do not include high-time-resolution data would not be able to truly assess “upwind/downwind” differences that help identify the toxics’ point of origin. For metals and BC, longer-term samples would likely blur the differences between concentrations originating from the Oil Field and those originating from other sources in the area such as nearby freeways.

STI has extensive experience in developing useful findings regarding the chemical and meteorological processes that influence localized air quality in complex environments such as those found at Baldwin Hills and in the Southern Coast Air Basin (SoCAB). In particular, STI has led over 50 studies that determined air quality source and receptor relationships and has developed several data analysis tools and software programs for this purpose. Dr. Paul Roberts, our proposed Principal Investigator, has over 30 years of experience designing and managing air quality field projects in many locations throughout the United States; he will be extensively involved in the design of the proposed study and in communicating the results to the Department and concerned stakeholders. Dr. Michael McCarthy (STI) and Dr. Richard Peltier (University of Massachusetts at Amherst) will be the lead scientists assessing the results and summarizing the impact of the Oil Field emissions on the community. Dr. McCarthy, who is recognized as an air toxics expert by the U.S. Environmental Protection Agency (EPA), has published a number of articles on national air toxics concentrations. Dr. Peltier, who is a leader in understanding ambient trace metal concentrations, will lead the analysis apportioning trace metal concentrations via the hourly metals measurements. Mr. David Vaughn will be the field manager; he has overseen many similar large field projects, such as landfill and airport monitoring in southern California, as well as near-roadway and personal exposure studies.

## B. STI's Qualifications

In this section, we provide a description of our team's technical and financial qualifications that will allow us to meet the objectives of the proposed work. In addition, we provide five references for similar work and provide required forms, including the List of Contracts and the List of Terminated Contracts (of which there are none). As required by the RFP, we also provide information on Pending Litigation and Judgments within the past five years (of which there are none). Full resumes of key staff and additional qualifications are provided in the Appendix to this proposal.

### B.1 Proposer's Background and Experience

Founded in 1982 and based in Petaluma, California, Sonoma Technology, Inc. (STI) is a California Small Business of about 70 employees providing air quality and meteorological research and services. With additional staff in central and southern California, STI is an employee-owned firm that delivers innovative, science- and technology-based solutions for our clients' air quality and meteorological needs worldwide. Our integrated teams of atmospheric scientists, engineers, technicians, programmers, analysts, and specialists generate products, services, and measurements tailored to meet each client's needs. In addition to our core services including meteorological and air quality measurements, exposure assessment, modeling, emissions development, and data analysis, our services include custom instrumentation, training and education, geographic information systems, specialized software development, air quality forecasting, and policy analysis.

STI scientists and engineers have extensive experience designing, managing, and performing air quality measurement studies throughout the United States (including the South Coast Air Basin, or SoCAB) and abroad. We help government and industry clients define study objectives and design air quality studies. Our studies help clients identify the sources, transport, transformations, and impacts of atmospheric pollutants on public health. We assist agencies in understanding the emissions sources that affect pollutant concentrations at specific locations and in developing control strategies to minimize pollutant concentrations and exposure, taking steps to identify the relative contributions of local sources and transported pollutants and precursors. Project examples in southern California include the California Regional PM<sub>10</sub>/PM<sub>2.5</sub> Air Quality Study, Southern California Ozone Study, Central California Ozone Study, Southern California Air Quality Study, and Sunshine Canyon Landfill air quality monitoring for the City of Los Angeles.

STI staff also have extensive experience operating and maintaining air quality and meteorological monitoring equipment. For example, STI currently runs the South Coast Air Quality Management District's (SCAQMD) wind profiler network, which includes five radar wind profilers, four sodars, and surface meteorological stations (see **Figure B-1**). This project, as well as many others, has provided our staff with the necessary experience to work effectively in and around airports, schools, ports, offshore oil rigs, roadway construction crews, landfill operators, and other settings that require sensitivity to ongoing operations, security, and related factors.

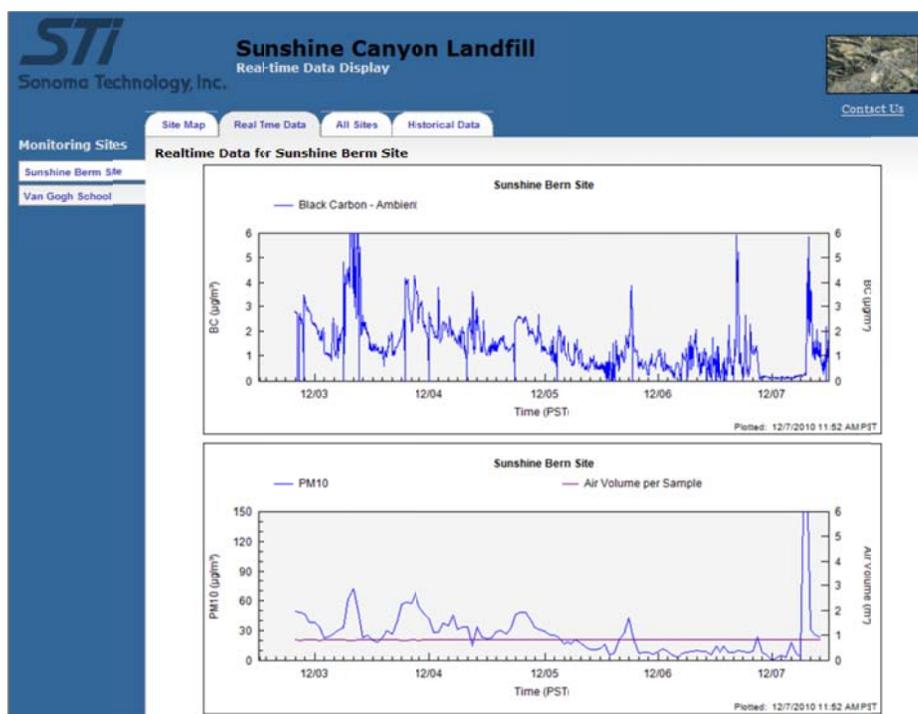


**Figure B-1.** STI staff maintaining equipment at Ontario International Airport.

STI offers a variety of specific services to accomplish the tasks required to meet the project objectives. Our services include determining site locations; preparing, setting up, operating, and maintaining monitoring equipment; and reviewing and auditing operations and data. STI analysts validate collected data, prepare quality-assured data sets, perform data analyses, perform modeling, evaluate modeling results, and communicate results through technical documents, webinars, and other methods. STI staff have prepared training materials and conducted training on data validation, data analysis, source apportionment, monitoring network assessments, and a wide range of other air quality-related topics for the U.S. Environmental Protection Agency (EPA) and other government clients.

STI has successfully run numerous long-term and special-studies monitoring and sampling networks and conducted data analysis to quantify air pollution impacts in downwind communities. These networks included continuous gaseous pollutant and particulate matter (PM) monitoring and sampling, plus meteorological monitoring and laboratory analysis support. For example, STI is currently running a two-site network of black carbon (BC),  $PM_{10}$ , and meteorological measurements near the Sunshine Canyon Landfill for the City of Los Angeles; monitored for BC and polycyclic aromatic hydrocarbons (PAHs) and sampled for various volatile organic compounds (VOCs) near the Santa Monica Airport; ran a four-site network of meteorological and continuous gaseous pollutant, BC,  $PM_{10}$ , and  $PM_{2.5}$  for a roadway construction project in southern Arizona; ran a six-site network of meteorological and continuous gaseous pollutant and BC measurements at near-roadway sites in Las Vegas, Nevada; ran a multi-site network of meteorological, routine, and research-grade gaseous and PM monitors and samplers for the California Regional  $PM_{10}/PM_{2.5}$  Air Quality Study (CRPAQS); and, for several different studies, ran a combination of continuous gaseous pollutant and particulate instruments at multiple sites in Arizona and California. For these types of projects, STI developed and used an automatically updated website to review data daily in order to ensure high-quality data and high data recovery (see example in **Figure B-2**). For these projects and others, STI has developed extensive field operation manuals, standard operating procedures (SOPs), and

quality assurance project plans (QAPPs), and has delivered high quality air quality and meteorological data at high data-recovery rates.



**Figure B-2.** Real-time data monitoring and data analysis on an interactive website as part of a project near a landfill.

STI staff members are expert in conducting data analysis to address scientific, regulatory, policy, and community objectives. Many of STI's data analysts have advanced degrees in atmospheric and environmental science, chemistry, and engineering. Of particular relevance to this project, STI staff are leaders in developing useful findings regarding the chemical and meteorological processes that influence localized air quality in complex environments such as those found in the Baldwin Hills and in the SoCAB. STI has led over 50 studies that determined air quality source and receptor relationships and has developed several data analysis tools and software programs for this purpose. Most recently we developed a tool for the EPA called EPA PMF 3.0 (see <http://www.epa.gov/heasd/products/pmf/pmf.html>) that allows scientists to elucidate source/receptor relations in complex emissions environments. We have published peer-reviewed results from several studies including work in the SoCAB and elsewhere (Brown et al., 2007a; 2007b; Buzcu-Guven et al., 2007). STI staff have been leaders in understanding air quality and meteorological processes in the SoCAB since the early 1970s; we designed and managed the field measurements and performed data analyses for the seminal Southern California Air Quality Study (SCAQS) in the late 1980s and continue to perform measurement and data analysis work in the SoCAB. STI has also conducted numerous studies to quantify pollutant concentrations from air emissions, including air toxics, and has participated in many short and long-term health exposure studies including the University of Southern California Children's Health Study. Many of these studies, including

some of the studies listed above, focused on separating the impact of individual sources from other local and regional sources, using statistical data analysis and modeling techniques.

STI has ample computing resources to support the project including computer equipment, data management/processing systems, software and supporting databases, and security systems. In addition to hardware and software resources, STI has a full staff of on-site IT specialists, software engineers, programmers, and database developers. STI routinely and automatically transmits field data to a local database and presents the data graphically on the web; this allows daily data review and troubleshooting, thus improving data recovery and data quality.

STI is an employee owned and directed company with annual sales of about \$10,000,000. We have no debt and have ample cash reserves to support company and projects needs including the purchase of air quality monitoring equipment. We are financially sound and have been so since our inception in 1982. A review of the County's Contract Database and Contractor Alert Reporting Database (CARD) is not applicable because we have not previously contracted with the County of Los Angeles.

STI's subcontractor, Dr. Rick Peltier, Assistant Professor of the Department of Environmental Health at the University of Massachusetts, Amherst, holds a Ph.D. in Atmospheric Chemistry, with a specialization in quantitative aerosol chemical characterization approaches. He also holds a Master of Public Health from Columbia University and continues to maintain primary research interests in how chemical components of aerosols affect human health. He has extensive experience in executing field studies, which include large and small ground studies, large aircraft-based studies, and remote-location field studies. He maintains a productive research lab at the University of Massachusetts with current projects including controlled smog chamber studies of photochemistry and health effects, field studies of aerosol chemistry in extreme cold environments, and instrument design approaches that build a measurement device capable of estimating the propensity of aerosol to induce reactive oxygen in cells. He is the 2012 awardee of the Walter Rosenblith New Investigator Award given by the Health Effects Institute. Dr. Peltier has extensive experience in projects relevant to this proposal, including former projects characterizing aerosol chemical components of carbonaceous particles at a field site in Riverside, California, participation in EPA supersite characterization projects (New York, Pittsburgh, and Atlanta), and investigations of aerosol chemical composition at residential sites in an urbanized location (New York City). He is currently operating his semi-continuous XRF, which collects hourly integrated samples of 24 trace metals, to characterize trace metals at a remote location in Alaska. As a result of his work, he has 23 peer-reviewed publications in this field and three more in preparation. His laboratory owns and operates a variety of chemical composition instruments, including methods in chromatographic separation (liquid and gas), carbon evolution, X-ray fluorescence spectroscopy, mass spectrometry, gas phase analytes, and a variety of aerosol physical measurement instruments (particle sizing/count).

### B.1.1 Specific Project Experience Related to the Baldwin Hills Air Quality Monitoring Study

This section summarizes the STI team's relevant project experience. Full descriptions of relevant, key projects are provided in the Appendix. The following projects demonstrate key aspects of our team's capabilities pertinent to the field monitoring, subsequent data validation, data interpretation, and reporting. **Table B-1** lists selected projects and identifies the skill areas used that relate to the Baldwin Hills project. In addition, five client references are provided in Section B.2, Exhibit 2.

**Table B-1.** STI and U-MASS projects and relevant skill areas.

Project	Skill Areas							
	Perform AQ and/or Meteorological Monitoring	Maintain Monitoring Equipment	Ensure QA/QC Standards Met	Analyze Chemical and Meteorological Data	Conduct Exposure Assessments	Quantify Emissions	Prepare Timely Technical Reports	Participate in Stakeholder Meetings
Ambient Air Quality Monitoring at Los Angeles Sunshine Canyon Landfill	✓	✓	✓	✓			✓	✓
Field Study of PM <sub>2.5</sub> Emissions Generated from a Road Widening Project	✓	✓	✓	✓		✓	✓	
U.S. 95 Mobile Source Air Toxics Study	✓	✓	✓	✓	✓		✓	✓
California Regional PM <sub>10</sub> /PM <sub>2.5</sub> Air Quality Study Anchor Site Operations (CRPAQS)	✓	✓	✓	✓		✓	✓	✓
Development of EPA Standard Operating Procedures for Measurement of Continuous PM							✓	
Finalize EPA Quality Assurance Handbook Updates							✓	
Lake Havasu Carbon Monoxide System	✓	✓	✓	✓	✓		✓	✓
TCEQ Summer 2001 Event-Triggered Sampling and Analysis	✓	✓	✓	✓		✓	✓	
ADEQ Continuous PM Operation	✓	✓	✓	✓	✓	✓	✓	✓
Marin County Rock Quarry Project	✓	✓	✓	✓	✓	✓	✓	
SCAQMD Profiler and Surface Instruments Operations/Maintenance	✓	✓	✓				✓	
West Oakland Near Port Diesel Particulate Matter Emissions Inventory Development		✓	✓	✓		✓	✓	✓

Project	Skill Areas							
	Perform AQ and/or Meteorological Monitoring	Maintain Monitoring Equipment	Ensure QA/QC Standards Met	Analyze Chemical and Meteorological Data	Conduct Exposure Assessments	Quantify Emissions	Prepare Timely Technical Reports	Participate in Stakeholder Meetings
Assessment of Air Pollution Spatial Variability in Long Beach, CA	✓	✓	✓	✓	✓		✓	
Combustion Exhaust and the Respiratory Health of LA/Long Beach Port Community Children			✓		✓		✓	
EPA National Toxics Analysis, Phases III-VI				✓	✓	✓	✓	
Southeastern States Air Toxics Analysis				✓	✓		✓	
Source Apportionment of VOCs in Los Angeles Using PMF				✓		✓	✓	
Laboratory-based measures of aged diesel exhaust in a mouse model of atherosclerosis	✓	✓	✓	✓	✓		✓	
Semi continuous measurements of transition metals in Fairbanks Alaska	✓	✓	✓	✓		✓	✓	✓
Study of Organic Aerosols at Riverside (SOARs)	✓	✓	✓	✓		✓	✓	
Megacity Impacts on Regional and Global Environments (MIRAGE)	✓	✓	✓	✓			✓	✓

### B.1.2 Staff Qualifications

**Table B-2** and the following biographical paragraphs for selected staff describe the key personnel and technical staff proposed for this project. Full resumes of the proposed project team members are included in the Appendix to this proposal, and resumes and publications lists of all STI staff can be found at <http://www.sonomatech.com/staff.cfm>.

**Table B-2.** Individuals assigned to the Baldwin Hills Air Quality Monitoring project.

Name	Title / Field of Expertise	Project Role	Highest Degree / Yrs of Experience	So. Cal AQ Exp.
<b>Sonoma Technology, Inc.</b>				
Dr. Paul Roberts	Executive Vice President; Chief Scientific Officer; Corporate Quality Assurance Officer / AQ/met monitoring, QA/QC	Principal Investigator	Ph.D., Environmental Engineering Science / 33	✓
Mr. David Vaughn	Group Manager, Air Quality and Exposure Measurements / AQ/met monitoring	Project Manager, Monitoring Lead	M.S., Plant Sciences / 23	✓
Dr. Mike McCarthy	Senior Air Quality Analyst / Exposure Assessment	Data Interpretation Lead	Ph.D., Chemistry/ 8	✓
Mr. Clinton MacDonald	Group Manager, Meteorological Measurements and Analysis / AQ/met monitoring and analysis	Project Advisor for Meteorology	M.S., Atmospheric Science / 16	✓
Ms. Alison Ray	Field Technician / Monitoring equipment maintenance	Senior Field Technician	B.S., Business Administration / 21	✓
Mr. Kevin Smith	Field Technician / Monitoring equipment maintenance	Field Technician	B.A., Commercial Illustration / 11	✓
<b>University of Massachusetts</b>				
Rick Peltier	Assistant Professor/Ambient aerosols and human health	XACT 625 instrument support and data analysis	Ph.D., Atmospheric Chemistry / 10	✓

**Dr. Paul Roberts**, STI Executive Vice President and Chief Scientific Officer, is the proposed Principal Investigator. His role will be to ensure the corporate and scientific support necessary for a successful project, including oversight of monitoring, data validation, and data analysis. He will also review the SOP and assist with troubleshooting of routine operations when needed. Dr. Roberts has 33 years of experience designing and managing air quality field projects in many locations throughout the United States, including in the SoCAB. He has designed and conducted studies to understand important meteorological, air quality, and exposure phenomena; to develop, apply, and evaluate meteorological, photochemical, and exposure models; and to evaluate the effectiveness of ambient air quality and meteorological networks in meeting regulatory requirements. These projects focused on ozone, PM<sub>10</sub> and PM<sub>2.5</sub>, visibility, toxics, CO, and meteorology. Dr. Roberts is a member of the Clean Air Scientific Advisory Committee (CASAC) CO National Ambient Air Quality Standards (NAAQS) Panel. He has extensive experience working on air quality issues in the SoCAB and in industrial environments.

**David Vaughn**, STI's Group Manager, Air Quality and Exposure Measurements, will be the Project Manager responsible for all field operations. He is currently managing the fourth year of field monitoring at two sites at the Sunshine Canyon Landfill for the City of Los Angeles. The monitoring is designed to evaluate municipal landfill PM<sub>10</sub>, BC, and VOC impacts on community-level ambient air quality. Mr. Vaughn wrote a "model" SOP for EPA on the operation

of the Met One Instruments BAM-1020 configured to meet EPA FEM EQPM-0308-170 for PM<sub>2.5</sub> mass (Vaughn, 2009). He installed and operated a four-station near-roadway emissions field study for the Arizona Department of Transportation (ADOT) employing continuous monitoring of PM<sub>10</sub>, PM<sub>2.5</sub>, BC, CO, NO<sub>x</sub>, CO<sub>2</sub>, CH<sub>4</sub>, VOC, PAH, and meteorological variables. He served as a field operator for a year-long U.S. 95 MSAT (Mobile Source Air Toxics) near-roadway study sponsored by the Nevada Department of Transportation (NDOT) in Las Vegas. The ADOT, NDOT, and landfill field studies have relied heavily on remote capabilities for system control, quality control (QC) checks, and real-time data viewing. Mr. Vaughn assisted in upgrading and testing field measurement equipment used in the Southern California Children's Health Study (CHS). He provided technical field assistance and quality assurance (QA) support for additional PM<sub>2.5</sub> measurements in support of the CHS, as well as providing training, QA support, and data management for an intra-community PM variability study in 12 southern California cities.

**Dr. Michael McCarthy** is a Senior Air Quality Analyst in STI's Air Quality Data Analysis Division. His research areas at STI include the analysis of hazardous air pollutants, speciated fine particulate matter (PM<sub>2.5</sub>), and VOCs on national and regional scales. Dr. McCarthy served as the lead analyst for three phases of EPA national air toxics data analysis projects, which involved the inspection of trends, risk distributions, and spatial variability of HAPs, as well as a regional analysis of air toxics concentrations for the Southeast States Air Resources Managers. He has worked on a near-roadway analysis of air toxics and PM and on national, state, and local network assessments. He is the author or co-author of 17 peer reviewed environmental journal articles and was an invited speaker at the 2007 Air Toxics Risk Assessor's meeting. Dr. McCarthy's corporate responsibilities include assisting STI's Quality Assurance Officer with the development and implementation of corporate-wide quality control and assurance initiatives and serving as an internal scientific reviewer for technical project design, analysis, and reporting.

**Mr. Clinton MacDonald**, Manager of STI's Meteorological Measurements and Analysis Group, will provide guidance regarding meteorological monitoring and analysis. He has over 16 years of experience performing meteorological and air quality data analyses and measurements. His work at STI focuses on managing meteorological measurements including radar wind profiler and sodar measurements; developing conceptual models of processes that control air pollution; and conducting meteorology, forecasting, and data analysis training courses. He is currently the principal investigator for the maintenance and operation of five radar wind profilers (RWPs) for the SCAQMD and is project manager of an air monitoring and analysis project on a Chevron oil platform in the Gulf of Mexico for the U.S. Department of the Interior and of a central California coastal air quality measurement project for the California State Parks.

**Ms. Alison Ray**, Senior Air Quality Field Technician at STI, will lead installation and operations of the monitors, including implementing SOPs and supporting the other site operators in troubleshooting and problem solving. Ms. Ray has 21 years of experience in network design, site selection and logistics, installation, routine operations, troubleshooting, auditing, data validation and reporting, network assessment, and quality assurance. She is responsible for installing, calibrating, and operating air quality and meteorological monitoring instruments and delivering high-quality data to domestic and international government and

industrial clients. She is currently lead field technician for a range of projects, including audits of Caltrans roadway monitors and near-source air quality monitoring in Jamaica.

**Mr. Kevin Smith**, STI's Primary Field Technician in Southern California, has broad experience in maintaining and operating technical equipment. He is currently lead field technician for air quality and meteorological monitoring projects at the Sunshine Canyon Landfill in Los Angeles and at SCAQMD meteorological sites. Mr. Smith provides on-site support for atmospheric measuring and sampling equipment (including radar, sodar, and surface meteorological sensors) and recording/transmitting data logger devices at the SCAQMD's network of radar wind profiler sites. He also supports BC and PM monitoring and VOC sampling. He performs bi-weekly inspections, calibrations, and data extractions; maintains site logs; and responds to emergency service calls.

**Dr. Richard Peltier** is an Assistant Professor at the University of Massachusetts, a position he has held since 2010. His didactic training includes a Master of Public Health from Columbia University Mailman School of Public Health, and a Ph.D. in Atmospheric Chemistry from Georgia Institute of Technology. He completed his postdoctoral training in Inhalation Toxicology at New York University School of Medicine under the direction of Morton Lippmann. Dr. Peltier has over 10 years of experience in the operation of research-grade air quality instrumentation, as well as extensive work in novel instrument design and developing; this includes at least 15 major, federally funded field research campaigns. His research interests, which are currently supported by the National Institutes of Health, the Health Effects Institute, and the U.S. Department of Transportation, are in identifying the specific chemical components of ambient aerosol that are most closely linked to human health effects. His current projects include cold-weather aerosol formation characterization, investigating differential health responses to aerosol that has undergone varying degrees of photochemical aging processing, and the development of a novel sampler capable of semi-continuous measures of reactive oxygen formation potential of ambient aerosol.

### **B.3 Pending Litigation and Judgments**

STI is not involved in any pending litigation, nor have any judgments been made against STI in the past five years.



## C. Approach to Provide Required Services and Quality Control

### C.1 Personnel and Project Management

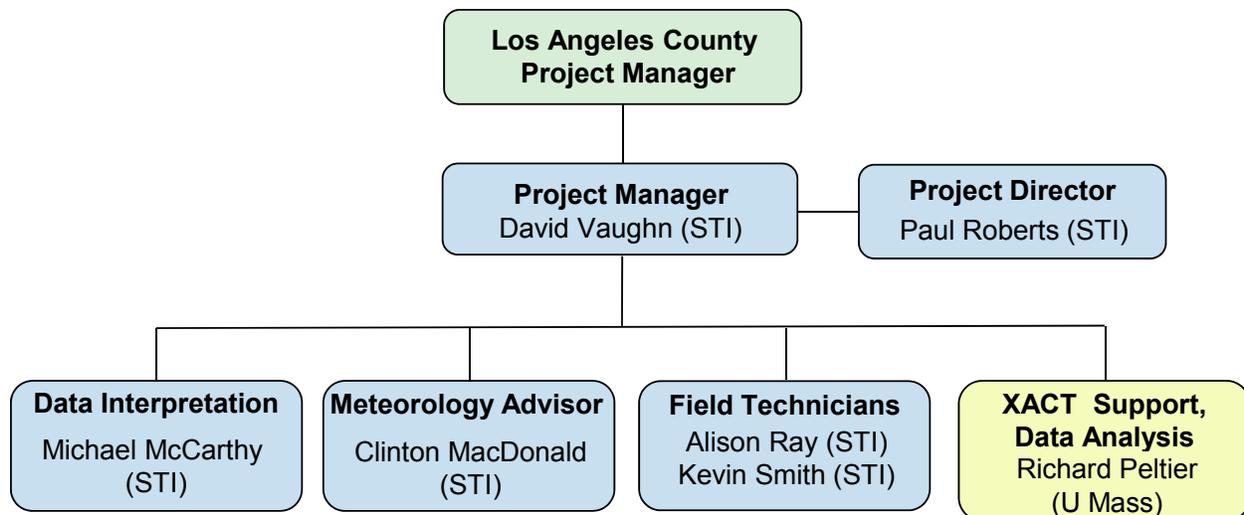
STI has assembled a multi-disciplinary and experienced team of professionals with proven experience on projects similar to the proposed work. Biographical paragraphs are provided for key personnel in Section B.1.2 and full resumes are provided in the Appendix to this proposal. The project organization and roles and responsibilities of assigned staff are provided in this section.

STI is fully committed to making the Project Manager and technical staff available on site as needed during the lifetime of the project. The Project Manager (or a designated alternate) will be available to the County during all work-week days (Monday through Thursday), between 9:00 am and 5:00 pm, 52 weeks per year (telephone 707-665-9900). In addition, the Project Manager will serve as a central point of contact with the County. The Project Manager will have authority to act for STI on all matters relating to the daily operation of the monitoring during the Contract.

#### C.1.1 Project Organization

The project organization chart in **Figure C-1** shows our proposed management structure and key staff for the project (also listed above in Table B-1). STI's Principal Investigator, Dr. Paul Roberts, and Project Manager, Mr. David Vaughn, are responsible for developing a project plan specifically designed to meet the goals and objectives of the project. The project plan will serve as a roadmap for the project and include a clearly defined technical approach to ensure that all resulting products are of high quality and are scientifically defensible. STI's project managers use a variety of resources and documents to plan their projects, including, but not limited to, the support of senior technical and management advisors, weekly budget information, QMPs, SOPs, annual program reports, and annual data completeness and precision and accuracy reports.

Paul Roberts (Principal Investigator) and David Vaughn (Project Manager) will communicate directly with the County's Project Manager on a routine basis. Dr. Roberts and Mr. Vaughn will work directly with each task leader throughout the project to ensure that all project components are well-coordinated and project objectives met.



**Figure C-1.** Project organization chart.

STI is committed to the collection of high-quality data, to the preparation of easily understood reports and analytical findings that meet client needs, and to collaboration and communication with our clients and stakeholders throughout the course of our work. These goals underpin our management philosophy and guide our response to handling management challenges that arise. For the work proposed here, STI will employ standard project management and budget control procedures that we have adopted as corporate policy and developed over the years in response to our experiences running field measurement and data analysis studies. By their nature, field programs demand careful oversight and require thorough project management plans. Personnel and equipment operate on-site, away from the office, and are thus in need of sufficient support and supplies to maintain ongoing operations in the field. Our proposed Project Manager, Mr. David Vaughn, and our Principal Investigator, Dr. Paul Roberts, who have more than 50 years combined experience with field operations, and individual task managers will each adhere to STI's standard management practices and will have access as needed to the array of technical and budget management tools described in this section.

### C.1.2 Project Management Procedures

**Kick-off meeting.** After receiving a fully executed contract, STI will produce a work plan describing the technical approach, project schedule, deliverable due dates, budget, and other pertinent task-related information. The work plan will be developed by the Project Manager in consultation with the Principal Investigator and task managers and will also outline communication procedures with County staff and with subcontractors. Once the work plan is delivered, STI will hold a project kick-off meeting with County staff in which we will review goals and tasks, discuss anticipated work elements, establish clear lines of communication between STI and County staff, and schedule upcoming progress discussions. A key goal of the kick-off meeting is to ensure that STI and County staff have a mutual understanding of the motivation for the work, the overall goals, the detailed work tasks, and the work products to be delivered.

**Regularly scheduled project team meetings.** STI's standard practice for field studies is to hold regularly scheduled team meetings at various stages of the work. This study involves several distinct phases with different communication needs. These phases include, for example, (a) a project planning and initiation period, (b) a period when we will operate the equipment, and (c) a period when data analysis is performed and results presented. During the early phases, we will have regular, weekly, internal (STI-only) meetings to discuss equipment deployment and progress. We will also hold regularly scheduled meetings with the County's project manager at least once every two weeks or as needed. Once we enter the more routine, monitoring phase of the work, we plan to hold regular monthly project meetings with County staff. Once the project begins, we can work with County staff to adjust this schedule as needed. During all work periods, we will also communicate work progress, monitoring anomalies, and other pertinent information.

Note that many of these meetings will occur via phone in order to provide cost-effective information as frequently as needed.

**Monthly reports of progress.** We will submit monthly progress reports that accompany our invoices. These reports will summarize the work accomplished during the reporting period, detail costs incurred to-date, and identify issues (if any) that need to be discussed or resolved with the County. To supplement the monthly reports, the STI project manager will, as needed, present informal briefings and reviews of work performed to the County.

### C.1.3 Budget Control Procedures

The STI Project Manager, Mr. Vaughn, will have budget control authority and will follow standard STI budget control procedures. Each of our projects is managed using five standard planning tools and procedures that help managers track expenditures and address budget-related issues:

**Weekly project manager budget reviews.** Our accounting staff uses an automated Financial Management System to provide project managers with weekly project budget reports by task. The weekly data enable managers to track cost against expected expenditures and quickly identify task expenditures that are trending away from anticipated levels.

**Weekly division manager project budget reports.** STI division managers receive a weekly report that identifies, by project and task, the budget, total spent, total funds remaining, percent budget expended, and percent time expended for all open contracts. As projects and tasks reach 75% of overall budget expended, they are highlighted to help division and project managers stay within budget.

**Weekly expense reports.** Project-related travel and other direct costs must be approved by project managers; requests for reimbursement are submitted weekly to project managers. These approval and reporting procedures enable project managers to ensure that all project-related charges are appropriate and within budget.

**Monthly invoicing and STI invoicing system standard practices.** STI's accounting staff prepares monthly invoices for all projects. The monthly invoice is accompanied by backup

documentation that itemizes, by task, labor hour costs by individual and other direct expenditures. The first invoice for a project is generated for project managers in draft format, enabling them to quality-check the labor rates applied and to ensure the accounting system is generating accurate invoices. Projects frequently have unique contract provisions related to the invoicing of equipment, subcontractors, and other costs. Our accounting staff works with our contracts staff to quality-check invoices, to provide any needed backup documentation for equipment purchases and other direct costs, and to assist with audits of our rates and financial management practices.

**Special budget tracking procedures specific to field programs.** In addition to the standard tools and procedures used for all STI projects, we employ additional budget control procedures for projects involving field work. For this project, as for all of our field study projects, STI's accounting department will provide the STI project manager (Mr. Vaughn) with seamless electronic access to STI's automated weekly finance management system reports.

#### **C.1.4 Issue and Risk Management Techniques**

STI's corporate approach is to ensure work quality throughout the project management process. To that end, we have developed a number of QA/QC practices. In addition, we have established standard procedures for identifying project issues and addressing risks. Highlights of these practices are provided here.

**General QA/QC procedures.** The mission of our QA/QC systems is to ensure that project resources are used efficiently to generate high-quality work products and to help identify and address at the earliest stage any problems that could affect work quality, cost, and timeliness. To maintain quality, STI has developed a corporate Quality Management Plan (QMP). Our 60-page QMP covers all aspects of our work, from the peer-review of our scientific products to the assessment and training of staff. Our proposed Principal Investigator for this study, Dr. Paul Roberts, is also STI's Corporate Quality Assurance Officer. It is Dr. Roberts' responsibility to ensure that all work completed under this contract is consistent with our corporate QMP.<sup>1</sup>

**Individual work product quality management.** STI seeks to produce high-quality written and electronic products that meet the needs of the target audience and are free of errors. STI achieves work product quality through a series of internal review-and-correction cycles and an external review by the client. All of STI's written reports are subjected to at least two internal reviews—the first by a senior technical staff member who is knowledgeable about the subject matter but is not the primary author of the work, and the second by a technical editor who is skilled in English mechanics and writing style. The reviews are iterative. Comments and suggestions are returned to the author, who takes responsibility for implementing or overseeing revisions. When a round of modifications is complete, the senior technical and/or editorial reviewer checks the revisions to make sure they are sufficient. Before any document (draft or final) is delivered to the client, the lead author or project manager gives it a final quality review and approves it for delivery. Similarly, electronic work products – including software, data, and websites – go through various work product QA/QC reviews. Field data are screened using

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<sup>1</sup> A copy of STI's Corporate QMP is available upon request. The latest edition is Version 3.0, dated August 4, 2010.

standard QA/QC procedures, and problematic data are flagged for appropriate removal from data analyses and other uses. Software and web site development is also subject to our QA/QC procedures, and our software and web-based work products must be independently tested under the direction of STI's Software Quality Assurance Engineer.

**Issue and risk management.** STI's Executive Committee (EC) meets weekly with division managers to identify and discuss emerging project-related issues that could affect work product delivery and budget. The weekly meetings are a forum in which any issue that could affect work product delivery can be discussed, including topics related to project staffing, data and equipment access, and budget. The purpose of the weekly meeting is to identify issues of concern and to assign responsibility for follow-up actions. In addition, the STI EC meets approximately every third week to address ongoing corporate management issues. Projects experiencing unique challenges are addressed by the EC to ensure that sufficient corporate support is available to projects and that remedial actions are identified and implemented, if needed.

## C.2 Study Methodology

### C.2.1 Overview of Project Goals

STI, in coordination with Dr. Rick Peltier of the University of Massachusetts, Amherst, has developed a technical approach to meet the primary objectives of the project based on a combination of four monitoring methods to cover the primary pollutants that are likely to impact human health from the Inglewood Oil Field. Our approach is informed by an analysis of the reported emissions from the Inglewood Oil Field and the relative toxicities of these pollutants as a way to determine the pollutants of greatest importance. This approach is intended to meet the primary project objectives and may provide an opportunity to meet the secondary project objectives for the pollutants of most concern to human health. The primary project objectives are to

- **Quantify the air toxic emissions from the Oil Field operations including drilling and well workovers.** This mandatory objective of the project will be addressed by quantifying the ambient air toxic concentrations that may be reasonably attributed to Oil Field operations. The project budget does not provide enough resources to precisely quantify the concentrations of all the air toxics that may be associated with the Oil Field Operations, so it is important to clearly identify and rank, according to the EIR and other relevant sources, the air toxics of interest. Once specific toxics are ranked, monitoring methods for the highest-ranked compounds must be assessed, since available methods may differ in detection limits, cost, and practicability. The area potentially affected by Oil Field operations is quite large, so the monitoring design must be considered in light of the variable diurnal and seasonal meteorological influences, the relatively high background concentrations known to exist in this area, and the substantial costs associated with the technology needed to accurately measure the target compounds. It is also important to understand that air toxics known to carry acute or chronic health risks may be less obvious to the community than other parameters, such as odors, that may carry a lower health risk. Additionally, monitoring programs currently in place need not be duplicated. It is recognized that the Air Monitoring Plan currently in place by PXP

is focused on monitoring and control of emissions of H<sub>2</sub>S and non-specified hydrocarbons (InterAct, 2009).

- **Assess the health risk of both acute and chronic exposure to air toxic emissions from Oil Field operations.** This is a mandatory objective of the project. Assessment of the health risk of acute and chronic exposures is complex and involves the synthesis of several types of health hazard information. The establishment of a health benchmark concentration—the concentration level at which no adverse health effects occur—is easier for some toxics than for others. For example, while diesel particulate matter (DPM) is considered a likely carcinogen on the basis of human and laboratory studies, the exposure response data in human studies are too uncertain to develop a carcinogenic unit risk.

In addition, two secondary project objectives were prefaced in the Request for Proposals (RFP) with the caveat, “to the extent feasible.” Our technical approach will provide data that should be sufficient to at least partially address these issues for the most important pollutants of concern. These secondary objectives are:

- **To the extent feasible determine and distinguish the major sources of toxic air emission within the areas surrounding the Oil Field.** We consider this a secondary objective of the project. The Oil Field is large (1400 acres) and the wells, storage tanks, and associated workday activities utilizing heavy equipment are widely distributed. Moreover, the Oil Field is surrounded and bisected by major roadways and other sources of ambient pollution such as LAX. Characterizing emissions from the Oil Field will require careful analysis of wind direction, spatial patterns, and chemical fingerprint information in order to separate the surrounding sources air toxics contributions from those of the Oil Field. This goal will be addressed to the extent feasible given the budgetary constraints and the priority of Goals 1 and 2.
- **To the extent feasible assess the Oil Field’s contribution to the overall acute and chronic health risk in the areas surrounding the Oil Field.** We consider this a secondary objective of the project. The Oil Field is not the only contributor to ambient air toxic concentrations in this area. If Oil Field emissions are separable from these other sources as described in Goal 3, we can characterize risk from the Oil Field. Using the measured concentrations and the meteorological data gained under Goal 1 and the dose-response information from Goal 2, previously collected data provided by PXP, and other available data from regional monitoring efforts, this goal will be addressed to the extent feasible

Our team’s approach to accomplishing the project goals includes the following major steps.

1. Conduct a hazard identification and dose-response assessment to determine which toxic species to monitor.
2. Evaluate the available monitoring methods applicable to each selected species for cost, reliability, detection limits, and overall data quality. Assess the usefulness for addressing the project objectives (e.g., continuous versus integrated sampling).

3. With knowledge of the target species, available monitoring methods, and the budget, determine the monitoring locations, and the frequency, duration, and type of sampling to occur at each location. This would include evaluation of diurnal and seasonal meteorological patterns, primarily wind speed and wind direction, local topography, and the spatial distribution of wells, storage tanks, and other potential sources within the oil field.
4. Plan the sampling logistics and implement the monitoring. For sample collection, this would include such items as power availability, accessibility, and communications.
5. Establish routine protocols with PXP to maintain an up-to-date log of Oil Field activities that will be used, in conjunction with collected data, to help address Goal 4. Experience with previous projects monitoring pollutant concentrations in areas subject to emissions from nearby sources has demonstrated great utility in these types of daily logs.

### **C.2.2 Hazard Identification and Dose-Response Assessment**

Health risk assessment comprises four component steps, as adopted by the California Office of Health Hazard Assessment (OEHHA) and first laid out by the National Research Council (National Research Council, 1983; California Environmental Protection Agency, 2001). The first step is hazard identification, which is used to identify pollutants of potential concern and their associated health impacts. The second step is dose-response assessment, which provides quantitative benchmark levels for assessing risk. The third step is exposure assessment, which involves assessing how people are exposed to the pollutant, for how long, and at what levels. Finally, the fourth step is risk characterization, where the three previous steps are synthesized into a quantitative evaluation of the potential of a pollutant to cause illness or disease in the population.

As part of this proposal and to support the development of a work plan, STI evaluated the potential toxicities for pollutants of concern by performing the hazard identification and dose-response assessment steps of the health risk assessment protocol. This toxicity ranking allows us to prioritize among the pollutants emitted by the Inglewood Oil Field to focus on the pollutants of most concern. For the hazard identification, STI used the reported emissions from 2005 and 2006 used in the Baldwin Hills Community Standards District Environmental Impact Report (Marine Research Specialists, 2008). In the EIR, Table 4.3.2 provides a list of all toxic air contaminants emissions in pounds per year reported to the SCAQMD. The table is provided below as **Table C-1**.

**Table C-1.** Table 4.3.2 from the Baldwin Hills CSD EIR, listing toxic air contaminant emissions in pounds per year from operations and drilling (including well-workovers), and totals..

Pollutant Description	2005 – 2006 Operations	Drilling <sup>1</sup>	Total	Inventory Threshold for Reporting <sup>2</sup>
1,1,2,2-Tetrachloroethane	0.03	0	0.03	1
1,1,2-Trichloroethane (Vinyl trichloride)	0.02	0	0.02	50
1,2,4-Trimethylbenzene	14.0	15.0	29.0	5
1,2-Dichloropropane (Propylene dichloride)	0.02	0	0.02	20
1,3-Dichloropropene	0.02	0	0.02	10
Acetaldehyde	7.8	208.1	215.9	20
Acrolein	4.4	10.31	14.7	0.05
Ammonia	244.3	0	244.3	200
Arsenic and Compounds (inorganic)	0.0007	0.60	0.60	0.01
Benzene	284.3	56.6	341.0	2
Butadiene (1,3)	0.44	5.4	5.8	0.1
Cadmium	0.0007	4.8	4.8	0.01
Carbon tetrachloride	0.03	0	0.025379	1
Chloroform	0.02	0	0.01968	10
Chlorine	0	41.6	41.6	None
Chromium, hexavalent (and compounds)	0.00004	0	0.000044	0.0001
Copper	0.0018	3.02	3.02	0.1
Diesel exhaust particulates	15.2	1311.6	1326.9	10
Ethyl benzene	179.9	8.6	188.6	200
Ethylene dibromide (1,2-Dibromoethane)	0.03	0	0.03	0.5
Ethylene dichloride (1,2-Dichloroethane)	0.02	0	0.02	2
Formaldehyde	131.4	416.5	548.0	5
Hexane	242.9	4.4	247.4	200
Hydrochloric acid	0.08	0	0.08	20
Hydrogen selenide	0.0010	1.2	1.2	0.5
Hydrogen sulfide	0.27	0	0.27	5
Lead compounds (inorganic)	0.0037	5.1	5.1	0.5
Manganese	0.0014	4.8	4.8	0.1
Mercury	0.0009	3.6	3.6	1
Methyl ethyl ketone (2-Butanone)	0	41.8	41.8	None
Methanol	1.04	0.85	1.9	200
Methyl tert-butyl ether	65.7	0	65.7	200
Methylene chloride (Dichloromethane)	0.06	0	0.06	50
Nickel	0	15.3	15.3	0.1
Phosphorus	0.0017	2.30	2.3	None
Polycyclic Aromatic Hydrocarbons	3.5	13.4	16.9	0.2
Styrene	0.02	1.6	1.7	100
Toluene	196.1	41.7	237.8	200
Vinyl chloride	0.01	0	0.01	0.5
Xylene	106.1	29.5	135.5	200

Source: 2005-2006 Operations from SCAQMD AER (based on fiscal year).

1. Drilling emissions are calculated from 2005/2006 drilling activities and includes well drilling, workovers and well pad grading.
2. Thresholds from the SCAQMD Protocol for the development of toxic emission inventories, 2004. Each facility emitting a toxic air contaminant greater than or equal to the annual thresholds listed in this table is assessed an annual emissions fee as specified in SCAQMD Rule 301.

STI used these emissions values to compare the pollutants' relative toxicities by weighting these emissions in relation to acute and chronic health benchmark levels from OEHHA. Chronic cancer risks cancer potency factors were accessed from [http://www.oehha.ca.gov/air/hot\\_spots/tsd052909.html](http://www.oehha.ca.gov/air/hot_spots/tsd052909.html), and chronic and acute Reference Exposure Levels (RELs) were accessed from <http://www.oehha.ca.gov/air/allrels.html>. Acute RELs can be either 1-hr, 8-hr or 24-hr values; the lowest REL was chosen to provide a conservative estimate of acute toxicities. All pollutant emissions were converted from pounds to micrograms, then weighted by pollutant-specific chronic cancer potency factors, chronic RELs,

and acute RELs, if applicable. Note that not all of the pollutants listed in Table C-1 are carcinogenic or cause noncancer health impacts.

From this weighting of emissions rates, the pollutants were rank-ordered to prioritize the list. **Table C-2** shows the final result from this weighting scheme with the top 13 pollutants listed. The weighted emissions results are normalized so that the most toxic pollutant in a category is scored as 1.0 and all other pollutants are shown relative to that value. Values below 0.005 are rounded and not shown, as contributions of less than 1% in relation to the key pollutant in a category are considered negligible.

For chronic cancer risk, DPM from the diesel generators is the most important pollutant. This is consistent with the findings from the Multiple Air Toxics Exposure Study III, conducted by SCAQMD, which found DPM (or EC, elemental carbon) to be the most important toxic pollutant contributing to risk in the Los Angeles basin (South Coast Air Quality Management District, 2008). In our analysis, the only other pollutants with cancer risks above 1% of the risk from DPM were cadmium (5%), benzene (2%), nickel (1%), and formaldehyde (1%). The estimated risk from emissions of all other pollutants was approximately 10% of the estimated risk from emissions of DPM.

For chronic noncancer risks, many pollutants were of similar importance. Nickel was the highest risk, followed by DPM (86% of nickel), cadmium (78%), chlorine (67%), mercury (39%), formaldehyde (20%), manganese (17%), acrolein (14%), arsenic (13%), and lead (11%). These noncancer risks can be reproductive, respiratory, or neurological, or they may involve a host of other effects. The similar rankings across pollutants indicates that there is no single driver of chronic health impacts based on the emissions, and so a number of pollutants may be important to monitor.

For acute noncancer risks, formaldehyde was the most important pollutant, followed by manganese (46% of formaldehyde). Mercury (10%), acrolein (10%), arsenic (5%), and nickel (4%) were also on the list, but are of less importance. Acute effects occur on time scales shorter than one day.

The comparison of emissions from the 2005-2006 inventory shows that the key pollutant to measure from a toxicity standpoint is DPM. Unfortunately, no direct measurement method of DPM is possible (as discussed by MATES III), so a proxy will be used to estimate DPM concentrations. After DPM, the key pollutants to measure include nickel, cadmium, benzene, formaldehyde, manganese, arsenic, acrolein, and mercury. However, the chemical and physical characteristics of these different pollutants requires multiple measurement methodologies. Overall, the pollutants other than DPM can be categorized as metals (nickel, arsenic, lead, manganese, cadmium), hydrocarbons (benzene), and carbonyls (formaldehyde, acrolein). The results in Table C-2 drive our proposed study methodology choices, which are discussed in Section C.2.3, to focus on the key pollutants of concern from a health standpoint.

**Table C-2.** List of key pollutants and their relative toxicities based on the 2005-2006 EIR emissions (Table C-1) and OEHHA health benchmark levels.

Pollutant	Total Lb/Year	Fraction from Drilling and Well Workovers	Cancer 1-in-a-Million Level ( $\mu\text{g}/\text{m}^3$ )	Acute REL ( $\mu\text{g}/\text{m}^3$ )	Chronic REL ( $\mu\text{g}/\text{m}^3$ )	Cancer Relative to DPM	Chronic REL Relative to Nickel	Acute REL Relative to Formaldehyde	Cancer Rank	Chronic REL Rank	Acute REL Rank
Diesel exhaust PM	1326.8	0.99	3.3E-03		5	1.00	0.86		1	2	
Cadmium	4.8007	1.00	2.4E-04		0.02	0.05	0.78		2	3	
Formaldehyde	547.9	0.76	1.7E-01	9	9	0.01	0.20	1.00	5	6	1
Nickel	15.3	1.00	3.8E-03	6	0.05	0.01	1.00	0.04	4	1	6
Chlorine	41.6	1.00		210	0.2		0.67	0.00		4	9
Manganese	4.8014	1.00		0.17	0.09		0.17	0.46		7	2
Mercury	3.6009	1.00		0.6	0.03		0.39	0.10		5	3
Acrolein	14.7	0.70		2.5	0.35		0.14	0.10		8	4
Lead	5.1037	1.00	8.3E-02		0.15	0.00	0.11			10	
Arsenic	0.6007	1.00	3.0E-04	0.2	0.015	0.00	0.13	0.05	6	9	5
Benzene	340.9	0.17	3.4E-02	1300	60	0.02	0.02	0.00	3	11	8
PAHs	16.9	0.79	9.1E-05			0.00			7		
Acetaldehyde	215.9	0.96	3.7E-01	470	140	0.00	0.01	0.01	8	12	7

### C.2.3 Proposed Methodology and Instrumentation

As discussed in Section C.2.2, 37 toxic air contaminants are emitted from the Inglewood Oil Field, but the health risks are driven by only a few pollutants. Key among all pollutants for health risk is DPM. Other key pollutant groups that are important for health risk are metals, hydrocarbons, and carbonyls. For these pollutants, it is necessary to (1) characterize emissions from the Inglewood Oil Field operations and drilling, and (2) assess the health risk from the emissions. In order to meet both of these goals, multiple measurement methodologies are necessary to characterize the different pollutant groups. Thus, the STI team selected a monitoring approach that prioritizes meeting both objectives for the pollutants of highest concern and also provides estimates of chronic risk for those pollutants that appear to be of lower general concern. Our approach also considers the confounding factor of multiple external emissions sources of the pollutants of concern that likely impact areas surrounding the Inglewood Oil Field, including emissions from LAX, roadways such as I-10, I-405, and La Cienega Blvd., and any residential or commercial emissions.

Frequently, there is more than one method for monitoring a given pollutant. For example, both time-integrated sampling (e.g., 24-hr or multiple day filter-based sampling) and continuous methods can be used for many air toxics. Additionally, some pollutants are best measured by using surrogate species that are highly correlated with the target species. Selection of a monitoring method for a given toxic is determined by a cost-benefit evaluation and pertinence to study objectives.

The STI team is proposing a three-pronged measurement approach to characterizing the emissions and health risk from the Baldwin Hills area. First, STI will use four Aethalometer instruments to continuously measure black carbon (BC) as a proxy for DPM over the course of one year. Black carbon is a widely accepted surrogate for the monitoring of aggregate DPM. STI has successfully used BC measurements as a proxy for DPM from heavy-duty diesel vehicles in Las Vegas and San Rafael and from roadway construction equipment in Arizona. Aethalometers provide real-time information on concentrations of BC and can be correlated with meteorological measurements of wind direction and wind speed to identify emissions from the Oil Field operations and emissions originating from other ubiquitous sources of BC in the surrounding communities. Methods that rely on filter samples integrated over a longer time period (e.g., 24 hours) confound the determination of source because of variable wind direction during a 24-hour period. Second, the STI team will deploy a real-time metals instrument, the XACT 625 semi-continuous X-ray fluorescence spectrometer, to measure twenty-four metals for a period of approximately two months. This instrument is costly to operate, so the monitoring plan for metals focuses on a few key months instead of an entire year. This tradeoff is viewed as a viable alternative to longer-term 24-hr filter-based sampling and is expected to reveal more detailed information on the contribution of the Oil Field to this group of elements, which rank high among the list of air toxics possessing significant health risks. The XACT instrument can make measurements at durations ranging from 15 minutes to 4 hours; for this study we expect to collect at one-hour resolution. Metals measurements from this instrument will also be compared with wind direction and speed to characterize sources of metals emissions from the Inglewood Oil Field and surrounding communities. Unique chemical fingerprints will be used as a means of identifying specific emissions sources. For example, we may expect nickel and vanadium to be correlated with burning of oil, while zinc would be more characteristic of brake-

pad linings. Finally, we will deploy passive samplers for BTEX (benzene, toluene, ethylbenzene, and xylenes) and for carbonyls (formaldehyde and acetaldehyde) at one-week durations to capture spatial gradients in concentrations of these pollutants around the Oil Field and in the surrounding communities. We have budgeted a total of 52 BTEX samplers and 52 carbonyl samplers, with 10% of the samples for quality control. The number of samplers to be deployed at one time, and the spatial arrangement of those samplers, will be determined after a few months of meteorological and BC data have been collected. This will allow us to more accurately approximate the spatial extent of the Oil Field impacts of BC, and by inference, the potential for impacts of BTEX and carbonyls.

Due to budgetary constraints, STI was forced to prioritize the pollutants for which monitoring could take place at high temporal resolution and to propose less than a full year of monitoring for some toxics. While a year-long monitoring campaign is standard for performing a chronic risk assessment, the climatology of the Los Angeles basin is such that a full year of monitoring is not necessary. Los Angeles is temperate year-round with only a few weeks of rainy conditions. It is possible to adequately characterize concentrations over a shorter representative time period and extrapolate them to values representative of chronic concern.

Of equal concern is that passive measurements may not adequately represent acute exposures for some hydrocarbons and carbonyls. Hourly or 8-hr long duration samples are necessary for comparison to acute health benchmarks. However, collecting hourly or 8-hr long duration samples to characterize both acute and chronic risk would require thousands (or hundreds) of samples (i.e., hourly measurements for acute risk and thousands of those hourly samples [or hundreds of the 8-hr duration samples] to create a representative annual average), which is cost-prohibitive given the allotted project budget. Since the VOCs and carbonyls are not the highest-rated priority toxics of concern (based on the EIR toxicity analysis shown in Table C-2), it was determined that the only feasible approach to characterize emissions and assess chronic risk was to perform week-long saturation spatial sampling to identify whether the Oil Field is a significant contributor of these pollutants. These week-long measurements may be sufficient to show gradients in concentrations, and thus any potential hot spots, and to show concentrations that are above acute levels of concern and identify whether additional monitoring of these pollutants on shorter-time scales is warranted.

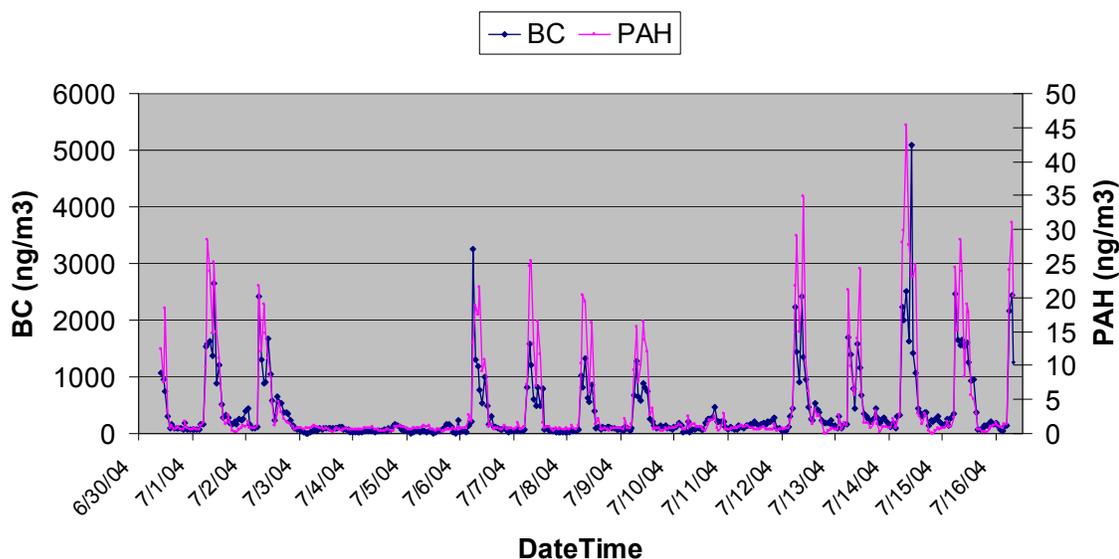
A detailed description of our monitoring approach is provided below, including quality assurance steps and instrument details. Each monitoring method is detailed in its own section.

### **Aethalometer Measurements of Black Carbon**

Magee Scientific (see <http://www.mageesci.com>) Model AE22 dual wavelength Aethalometers will be deployed in enclosures at four sites, with the exact location of the sites to be determined by prevailing winds, time of year, and the spatial distribution of potential sources of BC. These instruments measure the light transmittance through a collection spot on a reel-to-reel filter tape and reports data at 5-minute intervals. The aerosol is collected on an area of quartz fiber filter at a moderate face velocity. The sample air stream is drawn through the filter by a continuously operating pump. The optical attenuation of the aerosol deposit on the filter is measured by detecting the intensity of light transmitted through the spot on the filter.

It is important to understand the spatial and temporal variations in BC concentrations as a function of meteorological conditions, especially wind direction. For example, we have learned in past studies that DPM concentrations can vary substantially between weekdays and weekends or holidays because vehicle activity and industrial activity levels change (e.g., traffic density and work schedules). Similarly, seasonal variability in DPM, using BC as a surrogate, has been demonstrated at many locations. Monitoring protocols must provide data that represent this variability, as well as the range of meteorology that overlays the differing activity levels and seasons. One year of continuous BC data at four sites will be adequate to represent seasonal variability in DPM concentrations as well as differences owing to workday/non-workday schedules and upwind/downwind differences under various meteorological conditions.

DPM near large industrial sites can show a strong diurnal pattern, as well as a pronounced difference between days of high and low activity. **Figure C-2** shows a time series of hourly BC and particle-bound polycyclic aromatic hydrocarbon (PAH) data collected in a community very close to a large industrial rock quarry in northern California. (PAHs have been used as markers for DPM, just as BC has.) These data were collected within a few hundred meters of the quarry entrance, where high numbers of diesel trucks access the quarry. Each work day, the concentration of DPM increases near 7:00 a.m. and remains elevated until 4:00 or 5:00 p.m., during the time that trucks enter and leave the quarry and heavy equipment operates at the quarry. Weekends and holidays (July 4) show low concentrations and no diurnal variability.



**Figure C-2.** Time series of hourly BC and PAH concentrations near a California rock quarry.

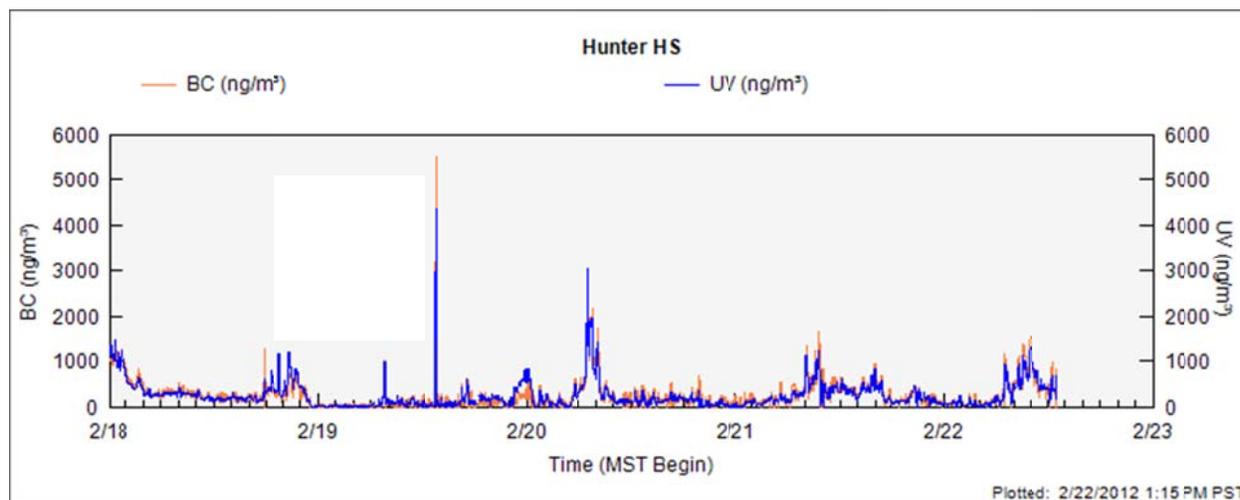
Note that the measured pollutant concentrations will depend on the emissions upwind of the monitoring site (regional background emissions, local Oil Field emissions, and on-road vehicle emissions), the meteorological conditions under which the pollutants are emitted and transported to the monitoring site, and the dispersion and transport of the pollutants from the various sources to the receptor monitoring sites. Both spatial and temporal emissions patterns

must be considered for all emissions sources. Oil Field activity data will be compared with meteorological data and BC data at the receptor sites.

### Aethalometer Quality Control and Quality Assurance

Quality control protocols for the Aethalometer BC measurements rely on near-real time review of raw data, remotely, on a daily or more frequent basis, as well as routine field maintenance procedures and associated record-keeping.

An integral part of the proposed monitoring study is the implementation of a web-based data retrieval system to allow routine viewing of real-time BC (and meteorological) data. Data will be retrieved from each BC monitoring site frequently (typically, every 10 minutes) by cell phone modem and transferred to STI's web server; undergo auto-screening quality assurance procedures; and be posted in graphical format to a password-protected web page for viewing by authorized personnel. A web-based data retrieval system helps prevent equipment downtime, enhances data recovery and data quality, and alerts users to anomalous trends in the data that may indicate problems. The data system also conserves project resources by allowing less-experienced, part-time operators to perform routine duties at the sites while more experienced personnel spend time remotely reviewing and evaluating the collected data. **Figure C-3** is an example of a web posting of Aethalometer BC and UV data in an ongoing project in Utah.



**Figure C-3.** Example of real-time BC and UV data series web posting for daily QC of a current STI project in Utah.

Regularly scheduled site visits by a local, part-time operator will occur for routine maintenance, including infrequent tape changes (the filter tape that collects BC samples), inlet cleaning, flow checks with a certified reference flow meter, and troubleshooting.

Additionally, all internally stored data in the Aethalometers (including diagnostics) are routinely downloaded for automated quality assurance and data validation protocols implemented by the Washington University Air Quality Lab AethDataMasher Version 7.0r BETA.

This custom software performs data validation and filter tape saturation compensation corrections, calculates the hourly output, formats date-time stamps, and generates validation log files. The hourly AethDataMasher output is further quality-assured by a visual inspection of minimum and maximum data values, stuck values, and baseline shift, as well as by direct comparison with other concurrently measured air quality and meteorological data. The validated BC data will be compared to activity logs of the Oil Field for qualitative evaluation of potential sources.

### **X-Ray Fluorescence Spectrometer Measurements of Metals**

The STI team will deploy the University of Massachusetts (UMass) XACT 625 semi-continuous X-Ray Fluorescence (XRF) spectrometer for approximately two months to support this investigation. The XACT instrument will be installed in a secure, temperature-controlled facility that includes standard rack-mount instrument housing capabilities.

The XACT 625 automated multi-metals monitor is based on reel-to-reel filter tape sampling followed by nondestructive XRF analysis of metals in the resulting particulate matter (PM) deposit. The XACT can simultaneously measure up to 24 elements with an atomic number between potassium and uranium. Ambient air is sampled through a PM size-selective inlet and drawn through a filter tape. The resulting PM deposit is then automatically advanced and analyzed by XRF for selected metals while the next sample is being collected. Sampling and analysis is performed continuously and simultaneously, except for the time required to advance the tape (about 20 seconds) and the time required for daily automated quality assurance checks. Typical sampling and analysis times range between fifteen minutes and four hours; for this project, we propose hourly samples, which will provide adequate assessment of diurnal profiles and trajectory-specific enhancements without compromising instrument sensitivity.

The instrument determines metal concentrations through two basic functions: (1) measuring the volume of air for the sample collected, and (2) measuring the mass of metals in the sample collected. In the XACT 625, aerosol is drawn into a sampling and analysis module and through a filter tape that collects particulate-phase metals. The air volume of the sample flow is simultaneously measured with a flow meter. Following sampling, the resulting filter tape deposit is advanced to a position where it is analyzed for metal mass using XRF. The X-ray method is consistent with EPA Method IO 3.3, *Determination of Metals in Ambient PM using XRF* (U.S. Environmental Protection Agency, 1999), and three energy levels are used to quantify the sample for the range of analytes. The instrument then determines metal concentrations by dividing the XRF-determined mass. Concentrations of measured elements are reported immediately after analysis and are automatically recorded by an on-board controller, which will be polled remotely.

For this project, we propose to measure the elements outlined in **Table C-3**. This encompasses many of the metals thought to be present in the study location, as well as other metals that can be used to identify emissions signatures of other sources that might impact the monitoring site.

**Table C-3.** Proposed list of measured elements for this study. LOD is Limit of Detection given in nanograms per cubic meter at standard temperature and pressure, assuming an hourly sample collection and analysis period.

Element	Atomic Weight	LOD	Element	Atomic Weight	LOD	Element	Atomic Weight	LOD
Sulfur	16	3.7	Iron	26	0.759	Bromine	35	0.185
Potassium	19	0.837	Cobalt	27	0.317	Rubidium	37	0.344
Calcium	20	0.319	Nickel	28	0.226	Strontium	38	0.447
Scandium	21	0.55	Copper	29	0.267	Silver	47	4.37
Titanium	22	0.38	Zinc	30	0.231	Cadmium	48	5.748
Vanadium	23	0.29	Germanium	32	0.121	Barium	56	0.945
Chromium	24	0.288	Arsenic	33	0.114	Mercury	80	0.189
Manganese	25	0.283	Selenium	34	0.141	Lead	82	0.218

### X-Ray Fluorescence Spectrometer Quality Control

The instrument follows a regular protocol of quality assurance by checking energy levels (based on a measurement of pure palladium) during each hourly sample run. Once per day (at noon or midnight, depending on user settings), a more comprehensive QA protocol is run where four pure standardized reference materials (Pd, Cr, Cd, Pb) are sequentially quantified for approximately 7 minutes each (“Upscale Calibration”). These data are reported daily and will be reviewed each day to ensure data are reported accurately and there is no short instrument malfunction or long-term instrument degradation. Sample flow rates are measured by an independent set of flow monitors, each of which is calibrated against a NIST-traceable primary standard.

Most operational functions for this instrument can be controlled remotely using high speed Internet connections. Approximately once every 25 days, the filter tape must be changed, but this task is very simple, requires little training, and will be handled by the local field technician. In the past, this instrument has been used extensively in remote locations (e.g., Fairbanks, Alaska), demonstrating that most maintenance tasks can be performed remotely as needed.

### Passive Measurements of Hydrocarbons (BTEX)

While VOCs are on the list of air toxics of concern, a preliminary analysis suggests that they are less important than DPM and metals, with benzene being the primary hydrocarbon of interest from the hazard assessment. While automated gas chromatography (GC) technology offers one way to achieve high time resolution data parallel to that obtained from the Aethalometer and the XRF spectrometer, budget constraints prevent the inclusion of a third semi-continuous analyzer. Therefore, passive samplers for benzene, toluene, and xylenes will be deployed in a spatial arrangement designed to identify possible hot-spots for BTEX. These

will be one-week integrated samples, with the maximum number of samples allowed by the project budget (see Monitoring Locations, Frequency, and Duration, below).

One example of the type of diffusive passive sampler that could be used for benzene is the Radiello 130 sampler. The 130 cartridge is a stainless steel net cylinder, with 100 mesh grid opening and 5.8 mm diameter, packed with  $530 \pm 30$  mg of activated charcoal with particle size 35-50 mesh. Volatile organic compounds are trapped by adsorption and later recovered by carbon disulfide displacement, analysis is performed by FID gas chromatography or GC/MS. The selectivity and certainty of chemical identification are substantial benefits of using GC/MS. Also, at environmental concentrations, for which there are more potential interferents, the complexity of the organic mixtures in air can complicate the reliability of a non-GC/MS-based analytical method.

### Passive Measurements of Carbonyls

Passive sampling, parallel in approach to that described above for hydrocarbons, will be used to assess ambient concentrations of carbonyl compounds. Radiello 165 is a stainless steel net cartridge filled with 2,4-dinitrophenylhydrazine (2,4-DNPH) coated Florisil. Aldehydes react with 2,4-DNPH to give the corresponding 2,4-dinitrophenylhydrazones. The 2,4-dinitrophenylhydrazones are then extracted with acetonitrile and analyzed by reverse phase HPLC and UV detection. The sampling strategy for carbonyl compounds is described below under Monitoring Locations, Frequency, and Duration.

### Meteorological Measurements

A 10-meter meteorological tower will be established adjacent to the trailer housing the XACT 625 and one of the Aethalometers. Average 1-minute data will be collected from all the deployed sensors. Sensors to be deployed include RM Young models:

- 05305V Wind Monitor (wind speed/wind direction)
- 41382VC Temperature and RH sensor
- 41342VC Platinum temperature probes at 2 heights (for Delta-T)
- 61302V Barometric Pressure sensor
- 70201 Solar radiation sensor

#### C.2.4 Monitoring Locations, Frequency, and Duration

**Table C-4** summarizes the parameters to be monitored, the type of sampling, the specific monitor or sampler, the number of locations, the frequency of sampling, and the duration of sampling. These components of the monitoring plan are described, with additional details, following the table.

**Table C-4.** Summary of monitoring methods, with suggested number of locations, sampling frequency, and sampling duration. Number of locations and frequency of passive samplers may change depending on first months' BC results.

Parameter	Sample Type	Monitor	Number of Locations	Frequency	Duration
BC	Semi-continuous	AE22 Aethalometer	4	Semi-continuous	1 year
Metals (list)	Semi-continuous	XACT 625 (XRF) spectrometer	1	Semi-continuous	2 months in Fall or Spring
VOC	Passive	Radiello 130 <sup>a</sup>	10	Twice, based on season	1 week each
Carbonyls	Passive	Radiello 165 <sup>b</sup>	10	Twice, based on season	1 week each
Meteorological	Continuous	RM Young sensors	1	Continuous	1 year

<sup>a</sup>Radiello® Cartridge Adsorbents for sampling BTEX and VOCs (CS2 Desorption), matrix SS net (100 mesh, 5.8 mm diam.), activated with activated charcoal (30-50 mesh), pk of 20.

<sup>b</sup>Radiello® Cartridge Adsorbents for sampling Aldehydes, matrix SS net with 2,4-DNPH coated FLORISIL®, pk of 20.

### Location of Monitors

Proper siting of the monitoring instruments is critical for evaluating the Oil Field's contribution to the concentrations of air toxics in the surrounding communities. Of primary importance is the consideration of meteorology and its impact on the dispersion and transport of air toxics. Local topography and existing obstructions may impact wind patterns and must also be considered. Available meteorological data from the existing PXP meteorological tower within the Oil Field, as well as data from the SCAQMD's stations at LAX and at West Los Angeles, will be evaluated for diurnal and seasonal wind patterns, and the initial placement of the monitors will be based upon these documented wind flows.

The primary monitoring site, a small trailer, will house the XACT 625 semi-continuous XRF spectrometer and one of the AE22 Aethalometers, and will also host a tower with a full complement of meteorological instrumentation. It is anticipated that the spectrometer will be available for use for a two-month period. The site for this main monitoring station will be chosen to reflect concentrations during both onshore and offshore wind flow conditions. The highly temporally resolved meteorological data collected from this installation will enable the characterization of Oil Field impacts at this receptor site as well as at other sites being monitored.

Besides the main site, three additional sites will be established to support the semi-continuous Aethalometer measurements of BC. At a minimum, it is desirable to obtain data from upwind and downwind locations during both onshore and offshore wind flow conditions.

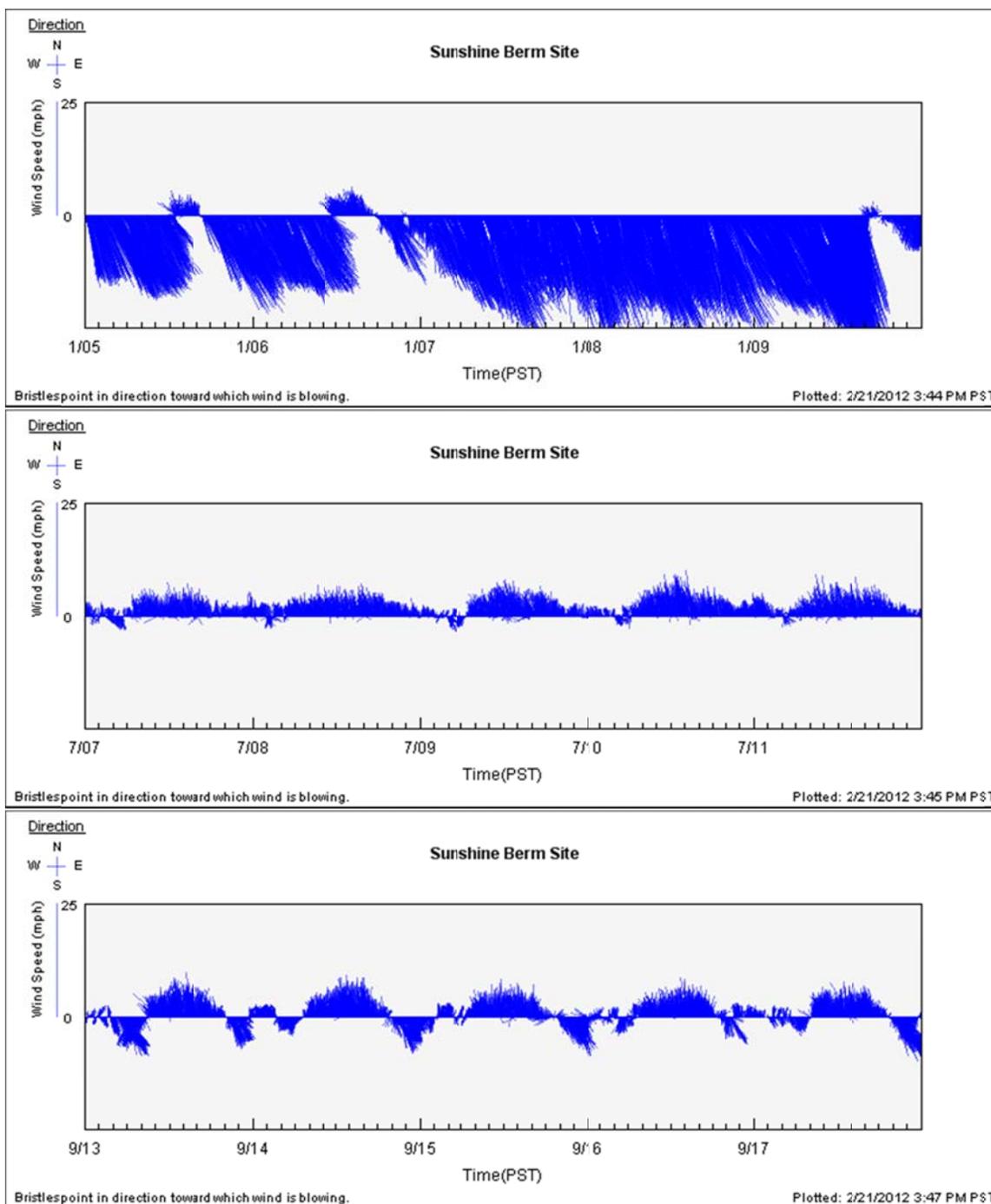
For the passive, weekly sampling of carbonyls and BTEX, a spatial array of samplers will be deployed. The selection of the exact number and the sites for these passive samplers will

depend upon a number of factors, including meteorology, accessibility, and transport patterns that are observed from the first few months of BC monitoring.

### **Frequency and Duration of Monitoring**

The frequency of monitoring is based on a two-season approach, as necessarily modified by limitations in budget. Ideally, all parameters would be monitored for a complete year so all of the seasonal variability effects on ambient concentrations of the monitored toxics could be estimated. Given the limitations on scope attributable to budget, the frequency of sampling must be limited to only the time periods which are representative of the two primary seasons in Los Angeles. In summertime, wind flows are primarily onshore, and in wintertime they are primarily offshore. In contrast, spring and fall are characterized by mixed wind flow patterns, and present an opportunity to conduct measurements under both regimes. The three parts of **Figure C-4** illustrate the typical wind conditions for winter, summer, and fall periods.

The semi-continuous measurement of BC, for an entire year will adequately represent seasonal effects. For XRF sampling of metals, the fall (or spring) period of mixed winds for a two-month period will allow estimation of background conditions and inferences about the magnitude of the Oil Field contributions. This approach works for the semi-continuous instrument measurements because these measurements yield highly time-resolved data, but it will not work for the week-long integrated passive sampling because the long integration time obscures upwind/downwind concentration characteristics during the daily wind cycle.



**Figure C-4.** Typical wind directions in the SoCAB in Winter (top); summer (middle), and fall (bottom). The bristles in these plots point in the direction toward which the wind is blowing. These are 1-minute data.

### C.2.5 Procedures and Analytical Methods

Procedures and analytical methods for the XACT 625 spectrometer (metals), the AE2 Aethalometer (BC as a surrogate for DPM), and passive samplers (BTEX and carbonyl

compounds) are detailed in this section. Detailed qualifications of the personnel mentioned below are presented in Section B.1.2.

### **XACT 625 Spectrometer**

Dr. Rick Peltier of the University of Massachusetts at Amherst will be primarily responsible for setup, oversight of operations, and daily quality control of the XACT 625 spectrometer for monitoring of metals. Following on-site setup, he will have remote access to the XACT data and most instrument functions on a daily basis. He will be assisted in the field, as necessary for hands-on maintenance (such as filter tape changes), by Kevin Smith, STI's locally based Field Technician. Additional field support, when needed, is available from David Vaughn, manager of STI's Air Quality and Exposure Measurements Group and Project Manager for the Baldwin Hills Air Quality Monitoring Study.

Data analysis of the XACT 625 data will be led by Dr. Michael McCarthy, Senior Air Quality Analyst with STI's Air Quality Data Analysis division. Dr. McCarthy will work with Dr. Paul Roberts, STI's Chief Scientific Officer, and with Dr. Peltier, in the analysis of ambient metals concentrations and the accompanying health risk assessment. They will be assisted by Jennifer DeWinter, Air Quality Analyst, and other STI staff as may be required.

### **AE22 Aethalometers**

David Vaughn and Alison Ray, STI's Senior Field Technician, will be responsible for the installation of the AE22 Aethalometers and for daily review of the BC data. Kevin Smith will be responsible for monthly flow checks and other on-site routine maintenance items (e.g., filter tape changes) over the course of the field campaign.

Data validation and first-level data analysis of the BC data will be undertaken by David Vaughn and Jennifer DeWinter. Additional analysis related to health risk assessment will be led by Dr. McCarthy in consultation with Dr. Roberts.

### **Passive Samples for BTEX and Carbonyls**

Success of the passive sampling approach for measurement of BTEX and carbonyl compounds depends in large part on specific siting of the samplers, since the number of samples to be collected is limited and the integrated nature of the sampling process confounds source attribution (compared to the high-time resolution metals and BC data). As such, Dr. Roberts and Dr. McCarthy will develop a passive sampler design that has the best likelihood of generating health-relevant data.

A total of 104 passive samplers will be used: 88 for field sampling and 16 for QC (blanks and duplicates). The spatial arrangement of the 88 field designated passive samplers, the number of samplers per array, and the dates of deployment will be decided on the basis of several factors. Meteorological parameters and BC will be monitored for one or two months, and the resulting data will undergo a preliminary analysis to help determine how the samplers will be deployed. It is likely that input from the CAP and the expertise of on-site PXP personnel relative

to Oil Field operations will be incorporated in the passive sampler deployment placement and timing.

Most passive samples will be placed in the community near the Oil Field, while a few will be placed further away from the Oil Field to represent the general urban background. Differences between the near-source and urban background samples will represent the contribution of the Oil Field.

Air Toxics Ltd. ([airtoxics.com](http://airtoxics.com)) will be providing the passive sampling substrates and will analyze the collected samples. Air Toxics Ltd. is an environmental laboratory accredited by the National Environmental Laboratory Accreditation Program (NELAP) and Department of Defense (DOD-ELAP). It is also certified by California DHS. They will analyze the Radiello 130 passive samplers for BTEX using GC/MS, and the Radiello 165 samplers for carbonyls, including aldehyde and acetaldehyde, using a Modified EPA TO-11A method by HPLC.

### C.2.6 Documentation Methods

The documentation methods differ between the semi-continuous sampling protocols (Aethalometer for DPM and XRF spectrometer for metals) and the passive samplers used to assess the ambient concentrations of BTEX and carbonyl compounds.

The continuous monitors incorporate in their firmware several automatic documentation protocols that reveal instrument performance characteristics. In the case of Aethalometer measurements for BC, the instrument records not only the BC concentration, but also data for a number of instrument diagnostic variables, such as reference and sample lamp voltages and flow rates. In addition to the daily files (.csv) of BC and diagnostic data, a .txt "Message file" is also created to summarize each day's instrument performance characteristics. Flow rates are checked monthly by a field technician using a certified NIST-traceable reference flow meter, and recorded in a log book and in the digital log book protocol of the Data Acquisition System (DAS) that is deployed with each Aethalometer. Any measured flow rate that is more than 5% outside the target flow rate is corrected by performing a flow calibration on the instrument using an internal flow calibration routine in combination with the reference flow meter. Daily review of the BC data, as described above, plays a significant role in the documentation of instrument performance.

The passive samplers used for measurement of ambient concentrations of VOCs and carbonyl compounds rely on adherence to specific protocols for sample setup, exposure, retrieval, storage, and shipping, accompanied by accurate record keeping by the field technicians. Specific protocols, provided by the sampler manufacturers, will be followed. For record keeping, two main types of information are required for tracking the samples: Chain of Custody (COC) information and Site Identification information. An example of a COC form is shown in **Figure C-5**. The COC form allows for documentation of important sampler data and helps to track samples as they are deployed to the field and then sent on to the laboratory for analysis. The Site Identification form helps to document important information about each monitoring site, including notes on accessing the site. An example is shown in **Figure C-6**. These forms were developed by STI and EPA staff and used for the recent NO<sub>2</sub> near-road pilot study (<http://www.epa.gov/ttn/amtic/nearroad.html>).

<b>Passive Sampling Device (PSD) Chain of Custody Form</b>	
<b>Field Log</b>	
<b>PSD ID</b>	<b>PSD receipt date (optional)</b>
<b>Substrate information</b> <input type="checkbox"/> BTX <input type="checkbox"/> Carbonyl	
<b>Type of use</b> <input type="checkbox"/> Sample <input type="checkbox"/> Field Blank <input type="checkbox"/> Trip Blank	
<b>Site name</b> _____ <b>PSD mount no.</b> _____  Latitude _____  Longitude _____  PSD mount height (m) _____	<b>Exposure date and time (mm/dd/yy hh:mm)</b>    <b>Recovery date and time (mm/dd/yy hh:mm)</b>
<b>Field notes</b>	

<b>Chain of Custody Log</b>	
Shipping Information	
<b>Shipped to lab by</b>	<b>Date</b>
<b>FedEx tracking number</b>	

Lab Receipt Information (Lab Use Only)	
<b>Received at lab by</b>	<b>Date</b>
<b>Condition of container/PSDs</b>	

**Figure C-5.** Example of a Chain of Custody form.

<b>Site Information Sheet</b>	
<b>Baldwin Hills Passive Sampling</b>	
<b>Site name</b>	
<b>Site address</b>	
<b>Site access and safety</b> (including entry/egress points and any suggested or required safety procedures)	
<b>Passive Sampling Device (PSD) Mount Information</b>	
<b>PSD Mount 1</b>	
Latitude _____	<b>Miscellaneous information:</b>
Longitude _____	
PSD mount height (m) _____	
<b>PSD Mount 2</b>	
Latitude _____	<b>Miscellaneous information:</b>
Longitude _____	
PSD mount height (m) _____	
(Continue on subsequent page if necessary)	

**Figure C-6.** Example of a Site Identification form.

### C.2.7 Quality Control Plan

The terms “quality control” and “quality assurance” are often used interchangeably, but in fact have important distinctions. Quality control (QC) refers to the operational techniques and activities used to fulfill the requirements for quality. QC is what the field technician practices when conducting maintenance and verification procedures on the AAE22 Aethalometer or the XACT 625 spectrometer. QA refers to the planned or systematic activities used to provide confidence that the requirements for quality are fulfilled. For example, post processing data validation protocols are QA activities. Day-to-day QC activities are described below, followed by a discussion

The first line of defense against invalid data is the implementation of best practices in day-to-day QC operations affecting the data collection process. These practices are outlined below, with specific details as they relate to the Baldwin Hills project. Several embedded

Quality Control procedures for the AE22 Aethalometer and the XACT 625 instruments have been explained along with the instrument descriptions (above).

- Understanding of the principle of operation of the equipment. STI's project team has extensive experience with AE22 Aethalometers. STI is frequently asked to Beta test new versions of instrument hardware and software. Dr. Peltier is an expert user of the XACT 625 spectrometer.
- Diligence in site selection followed by strict installation procedures. EPA guidelines for site selection of meteorological instrumentation will be followed. Initial placement of the BC monitoring sites will be based upon topography, winds, accessibility, and pertinence to project objectives. Proper installation includes such factors as electrical grounding, leak checking, sampling fetch, enclosure stability, and level (plumb).
- Scheduling and implementation of routine maintenance procedures (e.g., inlet cleaning, pump maintenance). The Aethalometers and the XACT 625 will undergo monthly cleaning procedures. Tape changes of the Aethalometers and the XACT 625 will occur as needed. The tower and cabling of the meteorological will be reviewed at each site visit.
- Scheduling and implementation of QC protocols (e.g., flow checks, instrument settings). Flow checks will be conducted monthly on the Aethalometers and the XACT 625. Daily QC checks on four reference elements will be conducted with the XACT instrument.
- Documentation/reporting of all field QC results and related field activities. All field QC procedures will be documented in a digital log of the Data Acquisition System at each site during each site visit. Originals and copies of the documentation forms for the passive samplers will be housed separately.
- Daily review of real-time data via a central data system. Aethalometer and XACT 625 data will be polled sub-hourly and posted on a real-time web page for daily, or more frequent, review.
- Prompt troubleshooting of any observed operational problem. Operational problems will be addressed as soon as site visit arrangements can be made with PXP (two day notice, according to the RFP).

The responsibility for implementation of the Quality Control Plan rests primarily with the Project Manager, David Vaughn. Mr. Vaughn will manage and direct the financial and staff assets of the project to provide quality work products on schedule and within budget. He is responsible for communication with the client, Principal Investigator, Senior Advisor, task leaders, staff, subcontractors, and line managers regarding the project. He is also responsible for monitoring progress in relation to project milestones and proposing corrective actions if the milestones are not being met on schedule or within budget. Mr. Vaughn will work with the Principal Investigator to ensure technical objectives are met.

The Project Manager is responsible for all aspects of the project from preparing the initial proposal/work plan to ensuring the final invoice is sent. As Project Manager, Mr. Vaughn

- Directs project staff, communicates the context of assignments, and holds project staff accountable for quality and timeliness
- Manages project-related communications with the client, Principal Investigator, Senior Advisor, task managers, staff, subcontractors, and line managers
- Monitors project progress in relation to milestones and budget and proposes corrective actions if the project falls behind
- Ensures
  - Adequate funding has been allocated for quality management including senior review
  - Project deliverables are entered into STI's tracking system
  - Staff assigned to the project use STI best practices including templates and review process to ensure work products meet quality standards
  - Work products are prepared, reviewed, and delivered to the client
- Works out scope changes with the client and staff assigned to the project
- Communicates, explains, and may document the technical approach, methodology of the project, project results, and conclusions
- Negotiates to find acceptable solutions in cases of conflicts with budget, staffing, or schedule, in cooperation with the Principal Investigator and guidance from the Senior Advisor as needed
- Keeps the Principal Investigator and Senior Advisor advised of project status on a regular basis

### **C.2.8 Drill Rig Activity Instrumentation: An Optional Task**

To supplement the air quality monitoring to be performed for this study, we propose an option to instrument all drill rigs operating in the Inglewood Oil Field with global positioning system (GPS) data loggers. These data loggers will provide continuous information on the location and status (engine on/off) of the drill rigs, and this information will be used to augment the existing emissions inventory for the oil field and to correlate equipment location and activity with air quality impacts observed through the monitoring network.

STI would work with Geoforce, a firm that specializes in GPS equipment tracking for the oil and gas industry. Geoforce sells a "SmartOne" GPS device that mounts on a piece of equipment and provides the following data through a project website and/or email:

- Equipment location (reported twice per day);
- Equipment hours of operations reports (daily, weekly, or monthly);
- Alerts when the equipment enters or leaves a specified "geofenced" area.

Previously, STI used a similar approach to evaluate the air quality impacts of construction equipment at a road-widening project in southern Arizona. During that study, we instrumented over 20 pieces of construction equipment with GPS instruments that reported equipment movements and engine status to a project website. This information was used to

develop a detailed construction equipment emissions inventory and to correlate equipment activity with air quality measurements collected on-site.

### C.3 Project Schedule

**Table C-5** presents a proposed timeline of tasks and deliverables, the key staff person(s) responsible, and the due date. This proposed project schedule assumes that the contract between the Los Angeles Department of Regional Planning and STI will be fully executed and in place by July 15, 2012. The monthly progress reports are considered deliverables, but are not listed in the table. They will be delivered by the 10<sup>th</sup> of each month, with the first one due August 10, 2012. As specified earlier, monthly teleconferences will replace 16 of the 20 monthly meetings with the County, to allow the shift of some funds to science priorities. The four quarterly in-person meetings are listed in the table.



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## **Appendix**

### **STI List of Qualifications**

#### **Resumes of Key Staff**

**Paul T. Roberts, Ph.D.**

**David L. Vaughn, M.S.**

**Michael C. McCarthy, Ph.D.**

**Richard E. Peltier, Jr., Ph.D.**

**Clinton P. MacDonald, M.S.**

**Alison E. Ray**

**Kevin M. Smith**



## PAUL T. ROBERTS

Executive Vice President  
Chief Scientific Officer  
Corporate Quality Assurance Officer



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### Educational Background

Ph.D., Environmental Engineering Science, California Institute of Technology  
M.Ch.E., Chemical Engineering, Rice University  
B.A., Chemical Engineering, Rice University

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### Professional Experience

Dr. Roberts joined STI in 1986. He has designed and managed many air quality field, data management, and data analysis projects. Most of these projects involve using field data and analysis methods to understand important meteorological, air quality, and exposure phenomena; to develop, apply, and evaluate meteorological, photochemical, and exposure models; and to evaluate the effectiveness of ambient air quality and meteorological networks in meeting various regulatory requirements. These projects have focused on a range of issues, including ozone, PM<sub>10</sub> and PM<sub>2.5</sub>, visibility, toxics, carbon monoxide (CO), and meteorology. Project types include near-roadway, regional, and exposure studies.

Dr. Roberts is leading the U.S. 95 MSAT (Mobile Source Air Toxics) Near-roadway Study sponsored by the Nevada Department of Transportation in Las Vegas and the air quality and meteorological measurements for a study of near-roadway emissions from construction equipment for the Arizona Department of Transportation. He also led a study of recreational boat CO emissions and exposure at Lake Havasu City in Arizona.

Dr. Roberts designed and managed regional air quality and meteorological field studies in many areas of the Country, including California (the South Coast Air Basin [Los Angeles], the San Joaquin Valley, Sacramento and the Sacramento Valley, the San Francisco Bay Area, and the southeastern desert), Arizona, Nevada, Southeast Texas [Houston], El Paso and Ciudad Juárez, the Texas and Louisiana Gulf Coast and the Gulf of Mexico, the area around Lake Michigan, and the northeastern U.S. from Virginia to Maine. He also performed and led data analysis efforts for these field studies, including evaluations of emissions, meteorological and chemical model results.

He also designed and managed the field exposure measurements for a long-term epidemiologic study in Southern California and for the Fresno Asthmatic Children's Environment Study (FACES). Dr. Roberts co-led the development and presentation of a three-day PAMS data analysis workshop and a PM workshop for EPA. He has done air quality and exposure work in cooperation with governmental, university, and industrial organizations in Cairo, Egypt; Jamaica; Ciudad Juárez, Mexico; and Bangkok, Thailand.

From 1981 to 1986, Dr. Roberts was chairman of several oil-industry trade association committees that sponsored air quality research, was a consultant to the environmental affairs group of Chevron, and testified at Federal hearings. From 1975 to 1986, he planned and directed research and development projects at Chevron Research Company and helped apply the results to operating plants in various Chevron refineries. He also led Chevron's process research efforts on tar sands and coal gasification and was involved in numerous methods development and methods evaluation projects.

In graduate school, Dr. Roberts developed the flash vaporization technique for measuring nanogram levels of particulate sulfur and carried out research on the transformation of SO<sub>2</sub> to particulate sulfur in Los Angeles. He also participated in the ARB ACHEx and the EPA RAPS.

Dr. Roberts was a member of the California Inspection and Maintenance Review Committee in 1994-1995, has served on various EPA peer-review panels since 1995, including the external Peer-Review Panel for EPA's "Air Quality Criteria for Carbon Monoxide" published in 2000 and the external Peer-Review Panel for Carbon Monoxide 2008-2010, and is a member of the Air & Waste Management Association and the American Association of Aerosol Research. Dr. Roberts is currently an Affiliate in the Department of Atmospheric Sciences at Colorado State University. He is also an expert on Victorian architecture in the San Francisco Bay Area.

## DAVID L. VAUGHN

Group Manager, Air Quality and Exposure Measurements



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### Educational Background

M.S., Plant Sciences, Cornell University  
B.A., Horticulture, Cornell University

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### Professional Experience

Mr. Vaughn joined STI in 2001. He is currently conducting a 14-site evaluation of spatial variability in ambient concentrations of polycyclic aromatic hydrocarbons (PAHs) in Bakersfield, California; is assisting with designing and implementing a U.S. Environmental Protection Agency (EPA)-sponsored pilot study to measure near-roadway concentrations of NO<sub>2</sub> in five U.S. cities; is implementing Phase I of a long-term study of mobile source emissions during pre- and post-highway construction in Salt Lake City, Utah; is managing the design and installation of a new air quality monitoring station for an industrial client in Jamaica; and is completing work on a model standard operating procedure (SOP) for monitoring PM<sub>2.5</sub> with the Thermo Scientific 8500C Filter Dynamics Measurement System (FDMS). He is the project manager for two ambient air quality monitoring sites at the Sunshine Canyon Landfill and the neighboring community of Granada Hills in Los Angeles County, California, for the City of Los Angeles. In 2009 and 2010, he assisted in establishing and operating four near-roadway monitoring sites in a study of road construction PM<sub>2.5</sub>, PM<sub>10</sub>, and mobile source emissions for the Arizona Department of Transportation. Mr. Vaughn also assisted in establishing and operating 10 monitoring sites in a study of near-roadway effects of mobile source air toxics (MSAT) on ambient air quality outside and inside nearby schools in Las Vegas, Nevada, for the Nevada Department of Transportation.

Mr. Vaughn was hired as the Field Manager for the Fresno Asthmatic Children's Environment Study (FACES) sponsored by the California Air Resources Board and the EPA. Mr. Vaughn designed and built the FACES Microenvironmental Monitoring System and was responsible for deploying it in over 100 homes and several schools in the Fresno area from 2002 through 2003.

Mr. Vaughn provided field sampling and data analysis support for a study evaluating ambient carbon monoxide (CO) concentrations and meteorological parameters in Lake Havasu City, Arizona. Based on the results of that study, he managed the design, installation, and operation of a monitoring network to provide real-time ambient CO concentration data and hazard alerts to police and fire department personnel in Lake Havasu City. He continues to provide technical support in the ongoing operation of the CO monitoring and alert system.

Mr. Vaughn assisted in upgrading and testing field measurement equipment used in the Southern California Children's Health Study (CHS). He continues to provide technical field assistance and quality assurance (QA) support for additional PM<sub>2.5</sub> measurements to support the CHS, as well as providing training, QA support, and data management for an intra-community PM variability study in 12 southern California cities. He also managed a field study, including data management and analysis, of PM<sub>10</sub> and PM<sub>2.5</sub> in Marin County, California. From 2004 through 2007, he held the primary responsibility for QA and data validation of speciated PM<sub>2.5</sub> data in an EPA-sponsored study at the Phoenix, Arizona, Supersite. He has contributed to the production of prototype air quality instruments, including a lightweight gas chromatograph for airborne measurements of greenhouse gases, and a military grade, integrated, multi-pollutant measurement system. He also trained clients to evaluate mitigation strategies to control fugitive dust emissions from the high deserts of southern California.

## MICHAEL C. McCARTHY

Senior Air Quality Analyst



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### Educational Background

Ph.D., Chemistry, University of California at Berkeley  
B.S., Chemistry, Creighton University

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### Professional Experience

Dr. McCarthy joined the air quality measurements and data analysis division at STI in 2003. He is the author or co-author of 15 atmospheric science peer-reviewed journal articles on air toxics, particulate matter, isotopic compositions of greenhouse gases, and other topics. Dr. McCarthy has served as the lead analyst in projects such as U.S. Environmental Protection Agency's (EPA) national air toxics data analysis; a regional analysis of air toxics concentrations for the Southeast States Air Resources Managers (SESARM); and source apportionment of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) in Edmonton and Athabasca, Alberta, Canada. Dr. McCarthy assisted in the study design of and data analysis for a near-roadway monitoring study focusing on mobile source air toxics at three schools for the Nevada Department of Transportation. He also assisted in smoke plume exposure work during southern California wildfires for the National Institute of Environmental Health.

Dr. McCarthy was the lead author for a strategic research plan for particulate matter for the Federal Highway Administration (FHWA), and has performed critical reviews and identified research needs for pavement rolling resistance and air quality behind noise barriers for the California Department of Transportation. In addition, Dr. McCarthy has led and been involved in network assessments for the EPA Photochemical Assessment Monitoring Stations (PAMS) network, the State of Wyoming, the San Joaquin Valley in California, and Edmonton. Dr. McCarthy has worked with the EPA to develop and write reports focusing on relationships among multiple air quality problems (e.g., ozone, particulate matter, and toxics), quality assurance, and optimizing the PAMS monitoring network.

Dr. McCarthy has managed projects that include examining air toxics concentrations near a pulp and paper mill for the Nez Perce tribe in Idaho; performing a monitoring network review for an Edmonton, Alberta, ozone management plan, and providing information on benzene trends for the EPA's annual report on the environment.

Dr. McCarthy's corporate responsibilities include assisting STI's Quality Assurance Officer with the development and implementation of corporate-wide quality control and assurance initiatives and serving as an internal scientific reviewer for technical project design, analysis, and reporting.

Before joining STI, Dr. McCarthy was a Research Assistant for Dr. Kristie Boering at the University of California at Berkeley, where he received his doctoral degree in Chemistry. During his research, Dr. McCarthy measured the stable isotopic compositions of CH<sub>4</sub>, CO<sub>2</sub>, and H<sub>2</sub> from stratospheric whole air samples to help constrain estimates of greenhouse gas emissions sources.

### Memberships

Air & Waste Management Association  
American Geophysical Union

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**Richard E. Peltier, Jr.**  
University of Massachusetts  
Department of Public Health  
Division of Environmental Health  
149 Goessmann Lab  
Amherst, MA 01003-9303  
(413) 545-1317 (p)  
(413) 545-6536 (f)  
rpeltier@schoolph.umass.edu

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***Curriculum Vitae*** (prepared January 2012)

**EDUCATIONAL HIGHLIGHTS:**

Georgia Institute of Technology, School of Earth and Atmospheric Sciences      Atlanta, GA  
PhD – Atmospheric Chemistry, Dec 2007

Columbia University, Mailman School of Public Health      New York, NY  
Masters of Public Health – Environmental Health Sciences, Dec 2001

University of Massachusetts      Amherst, MA  
B.S. Biology, May 1997

**EMPLOYMENT HISTORY:**

Assistant Professor, University of Massachusetts, Amherst, Department of Public Health, Division of Environmental Health Science      2010-present

*Pathway to Independence (K99) Postdoctoral Fellow*, NYU School of Medicine      2009-2010  
Department of Environmental Medicine, Tuxedo, NY

*NRSA Postdoctoral Fellow*, NYU School of Medicine, Department of Environmental Medicine, Tuxedo, NY      2007 – 2009

**HONORS AND AWARDS:**

Dissertation Initiative for the Advancement of Climate Change Research (DISCCRS) Scholar, Nov 2008

Gordon Research Conference (Mechanisms of Toxicology) Invitee, July 2008.

John Bradshaw Award (for novel instrumentation development) – March 2006

Air and Waste Management Association (Georgia) Scholarship – October 2005

EAS Chair's Special Service Award – May 2005

Student and Teacher Enhancement Partnership (STEP) Fellowship, Georgia Tech - April 2002

Dean's Scholarship, Columbia University – 2000-2001

Senior Leadership Award, University of Massachusetts - May 1997

**MULTI-INVESTIGATOR MEASUREMENT FIELD CAMPAIGNS:**

Partnership for Environmental Research and Community Health (PERCH, ground site)  
Pensacola, FL      Jul – Aug 2003

New England Air Quality Study – ITCT Intercontinental Transport and Chemical Transformation (NEAQS2004)

Portsmouth, NH      Jun – Aug 2004

Study of Organic Aerosol in Riverside (ground site)  
Riverside, CA      Jul – Aug 2005

MIRAGE/MILAGRO (C130 aircraft)  
Veracruz, Mexico      March 2006

INTEX-B (C130 aircraft)  
Seattle, WA      April-May 2006

TexAQS-II (P3 aircraft and ground site)  
Houston, TX      Aug-Oct 2006

## TEACHING AND MENTORING EXPERIENCE:

### *i) Didactic Teaching Experience*

#### *Graduate Level:*

NYU, Environmental Hygiene Methods	Course Director
NYU, Environmental Health Science	Course Director
Columbia University, Environmental Health Science, Fall 2000	teaching assistant
Columbia University, Environmental Hygiene, Spr 2001	teaching assistant
Columbia University, Environmental Urban Planning, Spr 2001	guest lecturer
New York University, Aerosol Science, Fall 2008	lecturer
New York University, Environmental Chemistry, Spring 2009	Course Director

#### *Undergraduate:*

University of Massachusetts, Intro to Env Health Spr 2011 (31)	course director
Columbia University, Environmental Planning, Spr 2001	lecturer
New School University, Environmental and Earth Science, Spr 2001	guest lecturer
Georgia Tech, Measures of Environmental Change, Fall 2003	guest lecturer
University of Georgia, Fundamentals of Ecology, Sum 2006, 2007	guest lecturer

### *ii) Student Mentoring*

Georgia Institute of Technology, Summer Undergraduate Research Experience  
Research project mentor, Andrea Thompson (2005)  
Research project mentor, Julie Simon (2006)  
Research project supervisor, Abigail Wintemute (2006)

NYU School of Medicine, Department of Environmental Medicine  
Research project mentor, Olufunke Bakare (MS expected, 2010)  
Research project mentor, Jaime Mirowsky (MS expected, 2010)

## PROFESSIONAL MEMBERSHIPS

American Association for Aerosol Research  
International Society for Environmental Epidemiology  
European Geophysical Union  
American Geophysical Union  
New York Academy of Science  
AAAS/Science Program for Excellence in Science  
Air and Waste Management Association  
American Thoracic Society

## SERVICE

2011 American Thoracic Society Assembly on Environmental and Occupational Health Program Committee  
Associate Editor (2010-current), J Exposure Science and Environmental Epidemiology

## REVIEWING SERVICES

### *i) Publications*

Aerosol Science and Technology	Atmospheric Environment	Talanta
J Geophysical Research	Toxicology	Environmental Engineering Science
J Air and Waste Management	Environmental Pollution	Inhalation Toxicology
J Exposure Sci Env Epi	Environmental Science and Technology	

### *ii) Granting Organizations*

NOAA Climate Sciences Program

## CLINTON P. MACDONALD

Group Manager, Meteorological Measurements and Analysis



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### Educational Background

M.S., Atmospheric Science, University of California at Davis  
B.S., Atmospheric Science, University of California at Davis

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### Professional Experience

Mr. MacDonald joined STI in 1996 and is the Manager of STI's Meteorological Measurements and Analysis Group. Mr. MacDonald's areas of expertise include meteorological and air quality analysis, air quality forecasting, diagnostic modeling, and the deployment, operations, and maintenance of radar wind profilers (RWP), Radio Acoustic Sounding Systems (RASS), sodars, and surface meteorological stations.

Mr. MacDonald has published several journal articles on meteorological and air quality processes, co-authored the U.S. Environmental Protection Agency (EPA) guidance document on developing an air quality forecasting program, and authored many formal reports on air quality transport and dispersion. He developed and taught numerous courses including (1) U.S. Environmental Protection Agency's (EPA) 2002, 2003, and 2004 National Air Quality Forecasting Conference courses on air quality forecasting; (2) EPA-sponsored 2003 Regional PM Air Quality Forecasting workshops; and (3) the 2003 American Meteorological Society course entitled "Profiler Observations, Applications, and Analysis." In addition, Mr. MacDonald has held the position of adjunct professor of meteorology at Santa Rosa Junior College since 2005.

As part of his meteorological measurement work, Mr. MacDonald serves on the Application Advisory Group for STI's participation in a Cooperative Research and Development Agreement (CRADA) to commercialize the National Oceanic and Atmospheric Administration's (NOAA's) boundary layer RWP technology. His role in the CRADA is to identify new applications for RWP products and to design and oversee the creation of RWP application software. Recent meteorological experiments led by Mr. MacDonald include a study to measure the effects of air turbulence generated by gas-turbine power plants on aircraft and a study to evaluate the usefulness of a ceilometer to characterize atmospheric boundary layer processes. In addition, he recently led the deployment and operations of RWPs, a mini-sodar, and two surface meteorological stations for the Texas Air Quality Study II. He is currently the Principal Investigator of an RWP operations project for the South Coast Air Quality Management District and of an RWP and sodar measurements project for the Cleveland Multiple Air Pollution Study.

Mr. MacDonald has led and participated in many data analysis projects to understand meteorological and air quality processes. He is currently the project manager for the Air/Sea Interaction Study sponsored by the U.S. Department of the Interior's Minerals Management Service (MMS). He managed the 1998 MMS Atmospheric Boundary Layer Study in the Gulf of Mexico and is currently managing a similar study for MMS. As part of the 1998 project, he calculated, evaluated, and analyzed surface fluxes and scaling parameters using the latest techniques developed during the TOGA COARE experiments; characterized the atmospheric boundary layer (ABL); evaluated annual, seasonal, and diurnal variations in ABL structure; described processes that influence ABL structure and variations in the Gulf of Mexico; and developed a three-dimensional diagnostic wind field to perform transport and dispersion analyses. As part of the 1997 Southern California Ozone Study (SCOS) and the 2000-2001 California Regional PM<sub>10</sub>/PM<sub>2.5</sub> Air Quality Study, Mr. MacDonald led the production of hourly three-dimensional wind fields using the CALMET diagnostic wind model driven by RWP data. Mr. MacDonald has also performed a wide range of data analysis activities for other studies such as the 1996 and 1997 Paso del Norte Ozone Studies, the Kansas City Scoping Study, the San Antonio Ozone Study, the Northern Front Range Air Quality Study, the NARSTO-Northeast 1995 Study, the Integrated Monitoring Study in the San Joaquin Valley, California, and an ozone study for the state of North Carolina.

**ALISON E. RAY**  
Senior Air Quality Field Technician



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## **Educational Background**

B.S., Business Administration, University of Florida

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## **Professional Experience**

Ms. Ray joined STI in 2007 as an Air Quality Field Technician. She is responsible for installing, calibrating, and operating air quality and meteorological monitoring instruments and delivering high quality data to domestic and international government and industrial clients. She routinely conducts air quality and meteorological performance audits. Ms. Ray is an expert in air sampling and analysis techniques such as those for continuous gaseous and particulate matter ambient monitoring, Federal Reference Method (FRM) particulate sampling, and air toxics sampling. Ms. Ray works with numerous systems to acquire digital and analog instrument data and uses remote telemetry to operate monitoring equipment and collect data. She is skilled in writing quality assurance project plans (QAPPs) and standard operating procedures (SOPs). Since joining STI, Ms. Ray has completed field work for several studies including inspecting and auditing the Caltrans' Remote Weather Information Systems (RWIS) network, deploying and operating offshore (oil platform) air quality measurements for the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE; formerly the U.S. Minerals Management Service), and measuring shipping facility impacts at dockside locations in Jamaica.

Ms. Ray has 20 years of experience in network design, site selection and logistics, installation, routine operations, troubleshooting, auditing, data validation and reporting, network assessment, and quality assurance. She is experienced in source testing, modeling and permitting, emission inventories, and workplace monitoring. She is proficient in ambient and trace level continuous gaseous pollutant monitoring and near-roadway continuous particulate measurements. Since 2001, she has been coordinating field studies and is an expert in logistics and technical support for field air programs.

Prior to joining STI, Ms. Ray worked for Environmental Science and Engineering (ESE) and its successor, MACTEC, most recently as the sole field technician for the middle region of the State of Georgia Ambient Air Monitoring Network, the only state network operated by a private contractor. She collected PM<sub>2.5</sub> integrated samples, speciated PM<sub>2.5</sub>-integrated samples, PM<sub>10</sub>-integrated samples, and air toxics samples. In addition, Ms. Ray operated continuous pollutant monitors, including FRM ozone, sulfur dioxide, oxides of nitrogen, and PM<sub>2.5</sub> Tapered Oscillating Element Monitors. She worked five years as a field technician for the U.S. Environmental Protection Agency's Clean Air Status and Trends Network (CASTNet) air quality and meteorological monitoring network and served an additional year as the Coordinator of Field Operations. She was the lead technician for workplace monitoring project field efforts for five years in the forest products industry and provided assistance on a variety of source testing activities, including PM<sub>2.5</sub> source testing. She also performed field and laboratory evaluations of sampler performance.

Ms. Ray has worked with industrial clients in Jamaica to bring their ambient monitoring programs into compliance with the Natural Resources Conservation Authority's new regulations. She continues to support client staff in operating air monitoring networks in Jamaica. She also has worked with state and local air quality agencies, transportation departments, universities, and U.S. government agencies.

## **Memberships**

Air & Waste Management Association

See <http://www.sonomatech.com/ResPub/AERpub.pdf> for a list of publications.

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## Educational Background

B.A., Commercial Illustration, Color Technology, Brooks Institute,  
Santa Barbara, CA

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## Professional Experience

Mr. Smith joined STI in February 2008 as a Field Technician. Mr. Smith is based in the Los Angeles area, where he is working on local projects for STI. He is lead field technician for air quality and meteorological monitoring projects at the Sunshine Canyon Landfill in Los Angeles and at South Coast Air Quality Management District (SCAQMD) meteorological sites. Mr. Smith provides onsite support for atmospheric measuring and sampling equipment (including radar, sodar, and surface meteorological sensors) and recording/transmitting data logger devices at the SCAQMD's network of radar wind profiler sites. He also supports black carbon (BC) and particulate matter (PM) monitoring and volatile organic compound (VOC) sampling at the Sunshine Canyon Landfill. He performs bi-weekly inspections, calibrations, and data extractions; maintains site logs; and responds to emergency service calls. Mr. Smith also provides field support as needed for the inspection and audit of Caltrans' Remote Weather Information Systems (RWIS) network. He has security clearance for working routinely on measurement equipment at the Los Angeles International and Ontario airports.

Mr. Smith brings to his position a technical service background consisting of a broad range of experience in installing, repairing, and servicing electrical and mechanical systems, including AC/DC voltage circuits, microprocessor controls, solid state recorders and logic operations; power supplies and transformers; optics and projection systems; and interpreting schematic drawings. He has more than 10 years of experience in field service practices and procedures; this experience includes troubleshooting, diagnosing, and repairing modules with component parts; reading and interpreting complex schematics, engineering drawings, work orders, technical manuals, and specifications; analyzing and interpreting device operations for malfunctions; preparing and maintaining appropriate and required records; and using advanced test equipment, basic hand tools, and special tools as required.

Mr. Smith has knowledge of Microsoft operating systems (Windows NT, 2000, XP, and Vista; and Windows NT Server and Windows NT Workstation), Linux, Microsoft Office, Esri ArcGIS v9.3, Ethernet networking, and modem and router configuration.

## Certifications

- SCAQMD, Portable Analyzer Operator Certification (expires January 2013)
- Testo 350XL Gas Analyzer, Master Class 1 Certification, February 2010
- Vaisala Lap 3000 Radar System Service and Maintenance Training