

State of California  
AIR RESOURCES BOARD

Research Resolutions

Research Division

April 26-27, 2001



## INTRODUCTION

Contained herein for Board review are nine resolutions and accompanying summaries from the Extramural Research Program recommended to the Board by the Research Screening Committee.

Item 1 is a research proposal from Environmental Business International, Incorporated entitled, "The Impacts of the Air Pollution Control Industry on the California Economy." The principal investigator will be Mr. Mariko Killion.  
Resolution No. 01-10

Item 2 is a research proposal from Sonoma Technology, Inc. entitled, "Collection of Micro-scale Emissions Activity Data in the South Coast Air Basin." The principal investigator will be Mr. Lyle Chinkin.  
Resolution No. 01-11

Item 3 is a research proposal from Sonoma Technology, Incorporated entitled, "Collection and Analysis of Weekend/Weekday Activity Data in the South Coast Air Basin." The principal investigator will be Mr. Lyle Chinkin.  
Resolution No. 01-12

Item 4 is a research proposal from the Research Triangle Institute entitled, "Environmental Health Conditions in Portable Classrooms." The principal investigators will be Mr. Gerry Akland and Dr. Roy Whitmore.  
Resolution No. 01-13

Item 5 is a research proposal from the University of California, Riverside entitled, "Characterizing the Range of Children's Pollutant Exposures During School Bus Commutes." The principal investigator will be Mr. Dennis Fitz.  
Resolution No. 01-14

Item 6 is a research proposal from the University of California, Riverside entitled, "Determination of the Contributions of Light-duty and Heavy-duty Vehicle Emissions to Ambient Particles in California." The principal investigator will be Dr. Kimberly Prather.  
Resolution No. 01-15

Item 7 is a research proposal from the University of California, Riverside entitled, "Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions." The principal investigator will be Dr. William P. L. Carter.  
Resolution No. 01-16

Item 8 is a research proposal from Analytical Engineering, Incorporated entitled, "On-Vehicle Emissions Testing System." The principal investigator will be Mr. David F. May.  
Resolution No. 01-17

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-10  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2475218, entitled "The Impacts of the Air Pollution Control Industry on the California Economy," has been submitted by Environmental Business International, Inc., in response to RFP No. 00-312.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2475218 entitled "The Impacts of the Air Pollution Control Industry on the California Economy," submitted by Environmental Business International, Inc., for a total amount not to exceed \$116,271.

**NOW, THEREFORE BE-IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2475218 entitled "The Impacts of the Air Pollution Control Industry on the California Economy," submitted by Environmental Business International, Inc., for a total amount not to exceed \$116,271. --

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$116,271.

## Attachment A

### “The Impacts of the Air Pollution Control Industry on the California Economy”

#### **Background**

Air pollution control regulations impose costs on businesses. These costs tend to promote demand for products and services of other businesses. In other words, most of the costs resulting from air pollution control (APC) regulations represent a shift of resources from one sector of the economy to another. While the costs of regulations are examined in great detail during the rulemaking process, the positive impacts of regulations on businesses are rarely considered.

APC regulations have created markets for many products and services. These products and services include pollution prevention, clean-up equipment and supplies, air pollution abatement systems, analytical-instruments, and specialized services, such as engineering, consulting, construction, laboratory analysis, and environmental impact assessment. Regulations also stimulate the demand for less polluting products, such as alternative solvents and cleaner burning fuels. Furthermore, regulations tend to promote both technological innovation and production efficiency, resulting in an increase in economic productivity and economic activity.

The California economy has benefited considerably from the APC industry. However, there is no consensus on the size of the APC industry's contribution to the California economy. There are several reasons for this lack of consensus. The industry encompasses many firms providing various products and services. These products and services are not classified into a unique set of standard industrial classification codes, which provide an organizational framework for most government data on businesses. Only a fraction of firms within this industry are publicly owned, so economic data are not readily accessible. Finally, many corporations lack an accounting system that specifically keeps track of their sales of the APC related products and services.

#### **Objective**

The objective of this study is to develop historical profiles of the California APC industry and quantify the contribution of the APC industry to California's economy from 1970 to the present.

#### **Expected Results**

The product of this research would provide the Board with a definition and segmentation of the APC industry, economic and financial profiles of the California APC industry from 1970 to 2000, a directory of the APC firms, and an evaluation of the impact of the APC industry on the California economy.

#### **Significance to the Board**

This information would enable the Board to conduct a more balanced evaluation of the economic impacts of its proposed regulations. Traditionally, the Board has assessed the costs of regulations in great detail during the rulemaking process. This assessment,

however, has rarely included a consideration of the positive impacts of regulations on businesses.

**Contractor:**  
Environmental Business International, Inc.

**Contract Period:**  
21 months

**Principal Investigator (PI):**  
Mariko T. Killion

**Contract Amount:**  
\$116,271

**Cofunding:**  
None

**Basis for indirect Cost Rate:**

The rates used by the contractor to estimate its indirect costs are based upon the rates it used for the three previous projects that it completed for the US Department of Commerce and US-Asia Environmental Partnership.

**Past Experience'with this Principal Investigator:**

The contractor is the publisher of the Environmental Business Journal, a leading publication on the environmental industry. In addition, the contractor has completed numerous environmental market studies for both private and public clients. The contractor has also provided data for two major environmental industry studies published by the U.S. Department of Commerce, "Environmental Industry of the United States: Overview by State and Metropolitan Statistical Area," and "The U.S. Environmental-Industry-Meeting the Challenge: U.S. Industry Faces the 21<sup>st</sup> Century."

**Prior Research Division Funding to Environmental Business International, Inc.:**

Year	2000	1999	1998
Funding	\$0	\$0	\$0

## BUDGET SUMMARY

Environmental Business International, Inc.

“The Impacts of the Air Pollution Control Industry on the California Economy”

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$76,780	
2.	Subcontractors	\$ 3,500	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 3,000	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 1,000	
8.	Supplies	\$ 3,000	
9.	Analyses	\$ 0	
10.	Miscellaneous	<u>\$ 0</u>	
	<b>Total Direct Costs</b>		<b>\$87,280</b>

### INDIRECT COSTS

1.	Overhead	\$19,195	
2.	General and Administrative Expenses	\$ 5,324	
3.	Other Indirect Costs	0	
4.	Fee or Profit	<u>\$,472</u>	
	<b>Total Indirect Costs</b>		<b><u>\$28,991</u></b>

<b><u>TOTAL PROJECT COSTS</u></b>	<b><u>\$116,271</u></b>
-----------------------------------	-------------------------

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-I 1  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2479-218, entitled "Collection of Micro-Scale Emissions Activity Data in the South Coast Air Basin," has been submitted by Sonoma Technology, Incorporated.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2479-218 entitled "Collection of Micro-Scale Emissions Activity Data in the South Coast Air Basin," submitted by Sonoma Technology, Incorporated, for a total amount not to exceed \$106,855.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2479-218 entitled "Collection of Micro-Scale Emissions Activity Data in the South Coast Air Basin," submitted by Sonoma Technology, Incorporated, for a total amount not to exceed \$106,855.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and has described in Attachment A, in an amount not to exceed \$106,855.

**Contractor:**  
Sonoma Technology, incorporated

**Contract Period:**  
12 months

**Principal Investigator (PI):**  
Mr. Lyle R. Chinkin

**Contract Amount:**  
\$106,855

**Cofunding:**

This proposal expands upon a project sponsored by the U.S. Department of Energy, National Renewable Energy Laboratory, conducted/initiated in the fall of 2000.

**Basis for Indirect Cost Rate:**

The Defense Contract Audit Agency (**DCAA**) is auditing STI's indirect cost rate for 1998 on behalf of the U.S. Environmental Protection Agency and the Department of Interior's Mineral Management Service. In a draft letter dated December 31, 2000, the DCAA indicated that its "audit did not find any exceptions to STI's proposed FY 1998 final indirect rates." Final approval of the 1998 audit results is expected shortly. **DCAA** will soon begin their audit of STI's rates during 1999 and 2000. -

**Past Experience with this Principal Investigator:**

The **ARB's** emission inventory staff have been very satisfied with the work of this principal investigator in previous projects. In fact, this project benefits from the **PI's** familiarity with the **ARB's** emission inventory as the developer of several components.

**Prior Research Division Funding to Sonoma Technology, Incorporated:**

Year	2000	1999	1998
Funding	\$0	\$0	\$0

## BUDGET SUMMARY

Sonoma Technology, Incorporated

Collection of Micro-Scale Emissions Activity Data in the South Coast Air Basin

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 26,593
2.	Subcontractors	\$ 44,925
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 1,482
5.	Electronic Data Processing	\$ 400
6.	Reproduction/Publication	\$ 0
7.	Mail and Phone	\$ 0
8.	Supplies	\$ 0
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 1,228</u>

Total Direct Costs		\$74,628
--------------------	--	----------

### INDIRECT COSTS

1.	Overhead	\$ 24,668
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 7,559</u>

Total Indirect Costs		<u>\$ 32,227</u> -
----------------------	--	--------------------

### TOTAL PROJECT COSTS

**\$106,855**

---

<sup>1</sup> PC and GIS equipment rental

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-12  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2483-219, entitled "Collection and Analysis of Weekday/Weekend Activity Data in the South Coast Air Basin," has been submitted by Sonoma Technology, Incorporated, in response to RFP No, 00-313.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2483-219 entitled "Collection and Analysis of Weekday/Weekend Activity Data in the South Coast Air Basin," submitted by Sonoma Technology, Incorporated, for a total amount not to exceed \$389,768.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2483-219 entitled "Collection and Analysis of Weekday/Weekend Activity Data in the South Coast Air Basin," submitted by Sonoma Technology, Incorporated, for a total amount not to exceed \$389,768.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$389,768.

## Attachment A

### “Collection and Analysis of Weekday/Weekend Activity Data in the South Coast Air Basin”

#### **Background**

Over the years, various analyses of ambient air monitoring data have revealed that ambient ozone concentrations at many monitoring sites (primarily in urban areas) tend to be higher on weekends than on weekdays. This phenomenon has been called the ozone weekend effect (WE Effect). The exact cause of the WE Effect is not definitively known but is associated with the influence of differences in human activities on weekends compared to weekdays.

#### **Objective**

The objective of this project is to collect anthropogenic activity data, particularly for weekends. This project will update activity data for on-road, off-road, and stationary sources in the counties of Los Angeles, Orange, Riverside, and San Bernardino. Existing activity data will be supplemented with new activity data for important and under-represented portions of the emission inventory.

#### **Expected Results**

This project will collect on-road and off-road mobile source and stationary source activity data during the summer ozone season for a domain that encompasses the counties of Los Angeles, Orange, Riverside, and San Bernardino. The ultimate data collection goals are hourly-resolved activity data sets by day of the week that can be used to estimate both regional, county-level resolution emissions (e.g., EMFAC2000 and OFFROAD models) and additional microscale, gridded emissions for air quality modeling (e.g., Direct Travel Impact Model). This project's efforts will be allocated approximately 60 percent, 30 percent, and 10 percent respectively to address data needs in the on-road, off-road, and stationary source sectors.

#### **Significance to the Board**

The activity data will enable better spatial and temporal characterization of the differences between weekday and weekend emissions and will thus allow additional testing of the various hypotheses as to the cause(s) of the WE Effect. Testing of the various hypotheses will include photochemical modeling applications. In addition, the high ozone concentrations on weekends will also need to be modeled to identify the type(s) and amounts of controls that will be necessary to attain and maintain ambient air quality standards. Current emission inventories for modeling are based on average data and need to be improved to accurately characterize the spatial and temporal differences between weekdays and weekends. Data from this project will be used to improve weekday and weekend emission inventories for modeling (both for supporting the State Implementation Plan and for quantifying the effect of some weekday and weekend differences).

**Contractor:**  
Sonoma Technology, Incorporated

**Contract Period:**  
21 months

**Principal Investigator (PI):**  
Mr. Lyle Chinkin

**Contract Amount:**  
\$389,768

**Cofunding:**  
N o n e

**Basis for Indirect Cost Rate:**

The Defense Contract Audit Agency (DCAA) is auditing Sonoma Technology Incorporated's (STI) indirect cost rate for 1998 on behalf of the U.S. Environmental Protection Agency and the Department of Interior's Mineral Management Service. In a draft letter dated December 31, 2000, the DCAA indicated that its "audit did not find any exceptions to STI's proposed CY 1998 final indirect rates." Final approval of the 1998 audit results is expected shortly. DCAA will soon begin their audit of STI's rates during 1999 and 2000.

**Past Experience with this Principal Investigator:**

The ARB's emission inventory staff have been very satisfied with the work of this principal investigator in previous projects. In fact, this project benefits from the private investigator's familiarity with the ARB's emission inventory as he was the developer of several components.

**Prior Research Division Funding to Sonoma Technology, Incorporated:**

Year	2000	1999	1998
Funding	\$0	\$0	\$0

## B U D G E T   S U M M A R Y

Sonoma Technology, Incorporated

Collection and Analysis of Weekday/Weekend Activity Data  
in the South Coast Air Basin

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 84,714	
2.	Subcontractors	\$ 190,552 <sup>1</sup>	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 1,320	
5.	Electronic Data Processing	\$ 1,000	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 0	
8.	Supplies	\$ 0	
9.	Analyses	\$ 0	
10.	Miscellaneous	<u>\$ 0</u>	
Total Direct Costs			<b>\$277,586</b>

### INDIRECT COSTS

1.	Overhead	\$ 85,561	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	<u>\$ 26,621</u>	
Total Indirect Costs			<u><b>\$112,182</b></u>

<b><u>TOTAL PROJECT COSTS</u></b>	<b><u>\$389,768</u></b>
-----------------------------------	-------------------------

---

<sup>1</sup> GeoStats (\$74,927), Freeman, Sullivan & Co. (\$64,025), Transtec (\$26,600), Wiltec (\$25,000)

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-13  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2488-219, entitled "Environmental Health Conditions in Portable Classrooms -- Augmentation," has been submitted by Research Triangle institute.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research-Screening Committee has reviewed and recommends for funding:

Proposal Number 2488219 entitled "Environmental Health Conditions in Portable Classrooms -- Augmentation," submitted by Research Triangle Institute, for a total amount not to exceed \$125,999.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2488-219 entitled "Environmental Health Conditions in Portable Classrooms -- Augmentation," submitted by Research Triangle institute, for a total amount not to exceed \$325,999.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$125,999.

## Attachment A

### “Environmental Health Conditions in Portable Classrooms – Augmentation”

#### Background

Research Triangle Institute (RTI) was recently funded by the ARB to conduct the major field work for the California Portable Classrooms Study, a statewide study conducted jointly by the ARB and the Department of Health Services (DHS). That study was requested by Governor Davis and mandated by the California Health and Safety Code, Section 39619.6. It includes measurements of indoor air pollutant levels and environmental conditions in 240 classrooms at 60 schools, including both portable and traditional classrooms.

The investigators will also collect floor dust samples in all classrooms, primarily from carpets, for the analysis of animal allergens. Because floor dust also serves as a reservoir for persistent pollutants, its pollutant concentrations provide an indication of historical buildup and potential long-term exposure to hazardous pollutants in floor dust. Exposure to the dust components can occur when dust is re-suspended and inhaled, when it contacts hands and food and is ingested, and when components are absorbed through skin contact with carpets.

Further analyses of these floor dust samples for pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals were proposed as an option in RTI's original proposal, as requested by the ARB's Request For Proposals. However, this optional proposal was not funded by the ARB because of insufficient funds at the time.

#### Objectives

The objectives of this project are to conduct the following additional tasks as part of the California Portable Classrooms Study;

- Analyze indoor floor dust samples for pesticides, PAHs, PCBs, and metals using the floor dust samples already collected.
- Sample and analyze indoor and outdoor air to identify and count viable and non-viable mold spores.
- Provide for the contractor's participation to support a technical review panel for the optional pollutant monitoring and analysis protocols.

#### Expected Results

The investigators would obtain important environmental measurements from schools across California, information that would otherwise not be available. They would initially analyze floor dust samples for pesticides, PAHs, PCBs, and metals in composite samples from 60 schools, followed by analysis of samples for individual classrooms where elevated pollutant levels are found. The investigators would count and identify mold spores, both viable and non-viable, to complement the sampling of the microbiological sampling of culturable (viable) species in the main study. The

investigators would also participate and assist in the meetings of a small technical advisory group that will be arranged by the ARB.

### **Significance to the Board**

The dust sample and mold analyses would greatly increase the available information on potential health risks children and teachers face from exposures to pollutants in schools. The targeted pollutants are thought to present significant health risks for all children, and for asthmatic children and adults- These additions would greatly improve the ability of the ARB and the DHS to assess the environmental health conditions in California's classrooms, and to develop **effective** recommendations to prevent harmful exposures to toxic pollutants in classrooms.

#### **Contractor:**

Research Triangle Institute

#### **Contract Period:**

12 months

#### **Principal Investigators (PIs):**

Mr. Gerry Akland and Dr. Roy Whitmore

#### **Contract Amount:**

\$125,999

#### **Cofunding:**

None.

#### **Basis for Indirect Cost Rate:**

The contractor's federally approved rates,

#### **Past Experience with this Principal Investigators:**

The contractors are currently Principal Investigator and Co-Principal Investigator in the California Portable Classrooms Study; and have performed very well to date. In addition, the ARB previously co-funded a successful federal study of personal and indoor exposures in southern California, in which Dr. **Whitmore** was a key team member. The ARB **has not previously funded** any projects involving Mr. Akland, but he has recently conducted successful studies of **indoor**, outdoor, and personal exposures to volatile organic compounds and/or aldehydes in Sacramento and-in southern California.

#### **Prior Research Division Funding to Research Triangle Institute:**

Year	2000	1999	1998
Funding	\$673,879	\$0	\$0

## BUDGET SUMMARY

Research Triangle Institute

“Environmental Health Conditions in Portable Classrooms -- Augmentation”

### **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	<b>\$47,009</b>	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 0	
5.	Electronic Data Processing	0	
6.	Reproduction/Publication	\$ 310	
7.	Mail and Phone	\$ 640	
8.	Supplies	\$ 9,884	
9.	Analyses	\$ 0	
10.	Miscellaneous	<u>\$ 4,295</u>	
	Total Direct Costs		\$62,138

### **INDIRECT COSTS**

1.	Overhead	<b>\$32,409</b>	
2.	General and Administrative Expenses	\$20,163	
3.	Other Indirect Costs	\$ 198	
4.	Fee or Profit	<u>\$11,091</u>	
	Total Indirect Costs		<u>\$63,861</u>

	<b><u>TOTAL PROJECT COSTS</u></b>	<b><u>\$125,999</u></b>
--	-----------------------------------	-------------------------

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-14  
April 26, 2001

Agenda item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number **2481-218**, entitled "Characterizing the Range of Children's Pollutant Exposure During School Bus Commutes," has been submitted by University of California, Riverside.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2481-218 entitled "Characterizing the Range of Children's Pollutant Exposure During School Bus Commutes," submitted by University of California, Riverside for a total amount not to exceed \$449,503.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2481-218 entitled "Characterizing the Range of Children's Pollutant Exposure During School Bus Commutes," submitted by University of California, Riverside for a total amount not to exceed \$449,503.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$449,503.

## Attachment A

### “Characterizing the Range of Children’s Pollutant Exposure During School Bus Commutes”

#### Background

A 1997 study of in-vehicle pollutant concentrations sponsored by the Air Resources Board indicated that proximity to diesel-fueled vehicles causes high concentrations of in-vehicle fine particles and black carbon, an indicator of diesel exhaust particulate. Because most California school buses are diesel-powered, significant numbers of school children are potentially exposed to high concentrations of diesel particles and other pollutants during their commutes by bus and during their time spent in proximity to idling buses. Children are especially susceptible to air pollution because of their high inhalation rates relative to body mass, their high activity levels, narrower lung airways, immature immune systems, and rapid growth. Exposure to pollutants as children travel to and from school has not been studied to date, even though roadways, sidewalks, and the space inside vehicles have repeatedly been shown to have some of the highest pollutant concentrations of all locations.

#### Objective

The objective of this study is to provide the pollutant concentration measurements needed to characterize school bus commute exposures experienced by children while riding on buses, waiting at bus stops, and waiting near idling buses-during loading. This study would obtain data needed to characterize the range of children’s exposures experienced during school bus commutes by obtaining measurements across a range of commute scenarios, sampling locations (such as bus stops and loading areas), and bus fuel types. A full range of both gaseous and particulate vehicle exhaust pollutants would be measured. Many of these measurements would be made in real-time to determine which factors and events result in the highest concentrations and to measure the duration of peak concentrations.

#### Expected Results

A large database of pollutant concentrations will be created and linked to various activities and locations in and around operating school buses. Real-time measurements will include particle mass, particle counts, black carbon, particle-bound polycyclic aromatic hydrocarbons, carbon monoxide, and nitrogen dioxide. Integrated measurements will include total particle mass, metals, and volatile organic compounds. Comparing concentrations to background levels will demonstrate whether school bus commutes contribute significantly to children’s exposures. Statistical analysis of factors associated with the highest concentrations will determine which activities, bus conditions, and driving conditions may be contributing the most to these exposures.

#### Significance to the Board

The results of this study will be used by ARB staff to better estimate children’s exposure to diesel exhaust particles and other bus-related pollutants, and to determine the fraction of children’s total exposure attributable to school bus-related activity. By identifying the factors that lead to higher exposures, the results of this study may

provide guidance for minimizing children's exposures. The results may also facilitate evaluations of the direct health benefits of alternative fuel types and improved bus control technologies.

**Contractor:**

University of California, Riverside,  
College of Engineering-Center for  
Environmental Research and Technology

**Contract Period:**

25 Months

**Principal Investigator (PI):**

Dennis Fitz

**Contract Amount:**

\$449,503

**Cofunding:**

The South Coast Air Quality Management District has agreed to provide \$59,000 through a direct contract with UCR for the inclusion of diesel buses retrofitted with particle traps and enhanced ambient VOC monitoring.

**Basis for Indirect Cost Rate:**

The indirect cost rate of 10 percent is a negotiated rate agreed to by the State and the University of California campuses.

**Past Experience with this Principal Investigator:**

Dennis Fitz has conducted previous satisfactory work for the ARB.

**Prior Research Division Funding to University of California, Riverside:**

Year	2000	1999	1998
Funding	\$0	\$479.943	\$278.579

**BUDGET SUMMARY**

University of California, Riverside

"Characterizing the Range of Children's Pollutant Exposure During School Bus  
Commutes"

**DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$ 99,079	
2.	Subcontractors	\$178,515 <sup>1</sup>	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 2,849	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 1,100	
7.	Mail and Phone	\$ 1,200	
8.	Supplies	\$ 97,998 <sup>2</sup>	
9.	Analyses	\$ 25,500 <sup>3</sup>	
10.	Miscellaneous	<u>\$ 7,990</u>	
	Total Direct Costs		\$424,231

**INDIRECT COSTS**

1.	Overhead	\$ 25,272	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	<u>\$ 0</u>	
	Total Indirect Costs		<u>\$ 25,272</u>

**\$449,503****TOTAL PROJECT COSTS**


---

<sup>1</sup>University of California, Los Angeles (\$178,515)
**\*Supply Details:**

Equipment Rentals:	
Aethalometer	\$26,000
EcoChem PAH Monitor	\$20,000
Portable Gas Chromatograph	\$15,000
Bus Rental	\$16,680
Plumbing	\$ 6,000
Electrical	\$ 6,000
Hardware	\$ 6,000
Fuel	\$ 1,450
Calibration Gases	<u>\$ 1,000</u>
Total Supplies	\$ 97,998

**<sup>3</sup>Analysis Details:**

Aldehydes and ketones	\$18,000
Elemental analysis	<u>\$ 7,500</u>
Total Analysis	\$ 25,500

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-15  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2491-219, entitled "Determinatidn of the Contributions of Light-Duty and Heavy-Duty Vehicle Emissions to Ambient Particles in California," has been submitted by the University of California, Riverside;

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2491-219 entitled "Determination of the Contributions of Light-Duty and Heavy-Duty Vehicle Emissions to Ambient Particles in California," submitted by the University of California, Riverside, for a total amount not to exceed \$333,790.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health-and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2491-219 entitled "Determination of the Contributions of Light-Duty and Heavy-Duty Vehicle Emissions to Ambient Particles in California," submitted by the University of California, Riverside, for a total amount not to exceed \$333,790.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$333,790.

## Attachment A

### “Determination of the Contributions of Light-Duty and Heavy-Duty Vehicle Emissions to Ambient Particles in California”

#### Background

Source apportionment experiments indicate that motor vehicle exhaust is a major component of PM<sub>10</sub>, especially in urban areas. To date, source apportionment within the motor vehicle fleet has relied on inferred fractionation based on “broad brush” approaches such as elemental carbon (EC) ratios or modeling from dynamometer test data. Since they are based on generalized and/or assumed fleet emission characteristics, these approaches are inappropriate for several types of analyses, especially examining “hot spots” and comparing in-use emissions with inventory estimates and modeled air quality (“top down” validation). Resolving these issues depends on developing methods to directly detect diesel and gasoline vehicles’ emissions in ambient air, a capability that appears beyond the reach of conventional sampling and analytical techniques-

Although many particle sources produce distinct “diagnostic” particles, the bulk collection of particles on filters or impaction plates masks individual particles, and precludes their recognition in ambient samples. Bulk sampling methods generally cannot gather samples over the short time periods needed for direct observation of the formation and transformation of secondary aerosols. Finally, bulk methods cannot distinguish between aerosols composed of identical particles with complex composition and those composed of mixtures of different kinds of particles. Without these kinds of data, source apportionment for primary aerosols relies on statistical inferences that often lack sound observational and theoretical bases, and interpretation of secondary particles relies on assumed gas-aerosol interactions not verified by observations in ambient air. The aerosol time-of-flight mass spectrometry (ATOFMS) technology, combines single-particle analyses, real-time data stream, and continuous operation. Therefore, it can potentially answer many questions about aerosols that cannot be practically addressed by other means, and can provide detailed information necessary to refine and extend the interpretation of data gathered by conventional bulk sampling and analysis methods. Previous work with ATOFMS indicates that this technology can distinguish gasoline and diesel emissions as well as sample aerosols with temporal resolution down to a few seconds. These are the exact capabilities needed to resolve the diesel-gasoline emission problem.

#### Objective

The objective of this project is to demonstrate source-specific (diesel versus gasoline) detection of ambient particles emitted by motor vehicles. The approach involves limited new source sampling to better characterize “fresh” diesel exhaust particles, reanalysis of existing ambient monitoring data, and new field sampling along roadways, in a tunnel, and in a complex urban setting.

**Expected Results**

The expected results are techniques to perform time-resolved (possibly real-time) source apportionment for motor vehicle particulate emissions. This project consists of multiple components. It will develop an ATOFMS data management system and sample diesel exhaust to identify “marker” compounds and particles. It will also characterize aerosol signatures of unburned fuel and lubricants as well as compare diesel and gasoline vehicle exhaust in a traffic segregated tunnel by assessing particle transformation by upwind-downwind sampling of roadway emissions. Finally, it will demonstrate the detection schemes in a complex urban setting.

**Significance to the Board**

Motor vehicles are major contributors to ambient concentrations of particulate matter (PM<sub>10</sub> & PM<sub>2.5</sub>). Diesel exhaust particles, a significant fraction of total motor vehicle PM emissions, are classified as a Toxic Air Contaminant. Developing plans to reduce human exposure to these air pollutants requires data on the origins of ambient aerosols, both to identify source-specific concentrations of primary particles and to understand the processes that form secondary particles in the air. Real-time single particle analysis using ATOFMS is capable of discriminating among sources-based on characteristic particles and particle populations that are irretrievably mixed in conventional filter and **impactor** samples. This study builds on the ATOFMS instrumentation and expertise developed at UCR with ARB support, with the goal of detecting motor vehicle aerosols in ambient air and discriminating their diesel and gasoline vehicle components in **quasi-real time**.

**Contractor:**

University of California, Riverside

**Contract Period:**

36 months

**Principal Investigator (PI):**

Dr. Kimberly Prather

**Contract Amount:**

\$333,790

**Co-funding:**

No co-funding is provided. However, project has cost savings through a cooperative effort with ongoing major diesel studies (ARB testing at MTA, ARCO EC-Diesel, CRC Project E55/59).

**Basis for Indirect Cost Rate:**

The indirect cost rate of 10 percent is a negotiated rate agreed to by the State and the University of California campuses.

**Past Experience with this Principal Investigator:**

Staff has extensive experience with Dr. Prather. Her program is in the forefront of particle analysis and her work is well-published.

**Prior Research Division Funding to the University of California, Riverside:**

Year	2000	1999	1998
Funding	\$0	\$479,943	\$278,579

## BUDGET SUMMARY

University of California, Riverside

“Determination of the Contributions of Light-Duty and Heavy-Duty Vehicle Emissions to Ambient Particles in California”

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 189,900
2.	Subcontractors	\$ 0
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 41,000
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 0
a.	Mail and Phone	\$ 0
8.	Supplies	\$ 50,000
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 24,800</u>

Total Direct Costs \$305,700

### INDIRECT COSTS

1.	Overhead	\$ 28,090
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 0</u>

Total Indirect Costs \$28,090

### TOTAL PROJECT COSTS

\$333,790

---

† Components to maintain operation of 3 ATOFMSs

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-16  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2485-219, entitled "Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions," has been submitted by the University of California, Riverside.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2485219 entitled "Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions," submitted by the University of California, Riverside, for a total amount not to exceed \$60,000.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2485219 entitled "Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions," submitted by the University of California, Riverside, for a total amount not to exceed \$60,000.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$60,000.

## Attachment A

### “Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions”

#### **Background**

Because emissions from architectural coatings are an important component of the stationary source volatile organic compounds' (VOC) inventory, the ARB approved a mass-based control measure for VOCs in architectural coatings in June 2000. The ARB also decided to evaluate the feasibility of reactivity-based regulations for architectural coatings because they can potentially make regulations more cost-effective and flexible. There are several issues regarding the feasibility of reactivity-based regulations. The uncertainties associated with the reactivity of VOCs in architectural coatings are considered to be a high priority.

Reactivity estimates are currently available for a wide variety of VOCs, including many of those emitted from architectural coatings. These are based on the current version of the SAPRC-99 mechanism, which incorporates results of environmental chamber and laboratory studies of a variety of representative compounds. However, based on a recent survey, several important VOCs that are found in architectural coatings are not well represented in the mechanism.

#### **Objective**

The objective of this three-year project is to carry out the research most needed to reduce uncertainties in ozone reactivity estimates for selected VOCs in architectural coatings. This project will focus on developing and applying procedures to reduce the uncertainties in ozone reactivity estimates for Texanol and selected petroleum distillate mixtures in architectural coatings.

#### **Expected Results**

The product from this effort will be the reactivity estimates for selected VOCs in architectural coatings and procedures developed to reduce the uncertainties of reactivity estimates.

#### **Significance to the Board**

The results of this project will provide useful information regarding the feasibility of a reactivity-based control strategy for architectural coatings.

#### **Contractor:**

University of California, Riverside

#### **Contract Period:**

36 months

#### **Principal Investigator (PI):**

William P. L. Carter, Ph.D.

#### **Contract Amount:**

\$59,984

#### **Cofunding:**

This proposal is an extension of several ongoing reactivity projects being carried out by Dr. William Carter at the University of California, Riverside. The method development of

direct reactivity is being funded by the California Air Resources Board, and the U.S. EPA is funding the development of "next generation" smog chamber.

**Basis for Indirect Cost Rate:**

The indirect cost rate of 10 percent is a negotiated rate agreed to by the State and the University of California campuses.

**Past Experience with this Principal Investigator:**

The principal investigator, Dr. William Carter, is one of the pioneers in determining and quantifying VOC reactivity. He is the leader of the NARSTO's VOC reactivity assessment team. He has published approximately 75 journal articles and almost 70 technical reports in the areas of atmospheric chemistry, chemical mechanism development, and VOC reactivity assessment. He compiled the list of compound reactivities codified in California's Low Emission Vehicles/Clean Fuels and aerosol coatings regulations. He has completed several studies on VOC reactivity for the ARB and has always delivered a quality product at a very reasonable cost.

**Prior Research Division Funding to the University of California, Riverside:**

Year	2000	1999	1998
Funding	\$0	\$479,943	\$278,579

## BUDGET SUMMARY

University of California, Riverside

“Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions “

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 27,352	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 1,000	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 500	
7.	Mail and Phone	\$ 0	
8.	Supplies	\$ 0	
9.	Analyses	\$ 20,181 <sup>1</sup>	
10.	Miscellaneous	\$ 6,048	
Total Direct Costs			<b>\$ 55,081</b>

### INDIRECT COSTS

1.	Overhead	\$ 4,903	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	\$ 0	
Total Indirect Costs			<b><u>\$ 4,903</u></b>

### TOTAL PROJECT COSTS

**\$ 59,984**

---

<sup>1</sup> Lab Costs: 31 Experiments @ \$651 per test

**PROPOSED**

**State of California  
AIR RESOURCES BOARD**

Resolution 01-17  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2489-219, entitled "On-Vehicle Emissions Testing System," has been submitted by Analytical Engineering, Inc.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2489-219 entitled "On-Vehicle Emissions Testing System," submitted by Analytical Engineering, Inc., for a total amount not to exceed \$100,004.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2489-219 entitled "On-Vehicle Emissions Testing System," submitted by Analytical Engineering, Inc., for a total amount not to exceed \$100,004.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$100,004.

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-17  
April 25-26, 2001

Agenda item No.: 01-03-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2489-219, entitled "On-Vehicle Emissions Testing System," has been submitted by Analytical Engineering, Inc.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2489-219 entitled "On-Vehicle Emissions Testing System," submitted by Analytical Engineering, Inc., for a total amount not to exceed \$100,004.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2489-219 entitled "On-Vehicle Emissions Testing System," submitted by Analytical Engineering, inc., for a total amount not to exceed \$100,004.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$100,004.

## Attachment A

### “On-Vehicle Emissions Testing System”

#### Background

Analytical Engineering, Inc., (AEI) with support from the United States Environmental Protection Agency (U.S. EPA), has been engaged in a three-tiered technology development and hardware delivery program of the Simple Portable On-board Testing (SPOT) system. Phase one of the program involved development and validation of AEI's exhaust mass flow measurement technology. The Trombone Mass Flow Module was developed in cooperation with the U.S. EPA. AEI's concept is based on dilution air entrainment and is the only system available that is easy to install, light, robust, and fouling-proof. Modifications to the in-stack probe may make it more versatile. The goal is to address the needs of virtually all exhaust configurations and as many stack sizes as possible with a single device.

The second phase of the program is critical to the long-term success of on-board measurement of in-use emissions. The program focuses on the preliminary development and integration of near real-time total particulate matter (PM) measurement capabilities. Although the work involves the evaluation of various potential methods, AEI's efforts will focus primarily on the feasibility and integration of Rupprecht & Patashnick's (R&P) personal Tapered Element Oscillating Microbalance (TEOM) technology. This technology has been identified by the U.S. EPA as the likely instrument of choice for on-vehicle, real-time PM measurements.

The third and last phase will culminate in the delivery of a first-generation SPOT unit. AEI will deliver the system to the ARB and provide subsequent training and on-call support. The SPOT unit will be identical to the one delivered to the U.S. EPA. SPOT is capable of simple and quick installation on a wide variety of on- and off-road diesel powered vehicles. The system can also be used for non-vehicle or small engine applications.

AEI is considering other analyte measurement modules which may allow the SPOT system to be used on spark ignition (SI), turbine, and other emissions sources. Funding for this work has come primarily from the U.S. EPA. On-vehicle calibration methodologies are also being explored. These features will greatly enhance the versatility of SPOT and can potentially make it a universal system for on-board emissions measurements.

#### Objective

The primary objective of this project is to gain on-board measurement capabilities via a simple system with extensive portability for sampling from on- and off-road vehicles/engines in stationary and mobile sources. The project will focus primarily on gaseous emissions from diesel engines. Near real-time PM emissions measurements will eventually be integrated into one portable unit.

**Expected Results,**

This project will provide a proven system for on-board gaseous emission measurements. It will use *in-situ* measurement technology, exhaust mass flow, NO, and O<sub>2</sub> concentrations, and fuel-specific emissions data are acquired on a second-by-second basis. Brake-specific emissions may be inferred from brake-specific fuel consumption maps available from the engine manufacturer. The ARB would benefit from results already achieved by AEI and the U.S. EPA. This includes initial durability trial runs and extensive pilot testing on construction equipment. The SPOT system is scalable and additional measurement modules, such as the Flame Ionization Detector module for hydrocarbon measurements, may be added for expanded application. The system meets or exceeds the initial requirements for data gathering, storage, and communication capabilities established by the U.S. EPA. The NGK ceramic electrochemical sensor for NO, and O<sub>2</sub> measurements was recently tested in an extensive research program by Southwest Research Institute (**SwRI**) for the ARB. The sensor was shown to be reliable, stable, and was proven for on-vehicle use. The on-vehicle calibration capabilities of the Trombone Mass Emission Module is a very significant feature of SPOT with potential for wide applicability.

**Significance to the Board**

Regulatory agencies, like the U.S. EPA and the ARB, increasingly need “real-world” emissions data as a screening tool and to create realistic emission inventories and air quality models for all emission sources. The SPOT system benefits a number of current ARB projects that need on-vehicle emissions measurements., The I/M test method for heavy-duty diesel vehicles, which is mandated in the MI7 of the State Implementation Plan, is one of the projects that will benefit from the SPOT system. Other projects that will benefit include the Construction Equipment Retrofit Demonstration program in the Mobile Source Operations Division, and the development of a test method for screening stationary and portable engine emissions for the Stationary Source Division. Although some of these projects already include hardware development and/or acquisition, the SPOT system may emerge as an additional viable alternative to current concepts.

**Contractor:**

Analytical Engineering, Inc.

**Contract Period:**

12 months

**Principal Investigator (PI):**

David F. May

**Contract Amount:**

\$100,004

**Cofunding:**

The U.S. EPA has funded AEI for \$1.2 million over the last one year for the development of the SPOT system.

**Basis for Indirect Cost Rate:**

The indirect costs used by AEI are the same as those used in the U.S. EPA contract and therefore, have been approved by the U.S. EPA.

**Past Experience with this Principal Investigator:**

Although the Research Division has not worked with AEI in the past, some of their employees have worked with the same US EPA employees who are also involved in this project.

**Prior Research Division Funding to Analytical Engineering, Inc.:**

Year	2000	1999	1 9 9 8
Fundina	\$0	\$0	\$0

## B U D G E T   S U M M A R Y

Analytical Engineering, Inc.

On-Vehicle Emissions Testing System

### **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$35,781
2.	Subcontractors	\$ 0
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 1,500
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 55
7.	Mail and Phone	\$ 200
8.	Supplies	\$16,810
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 0</u>

Total Direct Costs	\$54,346
--------------------	----------

### **INDIRECT COSTS**

1.	Overhead	\$ 3 0 , 8 7 9
2.	General and Administrative Expenses	\$ 6,522
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 8,255</u>

Total Indirect Costs	<u>\$45,657</u>
----------------------	-----------------

### **TOTAL PROJECT COSTS**

**\$100,004**

---

**PROPOSED****State of California  
AIR RESOURCES BOARD**

Resolution 01-18  
April 26, 2001

Agenda Item No.: 01-3-4

**WHEREAS**, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

**WHEREAS**, a research proposal, number 2487-219, entitled "Determination of Elemental Carbon & Organic Carbon Concentrations During the Southern California Children's Health Study, 1999-2001," has been submitted by California Institute of Technology.

**WHEREAS**, the Research Division staff has reviewed and recommended this proposal for approval; and

**WHEREAS**, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2487-219 entitled "Determination of Elemental Carbon & Organic Carbon Concentrations During the Southern California Children's Health Study, 1999-2001," submitted by California Institute of Technology, for a total amount not to exceed \$55,912.

**NOW, THEREFORE BE IT RESOLVED**, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2487-219 entitled "Determination of Elemental Carbon & Organic Carbon Concentrations During the Southern California Children's Health Study, 1999-2001," submitted by California Institute of Technology, for a total amount not to exceed \$55,912.

**BE IT FURTHER RESOLVED**, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$55,912.

## Attachment A

### “Determination of Elemental Carbon & Organic Carbon Concentrations During the Southern California Children’s Health Study, 1999-2001”

#### Background

Part of the effort of “The Epidemiologic Investigation to identify Chronic Health Effects of Ambient Air Pollutants in Southern California” (Children’s Health Study), underway since 1993, is to assess lung development in school-age children exposed to fine particles (C2.5 micrometers in diameter) along with other pollutants. Fine particle mass and ions are measured continuously every 2 weeks at 12 communities in southern California using a special sampler (Two-Week Sampler). Analyses of quartz fiber filters for organic and elemental carbon for the years 1994-1 998 have been completed.

Continuation of these analyses for the years 1999-2001 are important in order to maintain continuity of these data as part of the **PM2.5** data base for the Children’s Health Study. This is especially important since recent findings of health investigators have focused increasing attention on combustion-derived particles as important to human health.

#### Objective

This project will analyze all archived quartz fiber filters from the Children’s Health Study for the years 1999-2001 for their organic and elemental carbon content by using a thermal evolution and combustion procedure.

#### Expected Results

These analyses will result in a database of organic and elemental carbon concentrations. They will fill a gap in knowledge of the components of **PM2.5** mass as measured by the Two-Week Sampler for the Children’s Health Study from 1999-2001.

These results will update the current database, started in 1994, to include data up to 2001.

#### Significance to the Board

Particles in ambient air are known to be harmful to human health. Part of the effort of the Children’s Health Study is to assess the lung growth of school-age children upon exposure to fine-particle (<2.5 micrometers in aerodynamic diameter) mass and ions. The information gained from this project will continue to augment the current database in the area of organic carbon compounds and elemental carbon particles. It will, therefore, be directly applicable to the **ARB’s** mandate to protect the health of California’s citizens, especially those from sensitive subgroups. Information on the sources of **PM2.5**, especially those arising from combustion-derived sources, will allow the **ARB** to identify mitigation strategies to protect the public health in California.

**Contractor:**  
California Institute of Technology

**Contract Period:**  
19 months

**Principal Investigator (PI):**  
Glen R. Cass

**Contract Amount:**  
\$55,912

**Cofunding:**  
None

**Basis for Indirect Cost Rate:**

The indirect cost rate of 56 percent, applied to all non-equipment direct costs and benefits, is a federally approved rate.

**Past Experience with this Principal Investigator:**

Dr. Cass has had many contracts with the ARB involving characterization of ambient atmospheres. His most recent contract, "Determination of the Elemental Carbon, Organic Compounds, and Source Contributions to Atmospheric Particles during the Southern California Children's Health Study," wherein organic and elemental carbon concentrations were measured from 1994-1998, is directly related to the work detailed in the Proposal. Research Division staff are very satisfied with the work done on this contract as well as on previous contracts. His work is excellent and goes beyond the specific tasks outlined in the contracts.

**Prior Research Division Funding to California Institute of Technology:**

Year	2000	1999	1998
Funding	\$0	\$0	\$393,809

## BUDGET SUMMARY

California Institute of Technology

“Determination of Elemental Carbon & Organic Carbon Concentrations During the  
Southern California Children’s Health Study, 1999-2001”

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$29,216	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 0	
5.	Electronic Data Processing	\$ 2,175	
6.	Reproduction/Publication	\$ 2,000	
7.	Mail and Phone	\$ 0	
8.	Supplies	\$ 2,450	
9.	Analyses	\$ - 0	
10.	Miscellaneous	<u>\$ 0</u>	
	Total Direct Costs		\$35,841

### INDIRECT COSTS

1.	Overhead	\$20,071	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	<u>\$ 0</u>	
	Total Indirect Costs		<u>\$20,171</u>

<u>TOTAL PROJECT COSTS</u>	<u>\$55,912</u>
----------------------------	-----------------

---

