SSD

Contractor: U.C. Berkeley
Contract # 07-418

FUNDING FISCAL YEAR	FY 07/08	FY 08/09	FY 09/10	
TERM	06/30/08-05/31/10	06/30/08-05/31/10	06/30/08-05/31/10	
PCA	72480	72480	72480	
LINE ITEM/OBJECT	418.20	418.20	418.20	TOTAL
DESCRIPTION	Multimedia assessment on fuels			
Contract $	$ 100,000.00			$ 100,000.00
				$ -
				$ -
Total, Contract	$ 100,000.00	$ -	$ -	$ 100,000.00

Payments to Contractor:

Inv. #	Inv. Date	Ser Per				C/S
77803 - 75571	3/11/2009		3,308.58		3,308.58	C090183
77803-85510	6/10/2009		7,711.67		7,711.67	C090183
97472	9/14/2009		224.17		224.17	C090195
					-	
Total, Payments			$ 11,244.42	$ -	$ -	11,244.42
Balance Available to Pay Contractor			$ 88,755.58	$ -	$ -	$ 88,755.58
Balance Must Be Spent By:			*6/30/2010*	*6/30/2011*	*6/30/2012*	

Notes:

Contract Manager: Floyd Vergara

29

University of California Berkeley

Accounting Services

Extramural Funds Accounting

RCVD JUN 15 2009

Invoice To:

Air Resources Board
Accounting and Grants
P.O. Box 1436
Sacramento, CA 95812

Date: 6/10/2009

INVOICE NO. 77803 - 85510

Contract/Grant/Agreement/Purchase Order Number: 07-418

PI/Director: McKone, Thomas Edward

Reference:

Project Title Low Carbon Fuels Standard (LCFS) Multimedia Assessment

	Period Billed 3/1/2009 - 5/31/2009	
	Cumulative	*Current*
Salaries & Wages	9,296.82	6,289.02
Employee Benefits	688.38	688.38
Equipment & Facilities	0.00	0.00
Supplies, Materials, & Services	33.21	33.21
Travel	0.00	0.00
Subcontract	0.00	0.00
Indirect Cost	1,001.84	701.06
TOTAL	$11,020.25	7,711.67
Amount Now Due ☞		7,711.67

Refer to invoice # 77803 - 85510
and make check payable to:
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
Extramural Funds Accounting
2195 Hearst Ave RM 130 MC 1103
Berkeley, California 94720-1103

TIN # 94-6002123

It is hereby certified that all expenditures reported (or payment requested) are for appropriate purposes and in accordance with the agreements set forth in the application and award documents.

Mark Roderick

Questions regarding this invoice should be directed to:

Mark Roderick, Award Analyst
Phone: (510) 643-6971 FAX: 510-643-8997
Email: mroderick@berkeley.edu

University of California Berkeley

Accounting Services

Extramural Funds Accounting

RCVD MAR 17 2009

Invoice To:

Air Resources Board
Accounting and Grants
P.O. Box 1436
Sacramento, CA 95812

Date: 3/11/2009

INVOICE NO. 77803 - 75571

Contract/Grant/Agreement/Purchase Order Number: **07-418**

PI/Director: **McKone, Thomas Edward**

Reference:

Project Title **Low Carbon Fuels Standard (LCFS) Multimedia Assessment**

	Period Billed 6/30/2008 - 2/28/2009	
	Cumulative	*Current*
Salaries & Wages	3,007.80	3,007.80
Employee Benefits	0.00	0.00
Equipment & Facilities	0.00	0.00
Supplies, Materials, & Services	0.00	0.00
Travel	0.00	0.00
Subcontract	0.00	0.00
Indirect Cost	300.78	300.78
TOTAL	$3,308.58	3,308.58
Amount Now Due ☞		3,308.58

Refer to invoice # 77803 - 75571
and make check payable to:
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
Extramural Funds Accounting
2195 Hearst Ave RM 130 MC 1103
Berkeley, California 94720-1103

TIN # 94-6002123

It is hereby certified that all expenditures reported (or payment requested) are for appropriate purposes and in accordance with the agreements set forth in the application and award documents.

Mark Roderick

Questions regarding this invoice should be directed to:

Mark Roderick, Award Analyst
Phone: (510) 643-6971 FAX: 510-643-8997
Email: mroderick@berkeley.edu

Ly, Ginh@ARB

From: Clymer, Pam@ARB
Sent: Wednesday, September 23, 2009 1:54 PM
To: Ly, Ginh@ARB
Subject: RE: re: invoices

Hi Gihn,

The attached invoice has been approved for payment.

Pam

From: Ly, Ginh@ARB
Sent: Thursday, September 17, 2009 9:20 AM
To: Clymer, Pam@ARB
Subject: FW: re: invoices

Hi Pam,

Just want to follow up with invoice number 77803-75571 for contract # 07-418 amount of $3,308.58. Can I paid the invoice? Thank you.

Ginh

From: gly [mailto:gly@arb.ca.gov]
Sent: Tuesday, August 25, 2009 8:20 AM
To: Clymer, Pam@ARB
Subject: re: invoices

Hi Pam,

I got couples of the invoices that need you approval for payment. Please see attachment for invoice description. Is it ok to paid for the invoices? Below is the lists of information of the invoices. Please response your approval for payment via email. Thank you.

Vendor Name:	Invoice No.	Amount.
University of Calif. Berkeley	77803- 75571	$3,308.58
University Enterprises Inc	CS031005	25,273.67
Office of Environmental Health Hazard Assessment	08OEH183	32,338.80
Business Advantage	809	59,737.50
Office of Environmental Health Hazard Assessment	08OEH173	27,661.20

Ly, Ginh@ARB

From: Clymer, Pam@ARB
Sent: Wednesday, September 23, 2009 1:50 PM
To: Ly, Ginh@ARB
Subject: RE: re: invoice

Hi Ginh,

The following invoices have been approved for payment.

#77803-85510 $7,711.67
#18880-111200-A01392-ZZ $11,810.15 — in the same schedule.
#83472-1 $595.88

Pam

From: Ly, Ginh@ARB
Sent: Thursday, September 17, 2009 9:26 AM
To: Clymer, Pam@ARB
Subject: FW: re: invoice

Hello again,

Just follow up with these invoices below. Can I paid those invoice? Thank you.

Ginh

From: gly [mailto:gly@arb.ca.gov]
Sent: Friday, August 28, 2009 8:30 AM
To: Clymer, Pam@ARB
Subject: re: invoice

Hi Pam,

Please see attachment for invoices description. Is it ok to paid for the invoices? Please response your approval for payment via email. Thank you.

Vendor Name	contract number	invoice number	invoice date	amount
University of Calif, Davis	07-417	83472-1	04/13/09	$595.88 X
University of Calif, Riverside	07-411	18880-111200-A1392-ZZ	04/14/09	11,810.15 X
University of Calif, Berkeley	07-418	77803 – 85510	6/10/09	7,711.67 X

Ginh Ly
Air Resources Board
Accounting & Grants Section
(916) 445-2179
Fax: (916) 322-9612

Ly, Ginh@ARB

From: gly [gly@arb.ca.gov]
Sent: Tuesday, August 25, 2009 8:20 AM
To: Clymer, Pam@ARB
Subject: re: invoices
Attachments: AR-M550U_20090825_081108.pdf; AR-M550U_20090825_081145.pdf; AR-M550U_20090825_081216.pdf; AR-M550U_20090825_081257.pdf; AR-M550U_20090825_081336.pdf

Hi Pam,

I got couples of the invoices that need you approval for payment. Please see attachment for invoice description. Is it ok to paid for the invoices? Below is the lists of information of the invoices. Please response your approval for payment via email. Thank you.

Vendor Name:	Invoice No.	Amount.
University of Calif. Berkeley	77803- 75571	$3,308.58
University Enterprises Inc	CS031005	25,273.67
Office of Environmental Health Hazard Assessment	08OEH183	32,338.80
Business Advantage	809	59,737.50
Office of Environmental Health Hazard Assessment	08OEH173	27,661.20

University of California Berkeley

Accounting Services

Extramural Funds Accounting

RECD SEP 21 2009

Invoice To:

Air Resources Board
Accounting and Grants
P.O. Box 1436
Sacramento, CA 95812

Date: 9/14/2009

INVOICE NO. 77803 - 97472

Contract/Grant/Agreement/Purchase Order Number: 07-418

PI/Director: McKone, Thomas Edward

Reference:

Project Title Low Carbon Fuels Standard (LCFS) Multimedia Assessment

Approved
[illegible]

	Period Billed 6/1/2009 - 8/31/2009	
	Cumulative	*Current*
Salaries & Wages	9,149.90	-146.92
Employee Benefits	912.09	223.71
Equipment & Facilities	0.00	0.00
Supplies, Materials, & Services	55.51	22.30
Travel	104.70	104.70
Subcontract	0.00	0.00
Indirect Cost	1,022.22	20.38
TOTAL	$11,244.42	224.17

Amount Now Due ☞ 224.17

Refer to invoice # 77803 - 97472
and make check payable to:
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
Extramural Funds Accounting
2195 Hearst Ave RM 130 MC 1103
Berkeley, California 94720-1103

TIN # 94-6002123

It is hereby certified that all expenditures reported (or payment requested) are for appropriate purposes and in accordance with the agreements set forth in the application and award documents.

Mark Roderick

Questions regarding this invoice should be directed to:

Mark Roderick, Award Analyst
Phone: (510) 643-6971 FAX: 510-643-8997
Email: mroderick@berkeley.edu

Harman, Guy@ARB

From: Clymer, Pam@ARB
Sent: Wednesday, September 23, 2009 1:47 PM
To: Harman, Guy@ARB
Subject: RE: Invoice Approvals: UC Berkeley 07-418 #77803-97472, & 08-420 #15346-97208

Hi Guy,

Only invoice #77803-97472 in the amount of $224.17 has been approved for payment.

Pam

-----Original Message-----
From: Harman, Guy@ARB
Sent: Tuesday, September 22, 2009 9:51 AM
To: Clymer, Pam@ARB
Subject: Invoice Approvals: UC Berkeley 07-418 #77803-97472, & 08-420 #15346-97208

Please approve attached invoices by 09/22/09 via e-mail.

Thank you

guy

Guy Harman
Accountant I (Specialist)
California Air Resources Board
Phone (916) 322-9390
Fax (916) 322-9612

-----Original Message-----
From: sharpcopier@arb.ca.gov [mailto:sharpcopier@arb.ca.gov]
Sent: Tuesday, September 22, 2009 9:06 AM
To: Harman, Guy@ARB
Subject: Scanned image from Accounting Sharp Copier 20th Floor

DEVICE NAME: Accounting Sharp Copier 20th Floor
DEVICE MODEL: SHARP AR-M550U
LOCATION: 20th floor-South Side-Center

FILE FORMAT: PDF MMR(G4)
RESOLUTION: 300dpi x 300dpi

Attached file is scanned image in PDF format.
This file can be read by Adobe Acrobat Reader.
The reader can be downloaded from the following URL:

http://www.adobe.com/

STATE OF CALIFORNIA
STANDARD AGREEMENT
STD 213 (Rev 06/03)

OK

AGREEMENT NUMBER
07-418
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and the Contractor named below:

STATE AGENCY'S NAME
Air Resources Board (State)

CONTRACTOR'S NAME
The Regents of the University of California, Berkeley (UC Berkeley, UC, or Contractor)

2. The term of this Agreement is: June 30, 2008 through May 31, 2010

3. The maximum amount of this Agreement is: $100,000.00 One Hundred Thousand Dollars and No Cents

4. The parties agree to comply with the terms and conditions of the following exhibits which are by this reference made a part of the Agreement.

Exhibit A – Scope of Work	1 page
Exhibit A, Attachment 1 - Proposal	6 pages
Exhibit B – Budget Detail and Payment Provisions	2 pages
Exhibit B, Attachment 1 – Detailed Budget	4 pages
Exhibit C* – General Terms and Conditions	GIA 101*
Exhibit D – Special Terms and Conditions	1 page
Exhibit E – Additional Provisions	4 pages
Exhibit F – Contract Report Format Guidelines	6 pages

Items shown with an Asterisk (*), are hereby incorporated by reference and made part of this agreement as if

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*
The Regents of the University of California, Berkeley

BY *(Authorized Signature)* — DATE SIGNED *(Do not type)* 7/30/08

PRINTED NAME AND TITLE OF PERSON SIGNING
Jyl Baldwin, Assistant Director

ADDRESS
2150 Shattuck Avenue, Suite 313, Berkeley, CA 94704

STATE OF CALIFORNIA

AGENCY NAME
Air Resources Board

BY *(Authorized Signature)* — DATE SIGNED *(Do not type)* 11/12/08

PRINTED NAME AND TITLE OF PERSON SIGNING
Socorro Watkins, Chief, Business Management Branch

ADDRESS
P.O. Box 2815, Sacramento, CA 95812

Sharon Simmons
Contract Services Section Manager
Air Resources Board

California Department of General Services Use Only

APPROVED
NOV 25 2008
DEPT OF GENERAL SERVICES

☐ Exempt per:

EXHIBIT A
SCOPE OF WORK

1. The Regents of the University of California, Berkeley (UC, University, or Contractor) agrees to provide the following services for the project entitled "Low Carbon Fuels Standard Multimedia Assessment," which is attached hereto as Attachment 1 and made a part of this Agreement.

2. The project representatives during the term of this agreement will be:

Requesting Agency: ARB		**Providing Agency: Regents of the UC Berkeley**	
Division:	Stationary Source Division	Division:	Sponsored Projects Office
Contact:	Dean Simeroth	Contact:	Dan Jacobs
Address:	1001 I Street, Floor 6 Sacramento, CA 95814	Address:	2150 Shattuck Avenue, Ste. 313 Berkeley, CA 94704
Phone:	(916) 322-6020	Phone:	(510) 643-7365
Fax:	(916) 322-6088	Fax:	(510) 642-8236
Email:	dsimerot@arb.ca.gov	Email:	dan_jackobs@berkeley.edu

The ARB Contract Administrator is: The University's Contract Administrator is:

Requesting Agency: ARB		**Providing Agency: Regents of the UC Berkeley**	
Division:	Administrative Services	Division:	Sponsored Projects Office
Contact:	Sue Bayoneta	Contact:	Jyl Baldwin
Address:	1001 I Street, Floor 20 Sacramento, CA 95814	Address:	2150 Shattuck Ave., Ste. 313 Berkeley, CA 94704
Phone:	(916) 327-8215	Phone:	(510) 642-8117
Fax:	(916) 327-2940	Fax:	(510) 642-2836
Email:	sbayonet@arb.ca.gov	Email:	jbaldwin@berkeley.edu

Sponsored Projects Office
University of California, Berkeley
2150 Shattuck Avenue, Suite 313
Berkeley, CA 94704-5940

Principal Investigator: Thomas McKone
Fellow:
Project Title: Low Carbon Fuels Standard (LCFS) Multimedia Assessment

Please accept the enclosed proposal submitted on behalf of The Regents of the University of California Berkeley campus. Should this proposal be selected for funding, award documents should be issued using the information provided below.

Endorsed for the Regents by:

Jill Baldwin
Assistant Director
Compliance & Special Projects

If you have any questions or need additional information regarding this proposal, please contact:

Dan Jacobs
Principal Research Administrator
Phone: (510) 643-7365
Fax: (510) 642-8236
Email: dan_jacobs@berkeley.edu

AWARDS SHOULD BE MADE TO:	CHECKS SHOULD BE MADE PAYABLE TO:
The Regents of the University of California	**The Regents of the University of California**
c/o Sponsored Projects Office University of California, Berkeley 2150 Shattuck Avenue, Suite 313 Berkeley, CA 94704-5940 email address for electronics awards: spoawards@berkeley.edu Main Office: (510) 642-0120 Fax: (510) 642-8236 Website: http://spo.berkeley.edu	CHECKS SHOULD BE SENT TO: Extramural Funds Accounting Attn: Manager University of California, Berkeley 2195 Hearst Avenue, Room 130 Berkeley, CA 94720-1103 Telephone: 510/642-1371 Fax: 510/643-8997

Low Carbon Fuels Standard (LCFS) Multimedia Assessment

Proposed Scope of Work and Budget
University of California, Berkeley
T.E. McKone, PI, UC Berkeley
Available Budget for UCB: $100,000

Background

The California Environmental Protection Agency has an expanding need to address the health and environmental impacts and benefits of the use of alternatives to fossil fuel in the transportation sector. This need has been brought about by growing consumer interest in "green" alternative fuels. Additionally, there are increasing supplies of these fuels, emerging technologies, and greater political demand to address climate change and energy security.

As required by Section 43830.8 of the California Health and Safety Code, before adopting new fuel specifications, the California Air Resources Board (CARB) must provide a "multimedia assessment" of these new fuels. Many, if not most, alternate fuel formulations meet the requirement to perform a multimedia assessment. CARB, with input from the University of California, has prepared guidelines for performance of "multimedia" evaluations of new fuels. A draft of these guidelines was issued in March 2006, was reviewed by Cal-EPA staff and the California Environmental Policy Council for final approval. The final version of these guidelines titled "Guidance Document and Recommendations on the Types of Scientific Information to be submitted by Applicants for California Fuels Environmental Multimedia Evaluations" was released in February, 2008. We refer to this document here as the MMAG. This document was prepared to assist the California EPA's Multimedia Working Group (MMWG) in making decisions about new fuel specifications.

Among the key findings of this report is that the State of California needs information that will allow an informed decision as to the relative impacts posed by any newly proposed fuel technology to the State's resources, human health and the environment. New fuels or potential additives must be evaluated not only with regard to engine performance and emission requirements, but also with consideration of health and environmental criteria. These evaluations should consider airborne toxics and associated health risks, ozone formation potential, hazardous waste generation and management and surface and groundwater contamination resulting from releases during the production, distribution, and use of the proposed fuel. The MMAG sets out for both the CalEPA and new fuel applicants a set of recommended guidelines regarding how to approach, conduct, and evaluate a multimedia evaluation.

The key elements of the philosophy and approach in these recommendations are (a) flexibility to address factors unique to each fuel type, and (b) a tiered process for consultation and review within a lifecycle context. Consultation and review provides a means for the presentation of information by new fuel proponents and feedback iterations from the MMWG aided by expert consultation and peer review. The tiered structure is designed to accommodate the need to provide defensible information and scientific studies that are comprehensive, flexible enough to

capture issues unique to each fuel, and based on iterative review and consultation. The MMAG defines three tiers that compose the multimedia assessment process:

Tier I. Technical consultation and peer review to establish the impact assessment elements and issues

Tier II. Development and review of an experimental design for future actions and reports

Tier III: Implementation of a final multimedia impact assessment and submission of final report that is peer reviewed and is used as the basis for the Multimedia Working Group recommendations presented to the Environmental Policy Council.

In the near term, the MMWG must evaluate fuels that are entering the market to address issues of both energy security and climate change. Of particular interest are fuels with increasing levels of ethanol (up to 85%) and fuels that meet the California low-carbon fuel standard.

Ethanol is produced by fermenting simple sugars and starches into alcohol. In the US, corn is currently the most commonly used source of the sugars and starches, but research is focusing on the future use of a range of crops (switchgrass, miscanthus, sorgum, wood, etc) and end-product fuels (other alcohols, alkanes, etc). All cars can use ethanol in concentrations up to 10 percent. Flexible fuel vehicles can use concentrations up to 85 percent ethanol, a blend that is called E85. Ethanol reduces the amount of carbon monoxide produced as compared to conventional gasoline. It has been estimate that there are several hundred thousand flex-fuel vehicles in California, but there remains a limited supply of E85 stations due to the cost of transporting E85 from Midwestern ethanol plants.

As sources of ethanol in California increase, we expect to see a growing use of fuels with increasing levels of ethanol. In August, 2006, the California Legislature passed the Global Warming Solutions Act (AB 32), which enacts economy-wide greenhouse gas (GHG) emission reduction goals of about 25% below business as usual by 2020. It authorizes the California Air Resources Board (CARB) to identify "discrete early action measures" that can be put into place by 2010. An Executive Order by Governor Schwarzenegger on January 18, 2007 established the Low Carbon Fuel Standard (LCFS) and set a statewide goal to reduce the carbon intensity of California's transportation fuels at least 10% by 2020. The LCFS is expected to give rise to a number of alternate fuel formulations, in addition to E85, that must be addressed by the MBWG.

~~Here we~~ provide a scope of work to carry out Tiers I through III of the multimedia assessment to address alternative fuels such as E85 and those yet to be specified required to address the LCFS. This work will be carried out by researchers at the University of California collaborating with the staff of the CalEPA and members of the MMWG. In the sections below, we describe the tasks involved in this effort as well as projected timelines for these efforts for the combined UC Berkeley/UC Davis effort. The reason for presenting the budget and timelines in this way is that the scope of work and timeline for Tasks 2 and 3 cannot be accurately characterized without results from the Task 1 (Tier I) report. So, what we provide here are estimates of the FTE and experimental resource costs for our best estimates of the level of effort involved in this task.

Scope of Work

We divide this effort into three tasks. Task 1 is the implementation and documentation of a Tier-I assessment for an alternate fuel such as E85. Task 2 and Task 3 are, respectively, the implementation and documentation of Tier-II and Tier-III assessments for that fuel.

Task 1. Tier I Assessment for the Selected Fuel

The goal of the Tier I review is to develop a mutually-agreed upon Work Plan for the Multimedia Risk Assessment. Tier I begins with a summary report to the Cal-EPA and ends with an agreed upon Work Plan to proceed through the next two Tiers. The UC researchers will prepare for the MMWG a summary of what is known about the properties and hazards of a selected alternate fuel based on extant literature and based on their experience and expertise. The MMWG establishes the key elements and issues of the decision-making process associated with the new fuel. The established key elements and issues are reviewed by the MMWG and/or its designated experts. Included in the report presented to the MMWG are a summary of regulatory approvals, background fuel information, and an outline of information necessary for the impact-assessment-design report to be prepared during Tier II. The goals of the work include the following basic comparative risk assessment and Life Cycle Assessment elements:

1. Physical, chemical and environmental toxicity characteristics of the reference fuel, candidate fuel and additive components,
2. Summary of potential production, distribution, storage, and use release scenarios including a discussion of the most likely release scenarios,
3. Summary of the expected environmental behavior (transport and fate conceptual models associated with release scenarios) of proposed fuel or fuel components that may be released, and
4. Comparison of physical, chemical, and toxic properties of the fuel or additive components to appropriate agreed upon control fuel or fuel components.

The final step in the Tier I process is the development and review of the Tier I Work Plan. The Tier I Work Plan is developed with input and concurrence from the MMWG and focuses on key issues that must be addressed in the later Tiers. UC researchers will propose the Tier I Work Plan elements and justify the proposed approach to the MMWG for approval. This Work Plan serves to define the issues of the Risk Assessment Design that is carried out in Tier II.

The Tier I evaluation will involve reviews of feedstock production, fuel production, conveyance, storage, combustion, and environmental interactions processes. Key inputs for this assessment are resources available in technical and industry literature, websites, and other reporting venues. McKone will lead this effort at UC Berkeley with assistance from the UC collaborators, Rice, Maddalena, and other faculty and staff as needed to identify specific knowledge gaps.

The Berkeley component of this effort will focus on the physical, chemical and environmental toxicity characteristics of the reference fuel, candidate fuel and additive components and the summary of potential production, distribution, storage, and use release scenarios including a discussion of the most likely release scenarios.

Deliverable: Tier I Work Plan (as defined in the MMAG), with updated budget for Tier II
Timeline: 1 March 2008 to 30 June 2008.

Task 2. Tier II Assessment for the Selected Fuel

The next step in the multimedia evaluation process is the development and review of the Tier II Impact Assessment Design. Using the Work Plan developed in Tier I, Tier II comprises further data collection and the development of an Impact Assessment Protocol. The MMAG Tier II activities conclude with the preparation and review of a Multimedia Risk Assessment Protocol report. This section presents summary aspects of the design of models and experiments used to evaluate rates (fate and transport, partitioning to multimedia compartments, bioremediation, exposure, and toxicology) of the governing processes, as well as issues of life cycle design for a comparative impact/risk assessment. This summary design of models and experiments is intended as direction for the filling of knowledge gaps through experimental data collection and modeling calculations.

The experimental design for final impact assessment work is reviewed by the MMWG. Together with the MMWG and associated Agency staff, the UC researchers will define the Impact-Assessment Design elements and justify the proposed approach to the MMWG for approval. If necessary, the Impact-Assessment Design will be finalized consultation with appropriate UC peer reviewers.

The Impact Assessment Design will provide a comparison between a proposed alternate fuel and a baseline fuel (whose properties and life cycle will be defined by ARB). Experimental-design elements address the scope of the risk assessment, and fill any knowledge gaps that are identified in the Tier-I Work Plan including the:

- Role and use of models and surrogate chemicals,
- Approaches used to assess health and environmental impacts where experimental tools are not well defined, and
- Methodology for integrating all media (air, water, soil, etc.) analyses.

Experimental and modeling work as outlined in the experimental design will also be covered within Task 3. In this effort, UC Berkeley will focus on the role and use of models and surrogate chemicals. Field-specific studies will be reviewed and evaluated by McKone and co-workers at UC Berkeley.

Tier II concludes with a Risk Assessment Design report that addresses all the elements identified in the Tier I Work Plan. It will address the knowledge gaps identified during both the Tier I and Tier II efforts and include the results of the experimental and modeling work as outlined in the experimental design. The final product of Tier II is an Impact Assessment Design report that will be approved by the MMWG and, if necessary, in consultation with appropriate UC peer reviewers prior to executing Tier III. The estimated budget and timelines below represent a best estimate based on anticipated activities, tasks, and available funds to complete the Tier II report. Unanticipated activities and tasks that are subsequently identified to complete the Tier II report

would add additional costs to the budget and would need to be negotiated with ARB staff. In the event that additional funds are not available, a Tier II report will be completed based on the available information with a discussion of remaining uncertainties and knowledge gaps that could be addressed with additional funding.

Deliverable: Impact Assessment Design
Timeline: 1 July 2008 to 31 October 2008.

Task 3: Tier III Assessment for the Selected Fuel

In Tier III the products of the Tier II efforts will be used to prepare a final comparative Multimedia Impact Assessment, according to the agreed upon design developed through Tiers I and II. A final Multimedia Impact Assessment report will be prepared and submitted to the MMWG for evaluation and preparation of recommendations to the Environmental Policy Council. Prior to submittal to the Environmental Policy Council, the submitted Final Multimedia Impact Assessment report as well as the MMWG recommendation will undergo independent external expert Tier III Peer Review.

Tier III work will commence upon receipt of review and concordance with the efforts and budget proposed in the Tier I Work Plan and agreed upon in the Tier II Risk Assessment Design. The deliverable Tier III report will involve a critical summary of the results of the Tier I and Tier II activities, in light of the peer review comments received. The critical summary will include discussions of: the basis for selection of the base fuel, the priority release scenarios, the transport and fate, and toxicological/exposure pathway conceptual model hypotheses and assumptions, and resolved any remaining uncertainties and knowledge gaps. In addition to the critical summary, the Tier III report will present the overall findings and conclusions of the comparative multimedia impact assessment, including discussion of impacts to air, water, and general environmental resources, impacts to human health, and waste management issues.

The UC Berkeley team will focus on the priority release scenarios, the exposure pathway conceptual model hypotheses and assumptions, and strategies for confronting uncertainties.

The estimated budget and timelines below represent a best estimate based on anticipated activities, tasks, and available funds to complete the Tier III report. Unanticipated activities and tasks that are subsequently identified to complete the Tier III report would add additional costs to the budget and would need to be negotiated with ARB staff. In the event that additional funds are not available, a Tier III report will be completed based on the available information with a discussion of remaining uncertainties and knowledge gaps that could be addressed with additional funding.

Deliverable: Tier III report
Timeline: 1 November 2008 – 31 January 2009.

EXHIBIT B
BUDGET DETAIL AND PAYMENT PROVISIONS

1. Invoicing

A. For services satisf actorily rendered in accordance with this Agreement and upon receipt and approval of the invoices which properly detail all charges the ARB agrees to compensate the Regents of the University of California, Berkeley for actual expenditures incurred in accordance with the rates specified herein or attached hereto.

B. Invoices shall inclu de the Agreement Number and shall be submitted in triplicate not more frequently than quarterly in arrears to:

Air Resources Board
Accounting Section
P.O. Box 1436
Sacramento, CA 95812

C. BUDGET FLEXIBILITY: Subject to the prior review and approval of the contract manager, line items shifts of up to $25,000 or ten percent of the annual contract total, whichever is less, may be made up to a cumulative maximum of $25,000 or 10%, whichever is less, for all line item shifts over the life of the contract. There must be a substantial business justification for any shifts made. Fund shifts which increase Indirect, Overhead or General Expense line items are prohibited. Line item shifts may be proposed/requested by either the State or the University in writing and must not increase or decrease the total contract amount allocated. Any line item shifts must be approved in writing by the Division Chief of Stationary Source Division or his or her designee, and must be sent to Contracts Section within 10 days of approval for inclusion in contract folder. If the contract is formally amended, any line item shifts agreed to by the parties must be included in the amendment.

2. Budget Contingency Clause

A. It is m utually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, the State shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.

B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the State shall have the option to either cancel this

Agreement with no liability occurring to the State, or offer an agreement amendment to Contractor to reflect the reduced amount.

3. Payment

A. Costs for this Agreement shall be computed in accordance with State Administrative Manual Sections 8752 and 8752.1.

B. Nothing herein contained shall preclude advance payments pursuant to Article 1, Chapter 3, Part 1, Division 3, Title 2 of the Government Code of the State of California.

D. University will be paid for the payment period completed upon receipt, by ARB, of an invoice and progress report satisfying the requirements of this Agreement. The invoice and progress report must be deemed by ARB to reflect reasonable work performed in accordance with the Agreement.

E. The amount to be paid to University under this Agreement includes all sales and use taxes incurred pursuant to this Agreement. University shall not receive additional compensation for reimbursement of such taxes and shall not decrease work to compensate therefore.

California Air Resources Board (CARB)
Project Title: Multimedia Evaluation for E-85 and other fuels
Budget for University of California, Berkeley

	Project Role		Monthly Salary	Period	Appt. (months)	% Effort	COST Salary	COST Benefits	TOTAL
Personnel									
McKone, Thomas	PI		14,278	3/01/08 - 9/30/08	7	7%	6,998	1,189	8,186
		> 5%	14,992	10/01/08 - 6/30/09	9	7%	9,445	1,606	11,051
Maddalena, Randy	Researcher, LBNL		8,241	3/01/08 - 9/30/08	7	9%	5,192	883	6,074
		> 5%	8,653	10/01/08 - 6/30/09	9	9%	7,009	1,192	8,200
To be named	Researcher, LBNL		8,241	3/01/08 - 9/30/08	7	7%	4,038	688	4,725
		> 5%	8,653	10/01/08 - 6/30/09	9	7%	5,451	927	6,378
To be named	Grad Student Researcher		2,912	Summer 2008	3	100%	8,736	262	8,998
		> 2%	2,970	Fall 2009	4.5	50%	6,683	200	6,884
				Fee Remission				5,027	5,027
Smith, Nancy	Project Analyst		4,550	3/01/08 - 9/30/08	7	2.5%	798	175	972
		> 3.5%	4,710	10/01/08 - 6/30/09	9	2.5%	1,060	233	1,293
							55,406	12,380	67,787
				Total Personnel				67,787	67,787
Supplies & Expense	Computer Software							250	250
Travel	Transportation Costs: Meetings at CARB Office (Sacramento) (4 trips, roundtrip from Berkeley, estimated at 80 miles @ $0.505/mile)							162	162
Other Direct Costs	Dave Rice							22,000	22,000
	Communications Costs: Mailing, Phone, Fax							250	250
	Photocopy and Printing							239	239
	GAEL							222	222
								22,711	22,711
				Direct Costs				90,909	90,909
				Indirect Costs @ 10%				9,091	9,091
				Total Costs				100,000	100,000

Alternative Fuels Multimedia Assessment
Budget Justification

Personnel
Thomas E. McKone, Ph.D., Principal Investigator, will work on the project 7%. He will serve as the lead contact between UCB and ARB and be responsible for all programmatic aspects of the project. His expertise is in chemical transport, fate, and kinetics modeling.

Randy Maddalena, Ph.D., Research Scientist (LBNL), will work on the project 9%. He will be responsible for conducting assessments of the environmental behavior (transport and fate conceptual models associated with release scenarios) of proposed fuel or fuel components that may be released to the environment. He will also assess the role and use of models and surrogate chemicals and review and evaluate field-specific studies.

To Be Named, Researcher, will work on the project 7%. He/She will be responsible for helping with reports and evaluations.

To Be Named, Graduate Student Researcher, will work on the project 100% during the summer period, and 50% during the academic year. He/She will be responsible for collecting organizing and evaluating information on the physical, chemical and environmental toxicity characteristics of the reference fuel, candidate fuel and additive components and the summary of potential production, distribution, storage, and use release scenarios.
Full in-state fee remission and health insurance is requested.

Nancy Smith, Project Analyst, will work on the project 2.5%. She will be responsible for coordinating the fiscal management of the project. She will oversee the day-to-day fiscal affairs of the project and consult regularly with the principal investigator on budgetary, fiscal reporting, and financial matters affecting the project.

The salary rates are the standard rates as approved by the University of California, Berkeley. Merit and range adjustments have been calculated into the salary.

Fringe Benefits
According to University guidelines, benefits rates vary by position. Benefit rates are calculated at 17% for academic positions, 22% for staff, and 3% for students. Benefits for academic and staff include medical, dental, vision and life insurance.

Supplies & Expense
Computer Software is budgeted at $250 for the project. We anticipate the cost of expected updates to software necessary to the project.

Travel
Transportation costs are budgeted at $162. Travel for PI and research group to meet with the agency at the CARB Office in Sacramento (4 trips, roundtrip from Berkeley, estimated at 80 miles @ $0.505 per mile).

Other Direct Costs
David Rice. We anticipate a personal contract between the University of California and David Rice. Mr. Rice will play a key role in the project. He will responsible for collecting and evaluating release scenarios for production, distribution, storage, and use of low-carbon fuels

including a discussion of the most likely release scenarios. He will also assess the role and use of models and surrogate chemicals and review and evaluate field-specific studies.

These costs are budgeted at $22,000 for the project.

Communication costs are budgeted at $250 for the project. These costs include the mailing of relevant reports and documents to the funding agency throughout the project, and telephone/fax costs to support communication between the various project participants.

Photocopy and Printing costs are budgeted at $239 for the project. These costs include the photocopying and printing of relevant articles throughout the project and to provide for reproducing the draft and final report.

GAEL Insurance: Per University of California policy, we have included costs for *General, Automobile, and Employment Liability*, a mandatory charge for all non-federal funds. GAEL is computed at 40 cents per $100 of total salary ($55,406 * .0040 = $222)

Indirect Costs
The overhead rate is 10% as per the California Air Resources Board, specified rate.

David W. Rice, Jr.
Environmental Scientist

Dr. Thomas E. McKone
University of California
50 University Hall, #7360
Berkeley California USA
94720-7360

24 March 2008

Dear Dr. McKone,

I am writing this letter of collaboration to affirm that I am willing to engage as a consultant with the University of California Berkeley to work on the proposed effort titled "Low Carbon Fuels Standard (LCFS) Multimedia Assessment" (T.E. McKone, PI). I understand that my role in this project will be to play a key role in preparing and reviewing documents for the California Environmental Protection Agency and that I will also be responsible for collecting and evaluating release scenarios for production, distribution, storage, and use of low-carbon fuels including a discussion of the most likely release scenarios. I will also assess the role and use of models and surrogate chemicals and review and evaluate field-specific studies.

Best Regards,

David W. Rice, Jr.
Environmental Scientist

2808 Superior Drive, Livermore, CA 94550
Phone: 925-443-4389 Email: troutfly3@comcast.net

EXHIBIT D
SPECIAL TERMS AND CONDITIONS

1. **Termination**

   A. This Agreement may be canceled at any time by either party, upon thirty (30) days written notice to the other party.

   B. In the case of early termination, the performing agency will submit an invoice in triplicate and a report in triplicate covering services to termination date, following the invoice and progress report requirements of this Agreement. A copy and description of any data collected up to termination date will also be provided to ARB.

   C. Upon receipt of the invoice, progress report, and data, a final payment will be made to the performing agency. This payment shall be for all ARB-approved, actually incurred costs in accordance with Exhibits A and B, and shall include labor, and materials purchased or utilized (including all non-cancellable commitments) to termination date, and pro rata indirect costs as specified in the proposal budget.

2. **Disputes**

   A. ARB reserves the right to issue an order to stop work in the event that a dispute should arise, or in the event that the ARB gives the performing agency a notice that this Agreement will be terminated. The stop-work order will be in effect until the dispute has been resolved or this Agreement has been terminated.

   B. Any dispute concerning a question of fact arising under the terms of this Agreement which is not disposed of within a reasonable period of time by agency employees normally responsible for the administration of this agreement, shall be brought to the attention of the Executive Officer or designated representative of each agency for joint resolution.

3. **Amendments**

   ARB reserves the right to amend this agreement for additional time and/or additional funding.

EXHIBIT E
ADDITIONAL PROVISIONS

1. **Reports and Data Compilations**

A. ***With respect to each invoice period, University shall forward to the ARB Contract Administrator, one (1) electronic copy of the progress report and mail one (1) copy of the progress report along with each invoice. (Do not use Express Mail). When emailing the progress report, the "subject line" should state the contract number and the billing period. Each progress report will begin with the following disclaimer:***

The statements and conclusions in this report are those of the University and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

B. Each progress report will also include:

1. A brief narrative account of project tasks completed or partially completed since the last progress report;

2. A brief discussion of problems encountered during the reporting period and how they were or are proposed to be resolved;

3. A brief discussion of work planned, by project task, before the next progress report; and

4. A graph or table showing allocation of the budget and amount used to date.

5. A graph or table showing percent of work completion for each task.

C. If the project is behind schedule, the progress report must contain an explanation of reasons and how the University plans to resume the schedule.

D. Six months prior to Agreement termination date, University will deliver to ARB twenty (20) bound copies of a draft final report. The reports may be stapled or spiral bound, depending on size. The draft final report will conform to Exhibit F.

E. Within forty-five (45) days of receipt of ARB's comments on the draft Final Report (Exhibit F), University will deliver to ARB's Contract Manager two (2) copies of the Final Report incorporating all reasonable alterations and additions requested by ARB. Upon approval of the amended final report approved by ARB in accordance to Exhibit F, University will within two (2) weeks, deliver to ARB two (2) camera

ready UNBOUND originals of a Final Report incorporating all final alterations and additions. The final report will conform to the Contract Final Report Format, Exhibit F.

F. Together with the final report, University will deliver a copy of the report on diskette/CD, using any common word processing software (please specify the software used) and a set of all data compilations as specified by the ARB Contract Manager.

G. University's obligation under this Agreement shall be deemed discharged only upon submittal to ARB of an acceptable final report in accordance to Exhibit F, report diskette/CD, all required data compilations, and any other project deliverables.

H. Prior to completion of this Agreement, University shall be entitled to release or make available reports, information, or other data prepared or assembled by it pursuant to this Agreement, in scientific journals and other publications and at scientific meetings, provided however, that a copy of the publication be submitted to ARB for review and comment 45 days prior to such publication. Further, University shall place the disclaimer statement in a conspicuous place on all such reports or publications. Health related reports should include an acknowledgment to the late Dr. Friedman. Nothing in this provision shall be construed to limit the right of State to release information obtained from the University or to publish reports, information, or data in State publications.

2. **Copyrightable Materials**

In recognition of the policy of ARB and University to promote and safeguard free and open inquiry by faculty, students and the members of the public and in furtherance of such policy, both parties agree to the following with respect to rights in data and copyrights under this Agreement:

A. The term "Subject Data" shall mean all original and raw research data, notes, computer programs, writings, sound recordings, pictorial reproductions, drawings or other graphical representations, and works of any similar nature, produced by University in performance of this Agreement, but specifically excluding "Reports," as defined in this Agreement. Subject Data also excludes financial reports, cost analyses, and similar information incidental to contract administration.

B. The term "Reports" shall have the meaning assigned to it in this Exhibit F of this Agreement.

C. Ownership of all Subject Data and copyrights arising from Subject Data shall be vested in University while ownership of all Reports and copyrights arising from the Reports delivered under this Agreement shall be vested in ARB. University agrees to make available to the public for public benefit, to the extent the University shall

have the legal right to do so, without license or fee, any scholarly articles which are published from the Subject Data.

D. Nothing in this exhibit or Agreement shall be construed to limit the right of University faculty, students or staff to publish the Subject Data in the form of scholarly articles in academic journals nor to affect, abrogate or limit the right of University faculty, staff or students to make use of the Subject Data.

3. Travel & Per Diem

A. Any reimbursement for necessary travel and per diem shall be at the University's approved travel rates.

B. No foreign travel shall be reimbursed unless prior written authorization is obtained from ARB.

4. Meetings

A. Initial meeting. Before work on the contract begins, the Principal Investigator and key personnel will meet with the ARB Contract Manager and other staff to discuss the overall plan, details of performing the tasks, the project schedule, items related to personnel or changes in personnel, and any issues that may need to be resolved before work can begin.

B. Progress review meetings. The Principal Investigator and appropriate members of his or her staff will meet with ARB's Contract Manager at quarterly intervals to discuss the progress of the project. This meeting may be conducted by phone.

C. Technical Seminar. The Contractor will present the results of the project to ARB staff and a possible webcast at a seminar at ARB facilities in Sacramento or El Monte.

5. Confidentiality

A. It is understood that in the course of carrying out this Agreement, State may wish to provide University with proprietary or confidential information of State (Proprietary Information). University agrees to use its best efforts to hold proprietary information in confidence and shall return it to State upon the completion of the project.

B. This obligation shall apply only to proprietary information that is designated or identified as such in writing by State prior to the disclosure thereof. All proprietary information shall be sent only to the Principal Investigator. Moreover, this obligation shall not apply to any proprietary information which: a) is or becomes

publicly known through no wrongful or negligent act on the part of University; b) is already known to University at the time of disclosure; c) independently developed by University without breach of this agreement; or d) is generally disclosed to third parties by State without similar restrictions on such third parties.

EXHIBIT F

RESEARCH FINAL REPORT FORMAT

The research contract Final Report (Report) is as important to the contract as the research itself. The Report is a record of the project and its results, and is used in several ways. Therefore, the Report must be well organized and contain certain specific information. ARB's Research Screening Committee (RSC) reviews all draft Final Reports, paying special attention to the Abstract and Executive Summary. If the RSC finds that the Report does not fulfill the requirements stated in this Appendix, the document will not be approved for release, and final payment for the work completed may be withheld. This Appendix outlines the requirements that must be met when producing the Report.

Note: In partial fulfillment of the Final Report requirements, the Contractor shall submit a copy of the Report on a CD in PDF format and in a word-processing format, preferably in Word - Version 6.0 or later. This is in addition to the submission of any paper copies required. The diskette shall be clearly labeled with the contract title, ARB contract number, the words "Final Report", and the date the report was submitted.

Legibility. Each page of the approved Final Report must be legible and camera-ready.

Binding. The draft Report, including its appendices, must be either spiral bound or stapled, depending on size. The revised Report and its appendices should be spiral bound, except for two unbound, camera-ready originals.

Cover. Do not supply a cover for the Report. ARB will provide its standard cover.

One-sided vs. two-sided. To conserve paper, both the draft Report and the revised Report, except for the unbound camera-ready copies, should be printed on both sides of the page. The unbound camera-ready copies must be printed on only one side of the page.

Title. The title of the Report should exactly duplicate the title of the contract unless a change is approved in writing by the contract manager.

Spacing. In order to conserve paper, copying costs, and postage, please use single or one-line (1) spacing.

Page size. All pages should be of standard size (8 ½" x 11") to allow for photo-reproduction.

Large tables or figures. Foldout or photo-reduced tables or figures are not acceptable because they cannot be readily reproduced. Large tables and figures should be presented on consecutive 8 ½" x 11" pages, each page containing one portion of the larger chart.

Color. Color presentations are not acceptable; printing shall be black on white only.

Corporate identification. Do not include corporate identification on any page of the Final Report, except the title page.

Unit notation. Measurements in the Reports should be expressed in metric units. However, for the convenience of engineers and other scientists accustomed to using the British system, values may be given in British units as well in parentheses after the value in metric units. The expression of measurements in both systems is especially encouraged for engineering reports.

Section order. The Report should contain the following sections, in the order listed below:

Title page
Disclaimer
Acknowledgment (1)
Acknowledgment (2)
Table of Contents
List of Figures
List of Tables
Abstract
Executive Summary
Body of Report
References
List of inventions reported and copyrighted materials produced
Glossary of Terms, Abbreviations, and Symbols
Appendices

Page numbering. Beginning with the body of the Report, pages shall be numbered consecutively beginning with "1", including all appendices and attachments. Pages preceding the body of the Report shall be numbered consecutively, in ascending order, with small Roman numerals.

Title page. The title page should include, at a minimum, the contract number, contract title, name of the principal investigator, contractor organization, date, and this statement: "Prepared for the California Air Resources Board and the California Environmental Protection Agency"

Disclaimer. A page dedicated to this statement must follow the Title Page:

The statements and conclusions in this Report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

Acknowledgment (1). Only this section should contain acknowledgments of key personnel and organizations who were associated with the project. The last paragraph of the acknowledgments must read as follows:

This Report was submitted in fulfillment of [ARB contract number and project title] by [contractor organization] under the [partial] sponsorship of the California Air Resources Board. Work was completed as of [date].

Acknowledgment (2). Health reports should include an acknowledgment to the late Dr. Friedman. Reports should include the following paragraph:

This project is funded under the ARB's Dr. William F. Friedman Health Research Program. During Dr. Friedman's tenure on the Board, he played a major role in guiding ARB's health research program. His commitment to the citizens of California was evident through his personal and professional interest in the Board's health research, especially in studies related to children's health. The Board is sincerely grateful for all of Dr. Friedman's personal and professional contributions to the State of California.

Table of Contents. This should list all the sections, chapters, and appendices, together with their page numbers. Check for completeness and correct reference to pages in the Report.

List of Figures. This list is optional if there are fewer than five illustrations.

List of Tables. This list is optional if there are fewer than five tables.

Abstract. The abstract should tell the reader, in nontechnical terms, the purpose and scope of the work undertaken, describe the work performed, and present the results obtained and conclusions. The purpose of the abstract is to provide the reader with useful information and a means of determining whether the complete document should be obtained for study. The length of the abstract should be no more than about 200 words. Only those concepts that are addressed in the executive summary should be included in the abstract.

Example of an abstract:

A recently developed ground-based instrument, employing light detecting and ranging (lidar) technology, was evaluated and found to accurately measure ozone concentrations at altitudes of up to 3,000 meters. The novel approach used in this study provides true vertical distributions of ozone concentrations aloft and better temporal coverage of these distributions than other, more common methods, such as those using aircraft and ozonesonde (balloon) techniques. The ozone and aerosol measurements from this study, in conjunction with temperature and wind measurements, will provide a better characterization of atmospheric conditions aloft and the processes involved in the formation of unhealthful ozone concentrations than can be achieved with traditional ground-based monitors.

Executive Summary. The function of the executive summary is to inform the reader about the important aspects of the work that was done, permitting the reader to understand the

research without reading the entire Report. It should state the objectives of the research and briefly describe the experimental methodology[ies] used, results, conclusions, and recommendations for further study. All of the concepts brought out in the abstract should be expanded upon in the Executive Summary. Conversely, the Executive Summary should not contain concepts that are not expanded upon in the body of the Report.

The Executive Summary will be used in several applications as written; therefore, please observe the style considerations discussed below.

Limit the Executive Summary to two pages, single spaced.

Use narrative form. Use a style and vocabulary level comparable to that in Scientific American or the New York Times.

Do not list contract tasks in lieu of discussing the methodology.

Discuss the results rather than listing them.

Avoid jargon.

Define technical terms.

Use passive voice if active voice is awkward.

Avoid the temptation to lump separate topics together in one sentence to cut down on length.

The Executive Summary should contain four sections: Background, Methods, Results, and Conclusions, described below:

THE BACKGROUND SECTION. For the Background, provide a one-paragraph discussion of the reasons the research was needed. Relate the research to the Board's regulatory functions, such as establishing ambient air quality standards for the protection of human health, crops, and ecosystems; the improvement and updating of emissions inventories; and the development of air pollution control strategies.

THE METHODS SECTION. At the beginning of the Methods section, state what was done in general, in one or two sentences.

The methodology should be described in general, nontechnical terms, unless the purpose of the research was to develop a new methodology or demonstrate a new apparatus or technique. Even in those cases, technical aspects of the methodology should be kept to the minimum necessary for understanding the project. Use terminology with which the reader is likely to be familiar. If it is necessary to use

technical terms, define them. Details, such as names of manufacturers and statistical analysis techniques, should be omitted.

Specify when and where the study was performed, if it is important in interpreting the results.

The findings should not be mentioned in the Methods section.

THE RESULTS SECTION. The Results section should be a single paragraph in which the main findings are cited and their significance briefly discussed. The results should be presented as a narrative, not a list. This section must include a discussion of the implications of the work for the Board's relevant regulatory programs.

THE CONCLUSIONS SECTION. The Conclusions section should be a single short paragraph in which the results are related to the background, objectives, and methods. Again, this should be presented as a narrative rather than a list. Include a short discussion of recommendations for further study, adhering to the guidelines for the Recommendations section in the body of the Report.

Body of Report. The body of the Report should contain the details of the research, divided into the following sections:

Introduction. Clearly identify the scope and purpose of the project. Provide a general background of the project. Explicitly state the assumptions of the study.

Clearly describe the hypothesis or problem the research was designed to address. Discuss previous related work and provide a brief review of the relevant literature on the topic.

Materials and Methods. Describe the various phases of the project, the theoretical approach to the solution of the problem being addressed, and limitations to the work. Describe the design and construction phases of the project, materials, equipment, instrumentation, and methodology. Describe quality assurance and quality control procedures used. Describe the experimental or evaluation phase of the project

Results. Present the results in an orderly and coherent sequence. Describe statistical procedures used and their assumptions. Discuss information presented in tables, figures and graphs. The titles and heading of tables, graphs, and figures, should be understandable without reference to the text. Include all necessary explanatory footnotes. Clearly indicate the measurement units used.

Discussion. Interpret the data in the context of the original hypothesis or problem. Does the data support the hypothesis or provide solutions to the research problem? If appropriate, discuss how the results compare to data from similar or related studies. What are the implications of the findings? Identify innovations or development of new techniques or processes. If appropriate, discuss cost projections and economic analyses.

Summary and Conclusions. This is the most important part of the Report because it is the section that will probably be read most frequently. This section should begin with a clear, concise statement of what, why, and how the project was done. Major results and

conclusions of the study should then be presented, using clear, concise statements. Make sure the conclusions reached are fully supported by the results of the study. Do not overstate or overinterpret the results. It may be useful to itemize primary results and conclusions. A simple table or graph may be used to illustrate.

Recommendations. Use clear, concise statements to recommend (if appropriate) future research that is a reasonable progression of the study and can be supported by the results and discussion.

References. Use a consistent style to fully cite work referenced throughout the Report and references to closely related work, background material, and publications that offer additional information on aspects of the work. Please list these together in a separate section, following the body of the Report. If the Report is lengthy, you may list the references at the end of each chapter.

List of inventions reported and publications produced. If any inventions have been reported, or publications or pending publications have been produced as a result of the project, the titles, authors, journals or magazines, and identifying numbers that will assist in locating such information should be included in this section.

Glossary of terms, abbreviations, and symbols. When more than five of these items are used in the text of the Report, prepare a complete listing with explanations and definitions. It is expected that every abbreviation and symbol will be written out at its first appearance in the Report, with the abbreviation or symbol following in parentheses [i.e., carbon dioxide (CO_2)]. Symbols listed in table and figure legends need not be listed in the Glossary.

Appendices. Related or additional material that is too bulky or detailed to include within the discussion portion of the Report shall be placed in appendices. If a Report has only one appendix, it should be entitled "APPENDIX". If a Report has more than one appendix, each should be designated with a capital letter (APPENDIX A, APPENDIX B). If the appendices are too large for inclusion in the Report, they should be collated, following the binding requirements for the Report, as a separate document. The contract manager will determine whether appendices are to be included in the Report or treated separately. Page numbers of appendices included in the Report should continue the page numbering of the Report body. Pages of separated appendices should be numbered consecutively, beginning at "1".