

**Stationary Source Division**

**Contractor: University of California, Davis  
Contract # 07-404**

FUNDING FISCAL YEAR	FY 07/08	FY 08/09	FY 09/10	
TERM	10/01/07-12/31/09	10/01/07-12/31/09	10/01/07-12/31/09	
PCA	72480	72480	72480	
LINE ITEM/OBJECT	418.20	418.20	418.20	TOTAL
DESCRIPTION	Prep & assist in 2 phase study			

Contract \$	\$ 28,199.00	\$ 50,000.00	21,801.00	\$ 100,000.00
Rebudget memo per SSD (4/16/08)	\$ 71,801.00	\$ (50,000.00)	(21,801.00)	\$
				\$

<b>Total, Contract</b>	<b>\$ 100,000.00</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 100,000.00</b>
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Payments to Contractor:

Inv. #	Inv. Date	Ser Per		C/S
83361-1	2/4/2009		8,539.87	8,539.87 C080545 ✓
83361-2	2/4/2009		8,470.82	8,470.82 C080545 ✓
83361-4	7/15/2009		2,854.45	2,854.45 C090061 ✓
83361-3	4/13/2009	1/1 - 3/31/09	1,768.59	1,768.59 C090183 ✓
83361-5	10/12/2009	7/1 - 9/30/09	29,214.78	29,214.78 C090277 ✓

<b>Total, Payments</b>	<b>\$ 50,848.51</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 50,848.51</b>
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<b>Balance Available to Pay Contractor</b>	<b>\$ 49,151.49</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 49,151.49</b>
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Balance Must Be Spent By: 6/30/2010 6/30/2011 6/30/2012

**Notes:**  
Contract Manager: John Curtis

23

C080545

UNIVERSITY OF CALIFORNIA, DAVIS  
Accounting & Financial Services Office  
Extramural Accounting

Please include the following  
claim number on your  
remittance advice:  
**Claim No. XZ14216**

**CONTRACTOR'S INVOICE**

INVOICE TO

AIR RESOURCES BOARD  
P.O. BOX 1436  
SACRAMENTO, CA 95812-1436  
ATTN: ACCOUNTING SECTION

Invoice Number: **83361-1**  
Date: February 04, 2009  
Amount: **\$8,539.87**

Direct questions regarding this invoice to Amy Joy at (530) 757-8526 or aejoy@ucdavis.edu

Federal Employer ID # 94-6036494	Period Billed	
Contract/Grant/Agreement/Purchase Order #07-404	From 07/01/08	To 07/31/08

Project Title: CA low carbon fuel standard  
PI /Director: Sonia Yeh  
Department: Institute for Transportation Studies

Description of Services

PER TERMS OF INTERAGENCY AGREEMENT

RCVD FEB 10 2009

Salaries	\$5,820.02
Benefits	\$1,927.78
Supplies & Expenses	\$15.72
Travel	\$0.00
Indirect Costs @ 10%	\$776.35

*Approval  
attached*

Please 000  
Remark 0-000

**PAY THIS AMOUNT>>>>>** **\$8,539.87**

8,539.87 +  
8,470.82 +  
002  
17,010.696

*Kathleen Hass*  
Kathleen Hass/aej, Extramural Funds Division Manager

Make Check  
The Regent  
Cashier's Office  
P.O. Box 98  
West Sacramento, CA 95798-9062

In the best of my knowledge and belief this report is correct and complete, and all outlays  
for the purposes set forth in the award documents.

CO80545

UNIVERSITY OF CALIFORNIA, DAVIS  
Accounting & Financial Services Office  
Extramural Accounting

Please include the following  
claim number on your  
remittance advice:  
**Claim No. XZ14220**

**CONTRACTOR'S INVOICE**

INVOICE TO

AIR RESOURCES BOARD  
P.O. BOX 1436  
SACRAMENTO, CA 95812-1436  
ATTN: ACCOUNTING SECTION

Invoice Number: **83361-2**  
Date: **February 04, 2009**  
Amount: **\$8,470.82**

Direct questions regarding this invoice to Amy Joy at (530) 757-8526 or aejoy@ucdavis.edu

Federal Employer ID # 94-6036494	Period Billed	
Contract/Grant/Agreement/Purchase Order #07-404	From 10/27/08	To 12/31/08

Project Title: CA low carbon fuel standard  
PI /Director: Sonia Yeh  
Department: Institute for Transportation Studies

Description of Services

PER TERMS OF INTERAGENCY AGREEMENT

RCVD FEB 10 2009

Salaries	\$3,879.37
Benefits	\$1,086.94
Supplies & Expenses	\$10.85
Travel	\$2,723.54
Indirect Costs @ 10%	\$770.12

*Approval*  
*attached*

Please Return Invoice Copy with Check

**PAY THIS AMOUNT >>>>>**

**\$8,470.82**

Remarks:

**OUTSTANDING INVOICES:**

*James Ringo*  
*Kathleen Hass*

Kathleen Hass/aej, Extramural Funds Division Manager.

Make Check Payable and Remit To:  
The Regents of The University of California  
Cashier's Office  
P.O. Box 989062  
West Sacramento, CA 95798-9062

To the best of my knowledge and belief this report is correct and complete, and all outlays are for the purposes set forth in the award documents.

UNIVERSITY OF CALIFORNIA, DAVIS  
Accounting & Financial Services Office  
Extramural Accounting

Please include the following  
claim number on your  
remittance advice  
**Claim No. X23193**

**CONTRACTOR'S INVOICE**

INVOICE TO

AIR RESOURCES BOARD  
P.O. BOX 1436  
SACRAMENTO, CA 95812-1436  
ATTN: ACCOUNTING SECTION

Invoice Number: **83361-4**  
Date: **July 15, 2009**  
Amount: **\$2,854.45**

Direct questions regarding this invoice to Sheila Lame' at (530) 754-9532 or [slame@ucdavis.edu](mailto:slame@ucdavis.edu)

Federal Employer ID # 94-6036494

Contract/Grant/Agreement/Purchase Order #07-404

Period Billed

From  
04/01/09

To  
06/30/09

Project Title: CA low carbon fuel standard  
PI /Director: Sonia Yeh  
Department: Institute for Transportation Studies

Description of Services

PER TERMS OF INTERAGENCY AGREEMENT

RECD JUL 20 2009

Salaries	\$1,836.53
Benefits	\$753.28
Supplies & Expenses	\$5.13
Travel	\$0.00
Indirect Costs @ 10%	\$259.51

This invoice has been checked against our records and found to be the original claim presented for payment, and payment has not been previously made. We have recorded this payment to prevent a duplicate payment later.

*Approval*  
*W. Schaefer*

*W*  
Accounting Officer

Please Return Invoice Copy with Check

**PAY THIS AMOUNT>>>>>**

**\$2,854.45**

Remarks:

OUTSTANDING INVOICES:

83361-3 \$1,768.59 (04/13/09)

*James Remy*  
for Kathleen Hass/sml, Extramural Funds Division Manager

Make Check Payable and Remit To:  
The Regents of The University of California  
Cashier's Office  
P.O. Box 989062  
West Sacramento, CA 95798-9062

To the best of my knowledge and belief this report is correct and complete, and all outlays are for the purposes set forth in the award documents.

Harman, Guy@ARB

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**From:** Clymer, Pam@ARB  
**Sent:** Thursday, July 30, 2009 9:44 AM  
**To:** Harman, Guy@ARB  
**Subject:** RE: Invoice Approval: 07-404 #83361-4

Hi Guy,

This invoice has been approved for payment.

Thank you.

Pam

-----Original Message-----

**From:** Harman, Guy@ARB  
**Sent:** Thursday, July 23, 2009 1:16 PM  
**To:** Clymer, Pam@ARB  
**Subject:** Invoice Approval: 07-404 #83361-4

See attached invoice.

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:** Thursday, July 23, 2009 12:49 PM  
**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/>

**UNIVERSITY OF CALIFORNIA, DAVIS**  
Accounting & Financial Services Office  
Extramural Accounting

Please include the following  
claim number on your  
remittance advice:  
**Claim No. X23020**

**CONTRACTOR'S INVOICE**

**INVOICE TO**

**AIR RESOURCES BOARD  
P.O. BOX 1436  
SACRAMENTO, CA 95812-1436  
ATTN: ACCOUNTING SECTION**

Invoice Number: **83361-3**  
Date: **April 13, 2009**  
Amount: **\$1,768.59**

2009 APR 13 2009

Direct questions regarding this invoice to **Sheila Lame'** at (530) 754-9532 or [slame@ucdavis.edu](mailto:slame@ucdavis.edu)

Federal Employer ID # 94-6036494	Period Billed	
Contract/Grant/Agreement/Purchase Order #07-404	From 01/01/09	To 03/31/09

Project Title: **CA low carbon fuel standard**  
PI /Director: **Sonia Yeh**  
Department: **Institute for Transportation Studies**

Description of Services

**PER TERMS OF INTERAGENCY AGREEMENT**

Salaries		40
Benefits		1,768.59 + .45
		595.88 +
Supplies & Expenses	002	2,364.47 *
Travel		.00
Indirect Costs @ 10%		\$160.81

Please Return Invoice Copy with Check

**PAY THIS AMOUNT >>>>>**

**\$1,768.59**

Remarks:  
**OUTSTANDING INVOICES:**

*James Ringo*  
for Kathleen Hass/sml, Extramural Funds Division Manager

Make Check Payable and Remit To:  
The Regents of The University of California  
Cashier's Office  
P.O. Box 989062  
West Sacramento, CA 95798-9062

To the best of my knowledge and belief this report is correct and complete, and all outlays are for the purposes set forth in the award documents.

**Ly, Ginh@ARB**

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**From:** Clymer, Pam@ARB  
**Sent:** Wednesday, September 23, 2009 1:52 PM  
**To:** Ly, Ginh@ARB  
**Subject:** RE: invoice from University of Calif, Davis/ 07-404

Hi Ginh,

The attached invoice #83361-3 \$1,768.59 has been approved for payment.

Pam

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**From:** Ly, Ginh@ARB  
**Sent:** Thursday, September 17, 2009 9:33 AM  
**To:** Clymer, Pam@ARB  
**Subject:** re: invoice from University of Calif, Davis/ 07-404

Hi Pam.

Please see attachment for invoice description. Is it ok to paid for invoice number 83361-3 amount of \$1,768.59 for University of Calif, Davis contract # 07-404? Please response your approval for payment via email. Thank you.

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

**UNIVERSITY OF CALIFORNIA, DAVIS**  
 Accounting & Financial Services Office  
 Extramural Accounting

Please include the following  
 claim number on your  
 remittance advice  
**Claim No. XA00235**

**CONTRACTOR'S INVOICE**

**INVOICE TO**

**AIR RESOURCES BOARD**  
 P.O. BOX 1436  
 SACRAMENTO, CA 95812-1436  
 ATTN: ACCOUNTING SECTION

Invoice Number: **83361-5**  
 Date: **October 12, 2009**  
 Amount: **\$29,214.78**

Direct questions regarding this invoice to **Sheila Lame' at (530) 754-9532 or sllame@ucdavis.edu**

Federal Employer ID # 94-6036494

Period Billed

Contract/Grant/Agreement/Purchase Order **#07-404**

From  
**07/01/09**

To  
**09/30/09**

Project Title: **CA low carbon fuel standard**  
 PI /Director: **Sonia Yeh**  
 Department: **Institute for Transportation Studies**

Description of Services

PER TERMS OF INTERAGENCY AGREEMENT

Salaries	29,214.78 +
Benefits	37,118.32 +
Supplies & Expenses	0.02
Travel	66,333.10 *
Indirect Costs @ 10%	2,655.94

*Approval  
 Attention*

Please Return Invoice Copy with Check

**PAY THIS AMOUNT>>>>>**

**\$29,214.78**

Remarks:  
**OUTSTANDING INVOICES:**

*James Ringo*  
 for Kathleen Hass/sml, Extramural Funds Division Manager

Make Check Payable and Remit To:  
 The Regents of The University of California  
 Cashier's Office  
 P.O. Box 989062  
 West Sacramento, CA 95798-9062

To the best of my knowledge and belief this report is correct and complete, and all outlays are for the purposes set forth in the award documents.

SL1012091

Harman, Guy@ARB

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From: Clymer, Pam@ARB  
Sent: Friday, October 23, 2009 7:36 AM  
To: Harman, Guy@ARB  
Subject: RE: Invoice Approvals: UC Davis 07-404 #83361-5, & 07-417 #83472-3

ok ok

Good morning Guy,

The attached invoice has been approved for payment.

Thank you.

Pam

-----Original Message-----

From: Harman, Guy@ARB  
Sent: Monday, October 19, 2009 11:19 AM  
To: Clymer, Pam@ARB  
Subject: Invoice Approvals: UC Davis 07-404 #83361-5, & 07-417 #83472-3

Please approve attached invoices by 10/23/09 via e-mail.

Thanks

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: Monday, October 19, 2009 11:08 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)

AGREEMENT NUMBER <b>07-404</b>
REGISTRATION NUMBER <b>39000508306949</b>

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

STATE AGENCY'S NAME

**Air Resources Board (ARB or State)**

CONTRACTOR'S NAME

**The Regents of the University of California, Davis (UCD, University, or Contractor)**

2. The term of this Agreement is: **March 15, 2007 or Upon DGS Approval** through **December 30, 2009**

3. The maximum amount of this Agreement is: **\$ 100,000**  
**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	4 pages
Exhibit B – Budget Detail and Payment Provisions	2 pages
Exhibit B - Attachment 1	2 pages
Exhibit C* – General Terms and Conditions	GIA101
Check mark one item below as Exhibit D:	
<input checked="" type="checkbox"/> Exhibit - D Special Terms and Conditions (Attached hereto as part of this agreement)	1 page
<input type="checkbox"/> Exhibit - D* Special Terms and Conditions	
Exhibit E – Additional Provisions	3 pages
Exhibit F – Research Final Report Format	5 pages

Items shown with an Asterisk (\*), are hereby incorporated by reference and made part of this agreement as if attached hereto.  
 These documents can be viewed at [www.ols.dgs.ca.gov/Standard+Language](http://www.ols.dgs.ca.gov/Standard+Language)

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, Davis**

BY (Authorized Signature)

DATE SIGNED (Do not type)

*[Signature]*

**APR 03 2008**

PRINTED NAME AND TITLE OF PERSON SIGNING

**Ahmad Hakim-Elahi, Ph.D., J.D., Director of Sponsored Programs**

ADDRESS

**Sponsored Programs, 1850 Research Park, Suite 300  
 Davis, CA 95618**

**STATE OF CALIFORNIA**

AGENCY NAME

**Air Resources Board**

BY (Authorized Signature)

DATE SIGNED (Do not type)

*[Signature]*

**04.24.08**

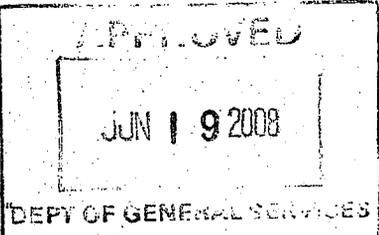
PRINTED NAME AND TITLE OF PERSON SIGNING

**Socorro Watkins, Chief, Business Management Branch**

ADDRESS

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

California Department of General Services Use Only



*[Signature]*

## EXHIBIT A Interagency Agreement

### SCOPE OF WORK

#### 1. Background

The California Global Warming Solutions Act of 2006 (The Act), also known as Assembly Bill 32, establishes a comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reduction of greenhouse gases (GHG). AB 32 charges the Air Resources Board (ARB or the Board) as the agency responsible for monitoring and reducing GHG emissions to 1990 levels by 2020 and requires ARB to adopt a plan by January 1, 2009 to indicate how emissions reductions will be achieved from significant GHG sources via regulation, market mechanisms and other actions. The Board has until January 1, 2011 to adopt the necessary regulations to implement that plan. Implementation begins no later than January 1, 2012 and the emissions reduction target must be fully achieved by January 1, 2020.

The Act recognizes that such an ambitious effort requires careful planning and a comprehensive strategy. Along with a deliberate approach, AB 32 recognizes that immediate progress in reducing GHG emissions can and should be made. Accordingly, the Act requires ARB to identify a list of "discrete early action greenhouse gas reduction measures". Once on the list, these measures are to be developed into regulatory proposals, adopted by the Board, and made enforceable by January 1, 2010.

At the Board's June 21, 2007 hearing, the Board reviewed and approved the Low Carbon Fuel Standard (LCFS), recommended by the Governor's Executive Order S-01-07 (see Attachment 2), as one of the early action items to be developed into a regulatory proposal. The LCFS creates a state-wide goal of reducing the carbon intensity of California's transportation fuel by 10 percent by 2020 and applies to all fuel providers, including refiners, blenders, producers and importers.

To develop the LCFS, both technical and policy issues need to be addressed. For instance, staff is required to evaluate several factors, including but not limited to: impacts on California's economy, the environment, public health, equity between regulated entities, electricity reliability, conformance with other environmental laws, and to ensure that the rules do not negatively impact low income communities. Additionally, fuel lifecycle analysis, as one of the central tools of LCFS, must be inclusive of environmental impact estimates based on the entire life cycle of the products including land use, sustainability, and production of feedstock.

The University of California has prepared a two-phase study to assess both the low-carbon fuels options that might be used to meet the LCFS and to examine the specific policy issues to meet this goal. The University of California Report on Low Carbon Fuel Standard for California (UC Report) identified several major areas of incompleteness and uncertainty including: land use, climate impacts of emission, treatment of market-mediated effects, and limited data quality.

The purpose of this work is to provide the ARB Stationary Source Division technical and advisory support in the effort to develop and implement California's Low Carbon Fuel Standard. This work is divided into the major projects listed below. Each is lead by the researcher identified and addresses the current issues with the development of LCFS, LCFS implementation, or providing additional studies on identified areas of uncertainty. The UC will also provide responses to specific issues that may emerge in the LCFS development process, prepare white papers in areas identified below and assist in coordinating between government and non-government agencies. Dr. Sonia Yeh from the University of California, Davis will serve as the principal investigator and be responsible for overall project management and communication with ARB staff.

## EXHIBIT A Interagency Agreement

### 2. Tasks and Deliverables

#### *Task 1. Provide advisory support to ARB on lifecycle analysis Improvement and tool development*

During the development of the LCFS, lifecycle analysis (LCA) will play a major role in determining the carbon intensity of various transportation fuels. The Lifecycle Emissions Model (LEM), developed by Dr. Delucchi at UC Davis, will be provided to ARB staff as a tool to compute the lifecycle global warming intensity (GWI) of the transportation fuels and compare them with estimates from the modified GREET model that is adopted by the ARB. This project will focus on addressing the technical issues associated with lifecycle model development. Researchers will provide advisory support to ARB staff and review the methodology in modifying existing LCA methods for use in developing the LCFS. In addition to LCA, white papers that summarize UCD research related to the bigger issues pertinent to the Life Cycle Analysis Working Group will be provided to the ARB. The topics may include, but not limited to, biofuel production potentials and supply curves in the Western States and in the U.S., potential environmental and water impacts due to the implementation of the LCFS in California; sensitivity and uncertainty analysis of LEM; sustainability impacts of LCFS. The list of white papers prepared under this task will be decided collectively by ARB and UCD.

*Deliverable:* LCFS lifecycle advisory support and white papers addressing issues pertinent to Life Cycle Analysis Working Group.

*Researchers:* Dr. Mark Delucchi, Dr. Alissa Kendall, Dr. Bryan Jenkins, and Dr. Sonia Yeh

#### *List of White Paper Topics (Preliminary):*

##### *GHG emissions from cultivation, fertilizer use, and land-use change in the lifecycle of biofuels (Mark Delucchi and Andy Jones)*

The production of biomass to make biofuels (such as corn-ethanol) involves the use of fertilizer, the cultivation of land, and even changes in the types of land uses, as increased production of biofuel feedstocks pushes agricultural production onto uncultivated lands. Our preliminary analyses indicate that these effects -- which are omitted or treated poorly in the major published LCAs -- may be quite important, accounting for more than 25 percent of total lifecycle CO<sub>2</sub>-equivalent greenhouse-gas (GHG) emissions. We propose to perform a detailed examination of these poorly characterized but potentially quite important sources of GHG emissions in biofuel lifecycles. Our efforts will focus on a developing a comprehensive characterization of the nitrogen (N) cycle in biofuel systems (because the flows and fate of N have significant direct and indirect effects on climate), understanding how biofuels policies will affect land uses and hence carbon sequestration in plants and soils, and incorporating the biogeophysical effects of land-use change (such as changes in albedo) into LCAs.

##### *Developing CO<sub>2</sub>-equivalency factors for direct and indirect climate-change gases (Mark Delucchi)*

In order to estimate the climate impact of emissions of GHGs, such as CO<sub>2</sub>, CH<sub>4</sub> (methane) and N<sub>2</sub>O (nitrous oxide), LCAs estimate physical emissions of the gases (in, for example, grams per million BTU), and then multiply the physical emissions by a "CO<sub>2</sub> equivalency factor" (CEF), which expresses the climate impact of each non-CO<sub>2</sub> gas in terms of the amount of CO<sub>2</sub> with an equivalent effect. Most LCAs today estimate only two non-CO<sub>2</sub> GHGs (CH<sub>4</sub> and N<sub>2</sub>O), and then estimate the CO<sub>2</sub> equivalent effect of these by using a simplified CEF known as a "Global Warming Potential," or GWP. This method has two serious shortcomings. First, it omits a wide range of gases and aerosols known to have important effects on climate. Second, the GWPs for CH<sub>4</sub> and N<sub>2</sub>O embody some simplistic and generally unrealistic assumptions. Therefore, in this work we propose to develop sophisticated CEFs for a wide range of GHGs, including carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), ammonia (NH<sub>3</sub> -- important in biofuel lifecycles), hydrocarbons (HCs), sulfur oxides (SO<sub>x</sub>), hydrogen (H<sub>2</sub> -- important in lifecycles involving hydrogen as a fuel), and several kinds of aerosols, including black carbon (BC), organic carbon (OC), and dust.

**EXHIBIT A**  
**Interagency Agreement**

*Biorefinery and biofuel potentials throughout the western states and entire US, and biofuel sustainability  
(Bryan Jenkins, Nathan Parker, Peter Tittmann, Quinn Hart, and Mui Lay)*

A series of projects analyze biorefinery and biofuel potentials throughout the western states, the entire US, and Canada. The supply analysis is done through a GIS model coupled to an optimization model to identify likely biorefinery sites and capacities based on biomass supply and biofuel markets. This work follows on an earlier assessment done for electricity. California specific models are being developed in similar fashion. The Collaborative has published a number of reports on biomass resources for California and last year wrote a roadmap for sustainable biomass development in the state. This included the need for sustainability standards in bioenergy development. There is a committee working on this at present. We've made preliminary estimates on water use. For more detailed analyses, Jay Lund, Wes Wallender, and possibly a couple of others including Steve Kaffka are working on the issue.

*Task 2. Providing advisory support to ARB on LCFS compliance and monitoring using VISION-CA model*

The goal of this project is to provide analyses and advisory support to ARB staff on methods of determining compliance during the implementation of LCFS. Advisory service will be provided to assist ARB staff using analytical tools, such as the VISION model, to determine the effectiveness of the program and the pace of technological progress, and to evaluate whether it is on track achieving the LCFS goals. The project will modify existing VISION-CA model to better reflect details of the LCFS and incorporate any future changes in LCFS. The model will be expanded to incorporate more fuel pathways and corresponding lifecycle GHG emission factors that reflect the ongoing work in LCA modeling. UCD researchers will add heavy-duty vehicle fleet to the VISION-CA model and make necessary adjustment to reflect any design changes in LCFS. A separate analysis on the feasibility of trading between fuels and vehicles under LCFS will be conducted.

*Deliverable:* VISION-CA model analytical tool development and reports on VISION-CA analysis  
*Researcher:* Dr. Sonia Yeh

*List of White Paper Topics (Preliminary):*

*Using the VISION-CA model to analyze the effectiveness and progress of the LCFS (Sonia Yeh)*

The project will modify existing VISION-CA methods and incorporate more details in LCFS. The model will be expanded to incorporate more fuel pathways and corresponding lifecycle GHG emission factors based on the modified GREET model by the CEC (the values can be easily changed to reflect the ongoing ARB work in LCA modeling), and heavy-duty vehicle fleet. Analysis will be conducted to explore the following questions: the extent of trading between fuels and vehicles can occur under LCFS, the pace of technological progress, and whether the ARB is on track meeting the LCFS goals.

*Task 3. Providing support to ARB on policy and regulatory development.*

This project will focus on conducting policy analysis and providing advisory support to ARB on key issues identified in development of the LCFS regulation. Areas that will be addressed may include, but not limited to, the market-based cap and trade system, technical and policy considerations in allocating the credits to fuels and/or vehicles, fuel shuffling, the integration of vehicle efficiency in LCFS, inclusion of upstream emissions, and conformity with other policies already in place, and others identified in the UC Report. A series of white papers will be provided to the ARB on these topics. The list of white papers prepared under this task will be decided collectively by ARB and UCD. The advisory services by UC to support ARB staff in investigating and addressing these issues will be critical to the development of LCFS.

*Deliverable:* LCFS policy and regulatory development advisory support  
*Researcher:* Dr. Christopher R. Knittel, Cynthia Lin, and Dr. Sonia Yeh

**EXHIBIT A**  
**Interagency Agreement**

*List of White Paper Topics (Preliminary):*

Economics of the LCFS (Chris Knittel, Jon Hughes, and Stephen Holland (UNC))

A comparative analysis of the different national policies to influence carbon emissions (Chris Knittel and Michael O'hare)

*Schedule and Milestones*

The following schedule is tentative; the exact start and completion date for each task is subject to the changes and shall be decided collectively by ARB and UCD.

	March 2008 – June 2008	July 2008 - Dec 2008	Jan 2009 - June 2009	July 2009 - Jan 2009
Task 1	LEM technical and advisory support			
Task 1	LEM peer review and publication			
Task 1			LEM analysis and white papers relevant to WK1	
Task 2	VISION-CA model modification and issue analysis			
Task 3	LCFS policy and regulatory development advisory support			
Task 3			White papers on LCFS policy and regulatory analysis	

*Schedule*

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

<b>State Agency:</b>	<b>Air Resources Board</b>	<b>Contractor:</b>	<b>The Regents of the University of California, Davis</b>
Name:	John Courtis	Name:	Sonia Yeh
Section/Unit:	Stationary Source Division	Section/Unit:	Institute of Transportation Studies
Address:	1001 I Street, P.O. Box 2815 Sacramento, CA 95812	Address:	2028 Academic Surge Davis, CA 95616
Phone:	(916) 324-9299	Phone:	(530) 754-9000
Fax:	(916) 323-1045	Fax:	(530) 752-6572
Email:	jcourtis@arb.ca.gov	Email:	slyeh@ucdavis.edu

Direct all administrative inquiries to:

<b>State Agency:</b>	<b>Air Resources Board</b>	<b>Contractor:</b>	<b>The Regents of the University of California, Davis</b>
Name:	Harold Pinkston	Attention:	Paula Noble
Section/Unit:	Stationary Source Division	Section/Unit:	Contracts and Grants Analyst
Address:	1001 "I" Street, 5 <sup>th</sup> Floor Sacramento, CA 95814	Address:	2028 Academic Surge Davis, CA 95616
Phone:	(916) 327-8217	Phone:	(530) 747-3921
Fax:	(916) 327-2940		(530) 747-3929
Email:	hpinksto@arb.ca.gov	Email:	pnoble@ucdavis.edu

**EXHIBIT B**  
**Interagency Agreement**

**BUDGET DETAIL AND PAYMENT PROVISIONS**

**1. Invoicing**

- A. For services satisfactorily rendered in accordance with this agreement and upon receipt and approval of the invoices which properly detail all charges the Air Resources Board agrees to compensate the Regents of the University of California, Davis for actual expenditures incurred in accordance with the rates specified herein or attached hereto.
- B. Invoices shall include the Agreement Number and shall be submitted in triplicate not more frequently than quarterly in arrears to:

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



*ARZ*  
*5/22/08*  
*SW 6/13/08*

~~C. University may rebudget funds up to a maximum of ten percent between major budget categories with prior notice to ARB's Contract Manager.~~

*ARZ 5/22/08*



~~D. Upon mutual agreement, ARB will give consideration to requests to rebudget funds in excess of ten percent, however, no rebudgeting in excess of ten percent and no rebudgeting of funds into the travel category may be performed without Research Division Chief approval. The total agreement cost will remain unchanged.~~

*SW 6/13/08*

**2. Budget Contingency Clause**

- A. It is mutually 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.
- C. ARB shall withhold payment equal to ten percent of the total Agreement cost until completion of all work and submission to ARB by University of a final report (including computer diskette copy) approved in accordance with Exhibit F by ARB.

**EXHIBIT B**  
**Interagency Agreement**

- 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.

**EXHIBIT B  
 ATTACHMENT I**

**Detailed Budget**

**Dr. Sonia Yeh**

Year 1 at 10.5% and Year 2 (13 months) at 8.4%	
Travel:	\$ 200.00
Materials/Supplies:	\$ 790.17
Total Salary:	\$15,041.25
Benefits (at 13%):	\$ 1,955.36
Total Payroll	\$16,996.61
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$17,986.78
Indirect Costs (10% of MTDC)	\$ 1,798.68
<b>SUB TOTAL COST</b>	<b>\$19785.46</b>

**Dr. Mark Delucchi**

Year 1 at 5.1 and Year 2 (13 months) at 4.5%	
Total Salary:	\$10,171.74
Benefits (at 35%):	\$ 3,560.11
Total Payroll	\$13,731.85
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$13,731.85
Indirect Costs (10% of MTDC)	\$ 1,373.19
<b>SUB TOTAL COST</b>	<b>\$15,105.04</b>

**Dr. Christopher Knittle**

Year 1 at 44% one summer month and Year 2 at 43% one summer month	
Total Salary:	\$10,144.08
Benefits (at 25%):	\$ 2,536.02
Total Payroll	\$12,680.11
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$12,680.11
Indirect Costs (10% of MTDC)	\$ 1,268.01
<b>SUB TOTAL COST</b>	<b>\$13948.12</b>

**Dr. Alissa Kendall**

Year 1 at 64% one summer month	
Total Salary:	\$ 5011.84
Benefits (at 19%):	\$ 952.25
Total Payroll	\$5,964.09
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$5,964.09
Indirect Costs (10% of MTDC)	\$ 596.41
<b>SUB TOTAL COST</b>	<b>\$6560.50</b>

**EXHIBIT B  
ATTACHMENT I**

**Detailed Budget**

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**Graduate Student Researcher**

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2 Academic years at 25%	
Total Salary:	\$14,469.41
Tuition:	\$14,839.15
Benefits (at 1.3%):	\$ 188.10
Total Payroll	\$29,496.66
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$29,496.66
Indirect Costs (10% of MTDC)	\$ 1,465.75
<b>SUB TOTAL COST</b>	<b>\$30,962.41</b>

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**Postdoctoral Researcher**

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Year 1 at 11%	
Total Salary:	\$5016.00
Benefits (at 13%):	\$ 652.08
Total Payroll	\$5668.08
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$5668.08
Indirect Costs (10% of MTDC)	\$ 566.81
<b>SUB TOTAL COST</b>	<b>\$6,234.89</b>

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**Financial Assistant**

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Year 1 and Year 2 (13 months) at 5.5%	
Total Salary:	\$ 4,948.91
Benefits (at 36%):	\$ 1,781.61
Total Payroll	\$ 6,730.52
GAEL Insurance 0.0058*Salary	Included in above Total Payroll
Subtotal Direct Cost	\$ 6,730.52
Indirect Costs (10% of MTDC)	\$ 673.05
<b>SUB TOTAL COST</b>	<b>\$ 7403.57</b>

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**TOTAL PROJECT COST** **\$100,000.00**

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**EXHIBIT D**  
**Interagency Agreement**

**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 noncancellable 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**  
**Interagency Agreement**

**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. University will deliver a set of all data compilations as specified by the ARB Contract Manager.

- E. University's obligation under this Agreement shall be deemed discharged only upon submittal to ARB of all required data compilations, and any other project deliverables.

- F. 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.

**EXHIBIT E**  
**Interagency Agreement**

**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. 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.
- C. 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.

**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.

**EXHIBIT E**  
**Interagency Agreement**

- 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 Interagency Agreement

### 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. The 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.

## EXHIBIT F Interagency Agreement

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

Title page  
Disclaimer  
Acknowledgment (1)  
Acknowledgement (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 that 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.

## EXHIBIT F Interagency Agreement

*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 unhealthy 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.

## EXHIBIT F Interagency Agreement

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

## EXHIBIT F Interagency Agreement

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<sub>2</sub>)]. 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".