State of California
AIR RESOURCES BOARD

Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach

RESEARCH PROPOSAL

Resolution 13-23

June 27, 2013

Agenda Item No.: 13-6-1

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

WHEREAS, a research proposal, number 2762-276, entitled "Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach," has been submitted by the University of California, Davis; and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2762-276 entitled "Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach," submitted by the University of California, Davis, for a total amount not to exceed $200,000.

WHEREAS, the Research Division staff has reviewed Proposal Number 2762-276 and finds that in accordance with Health and Safety Code section 39701, this research project will advance ARB's understanding of the impact of emissions from consumer products on California's air quality. These results will improve air quality models and will inform ARB's assessment of the air quality impacts of the exemption for low vapor pressure volatile organic compounds in the Consumer Products regulations.

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

> Proposal Number 2762-276 entitled "Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach," submitted by the University of California, Davis not to exceed $200,000.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed $200,000.

I hereby certify that the above is a true and correct copy of Resolution 13-23, as adopted by the Air Resources Board.

Tracy Jensen

Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach"

Background

Low vapor pressure volatile organic compounds (LVP-VOCs) are currently exempt from compliance with VOC limits for consumer products regulations based on their low vapor pressure/high boiling point. However, recent research indicates that certain LVP-VOCs may contribute to ozone and particulate matter (PM) formation. However, there is limited information about how the use of consumer products containing LVP-VOCs results in releases and transport, and the ultimate environmental fate of LVP-VOCs. In addition, for LVP-VOCs that are disposed down the drain and enter wastewater treatment facilities, the fate and transport of the compounds in ambient environments needs to be modeled to estimate the impact on air quality. Better understanding of the emission and multi-media pathways of these LVP-VOCs and their atmospheric availability is needed to assess their impacts on ozone and secondary organic aerosol (SOA) formation. This project is designed to develop multimedia environmental modeling tools to estimate the fraction of emitted LVP-VOCs in the gas phase that is available for ozone formation reactions

Objective

The overall objective of this project is to develop multimedia environmental modeling tools to determine: a) what portion of LVP-VOCs disposed of down the drain will be emitted to air, and b) what portion of LVP-VOCs emitted either through consumer product use or from a wastewater treatment facility will be available in the gas phase to form ozone.

Methods

The project includes development of multimedia environmental fate models to determine the fraction of emitted LVP-VOCs from consumer product use and disposal that is available for potential formation of ozone. First, a wastewater emission model will be developed to predict emission rates of LVP-VOCs that may occur at wastewater treatment facilities or in the discharge zone of the facilities. Then, an appropriate multimedia model will be developed to evaluate what portion of the compounds emitted from consumer product use (as determined from chamber experiments) will participate in ozone formation. The multimedia environmental model will be integrated with the wastewater emission model and other necessary model components into a multimedia mass-balance model to predict the fate and transport of emitted LVP-VOCs among various compartments. The model will be applied to LVP-VOCs to predict the fraction of LVP-VOCs that leads to formation of ozone. Based on the modeling results, a simple estimation tool of the fraction of LVP-VOCs available to form ozone in the air will be developed.

Expected Results
It is anticipated that this project will provide ARB with both a full model and a simple estimation tool to determine the impact of the emissions of LVP-VOCs on total ozone formation.

Significance to the Board
This research project will advance ARB's understanding of the impact of emissions from consumer products on California's air quality. These results will improve air quality models and will inform ARB's assessment of the air quality impacts of the exemption for LVP- VOCs in the Consumer Products regulations.

Contractor:
University of California, Davis

Contract Period:
24 months

Principal Investigator:
Deborah H. Bennett, Ph.D.

Contract Amount:
$200,000

Basis for Indirect Cost Rate:
The State and the University of California, Davis have agreed to a 10 percent indirect cost rate.

Past Experience with the Principal Investigator:
The Principal Investigator has contracted with ARB previously to validate down-the-drain emission factors for several consumer products and has successfully managed several large research projects for ARB.

Prior Research Division Funding to the University of California, Davis:

Year	2012	2011	2010
Funding	$4,949,363	$1,394,560	$508,267

BUDGET SUMMARY

University of California, Davis

"Environmental Fate of Low Vapor Pressure – Volatile Organic Compounds from Consumer Products: A Modeling Approach"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 158,730	
2.	Subcontractors	$ 21,954	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 240	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 895	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 0	
	Total Direct Costs		$181,819
INDIRECT COSTS			
1.	Overhead	$ 18,181	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 18,181
TOTAL PROJECT COSTS			**$200,000**

Attachment 1

SUBCONTRACTOR'S BUDGET SUMMARY

Subcontractor: University of California, Berkeley (UC Berkley)

Description of subcontractor's responsibility: UC Berkeley will provide guidance and model development support.

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	19,958	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	0	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	0	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$ 19,958
INDIRECT COSTS				
1.	Overhead	$	1,996	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 1,996
TOTAL PROJECT COSTS				**$ 21,954**