

**PROPOSED**

State of California  
CALIFORNIA AIR RESOURCES BOARD

**BENCHMARKING OF POST-AMMP DAIRY EMISSIONS AND PREDICTION  
OF RELATED LONG-TERM AIRSHED EFFECTS**

RESEARCH PROPOSAL

Resolution 18-9

**March 22, 2018**

Agenda Item No.: 18-2-3

WHEREAS, the California Air Resources Board (CARB 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 2815-288, titled “Benchmarking of Post-AMMP Dairy Emissions and Prediction of Related Long-term Airshed Effects,” has been submitted by the University of California, Davis for a total amount not to exceed \$384,974;

WHEREAS, the Research Division staff has reviewed Proposal Number 2815-288 and finds that in accordance with Health and Safety Code section 39701, the results of this study will help determine whether the implementation of alternative manure management practices (AMMP) in California’s agricultural sector is an effective air pollution mitigation strategy for existing dairies, and will help construct regulatory policies for the development of State Implementation Plans (SIP) and Short-Lived Climate Pollutant (SLCP) reduction strategies. Results from this project also will be used to inform other important ongoing programs (such as SB 1383, and help the Dairy and Livestock Working Group’s achieve their goals); and

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

NOW, THEREFORE BE IT RESOLVED, that CARB, pursuant to the authority granted by Health and Safety Code section 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and staff and approves the Research Proposal.

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 Proposal as further described in Attachment A, in an amount not to exceed \$384,974.

**Resolution 18-9**

March 22, 2018

**Identification of Attachments to Board Resolution 18-9**

**Attachment A:** “Benchmarking of Post-AMMP Dairy Emissions and Prediction of Related Long-term Airshed Effects” Summary and Budget Summary

## ATTACHMENT A

### “Benchmarking of Post-AMMP Dairy Emissions and Prediction of Related Long-term Airshed Effects”

#### Background

The State Legislature has repeatedly demonstrated commitments to improve air quality and to reduce greenhouse gas (GHG) emissions through the passage of multiple bills. CARB and other government agencies need to evaluate current dairy operations and develop the most effective air pollution control strategies to satisfy the goal of programs like Assembly Bill (AB) 32, Senate Bill (SB) 32, SB 1383, and AB 617. In an effort to reduce air pollution impacts from dairies, the California Department of Food and Agriculture (CDFA) created an incentive program for dairy farmers to adopt alternative manure management practices (AMMP) that would reduce existing methane (CH<sub>4</sub>) emissions. However, research studies have not yet been conducted to understand the impacts of using various AMMPs at California dairies with respect to the real-world CH<sub>4</sub> reduction potentials and local and regional air quality (e.g., primary and secondary air pollutants that affect public health as well as global climate). A companion contract to this proposal has already been funded by CDFA, and will provide the basis for pre-AMMP installation air pollutant emission monitoring on selected dairies in the San Joaquin Valley (SJV). There is a need to evaluate the CH<sub>4</sub> reduction and the potential air quality co-benefits between pre- and post-AMMPs dairies to quantitatively understand the effectiveness of such air pollution mitigation strategies.

#### Objective

The objective of this project is to characterize the impact of implementing AMMPs at California dairies with respect to GHG emissions, and local and regional air quality.

#### Methods

This project will utilize ambient measurements and chemical transport modeling to evaluate the GHG emissions and the air quality impacts of California dairies after the implementation of AMMPs. Specifically, this project will study the emissions of CH<sub>4</sub>, volatile organic compounds, nitrous oxide, ammonia, oxides of nitrogen, and PM from selected dairies in the SJV, and use a scenario-based regional air quality forecasting model to assess the GHG emission reduction and air quality impacts of various AMMPs over the next several decades. The investigators will collaborate with industry stakeholders, facility operators, and CDFA/CARB staff to identify dairies that are expected to adopt AMMPs that reduce existing CH<sub>4</sub> emissions. The investigators will work with collaborators to develop and implement a comprehensive sampling plan including standard protocols and methods to evaluate the air pollutant emissions after the implementation of AMMPs.

#### Expected Results

Repeated measurements will be made at selected dairy facilities using advanced analytical instruments available in the Mobile Air Quality Lab, and other equipment that the investigators possess. The air pollutant emission monitoring results will be used in

a scenario-based regional air quality forecasting model to predict the concentrations of PM and O<sub>3</sub> in the SJV through 2050. This modeling effort will develop a spatial understanding of PM and O<sub>3</sub> formation in the context of California’s State Implementation Plans (SIP), among others. The modeling effort will also examine the complex interactions of air pollutant emissions within the SJV by conducting sensitivity analyses comparing business-as-usual emissions (pre-AMMP) and with post-AMMP scenarios. The model results will be compiled into a comprehensive report that describes the advantages and the potential disadvantages of using various AMMPs in the SJV.

**Significance to the Board**

The results from this project will help determine whether the implementation of various AMMPs in California’s agricultural sector is an effective air pollution mitigation strategy for existing dairies, and will help construct regulatory policies for the development of SIP and Short-Lived Climate Pollutant (SLCP) reduction strategies.

**Contractor:**

University of California, Davis

**Contract Period:**

36 months

**Principal Investigator (PI):**

Frank Mitloehner, Ph.D.

**Contract Amount:**

\$384,974

**Basis for Indirect Cost Rate:**

The State and the University of California, Davis have agreed to a 25 percent indirect cost rate.

**Past Experience with this Principal Investigator:**

Dr. Frank Mitloehner completed one research project (contract number: 11-325) for CARB in the past, which was focused on the quantification of the emission reduction benefits of mitigation strategies for dairy silage. Dr. Mitloehner performed very well as a PI, and he was very responsive to meeting CARB’s research needs. His broad knowledge and extensive experience in the fields of dairy air quality research and agricultural emission measurements are well suited to the proposed project.

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

Year	2017	2016	2015
Funding	\$ 812,097	\$ 650,000	\$1,468,460

## BUDGET SUMMARY

Contractor: University of California, Davis

“Benchmarking of Post-AMMP Dairy Emissions and Prediction of Related Long-term Airshed Effects”

### **DIRECT COSTS**

1.	Personnel (Salary and Fringe Benefits)	\$ 254,629	
2.	Travel	\$ 36,400	
3.	Materials & Supplies	\$ 16,950	
4.	Equipment	\$ 0	
5.	Electronic Data Processing	\$ 0	
6.	Consultant(s)	\$ 0	
7.	Subreceptient(s)	\$ 0	
8.	Other Direct Costs	<u>\$ 0</u>	
	Total Direct Costs		\$ 307,979

### **INDIRECT COSTS**

1.	Indirect (F&A) Costs	<u>\$ 76,995</u>	
	Total Indirect Costs		<u>\$ 76,995</u>

**TOTAL PROJECT COSTS** **\$ 384,974**