Environmental

Behavior in Vegetative Barriers of Aerosol Particulate Matter 2.5 (PM'2.5') and PM'10' along Highways

A modeling tool that can simulate scenarios and recommend optimal vegetative barriers for California's transportation network.

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Project Title:
Behavior in Vegetative Barriers of Aerosol Particulate Matter2.5 (PM2.5) and PM10 along Highways

Task Number: 4051

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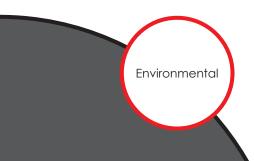simon.bisrat@dot.ca.gov

WHAT IS THE NEED?

There is a strong international consensus on elevated health risks for populations living, working, or going to school near large roadways. The health concerns have been linked to elevated levels of air pollution caused by traffic emissions. Public health concerns have raised interest in methods to mitigate these traffic emission impacts.

Traditionally, transportation and land use planning options have been focusing on vehicle emission standards and reduction in vehicle activity, and also establishing buffer or exclusion zones. These options are typically "long-term" since emission reductions take long to implement and planning and zoning is involved in rerouting and reducing vehicle miles travelled as well as establishing buffer zones. Other options to mitigate the impacts of traffic emissions focus on roadway design and urban planning that includes road location and configuration, and roadside solid barriers and vegetation. The advantage of the roadside barriers option is that it provides an opportunity for a "short-term" solution. Also, the roadside barriers often have other positive benefits. Thus, appropriately selected and planted roadside vegetation may reduce traffic-related air pollution concentrations by providing a way of reducing exposures to traffic emissions

WHAT ARE WE DOING?

This task will create a modeling tool that can simulate scenarios and recommend optimal vegetative barriers for California's transportation network that protects all near road communities from air pollutants. This tool, which will be called the Vegetative Barrier Model (VBM), will simulate the impact of roadside

barriers, with and without vegetation, on the concentrations of vehicle-related PM2.5/PM10 in the near-road environment. It will provide quantitative information for planning of vegetative barriers to reduce air pollution and advance equity and livability in underserved communities located near roads. The modeling study will be conducted at the University of California, Riverside. Data for developing VBM will be compiled from field studies conducted in the past. The data will also include results from computational fluid dynamics (CFD) studies. We will supplement the compiled data with measurements from field studies conducted in two locations in California.

WHAT IS OUR GOAL?

The primary goal of this project will be to develop a modeling tool that will help Caltrans practitioners simulate different vegetative barrier scenarios that will help them select optimal vegetative barriers.

WHAT IS THE BENEFIT?

Caltrans practitioners will be able to design and construct optimal roadside vegetative barriers as an air pollution mitigation measure in California's roadway system. Such vegetative barriers can also mitigate urban heat island effects, absorb CO_2, conserve water, prevent soil erosion, and increase aesthetic values.

WHAT IS THE PROGRESS TO DATE?

A research team from University of California Riverside campus has been selected and this task is at its contract preparation phase with an anticipated start date of January 2023.