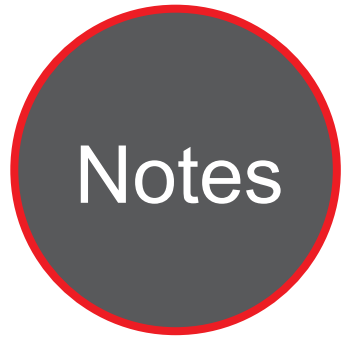




Caltrans Division of Research,  
Innovation and System Information

# Research



# Notes

Planning, Policy  
and  
Programming

## Automated Vehicles and Business District Parking

Using a microscopic road traffic model to simulate vehicle travel during peak hour to explore AV's effect on traffic flow

MAY 2019

Project Title:  
Automated Vehicles and Central Business District Parking: The Effects of Drop-Off-Travel on Traffic Flow and Vehicle Emissions

Task Number: 3314

Start Date: December 1, 2018

Completion Date: November 30, 2019

Task Manager:  
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### WHAT IS THE NEED?

The potential for automated vehicles (AVs) to reduce parking in central cities has generated a lot of excitement among urban planners. AVs could drop-off and pick-up passengers in areas where parking costs are high: personal AVs could return home or park in less expensive locations, and shared AVs could serve other passengers. Reduced on-street and off-street parking presents numerous opportunities for re-development that could improve the livability of cities, for example, more street and sidewalk space for pedestrian and bicycle travel.

However, reduced demand for parking would be accompanied by increased demand for curbside drop-off/pick-up space with related movements to enter and exit the flow of traffic. This change could be particularly challenging for traffic flows in downtown urban areas during peak hours where high volumes of drop-offs and pick-ups are likely to occur.

As a result, the research team proposed a study that uses a microscopic road traffic model to simulate vehicle travel in San Francisco's downtown central business district during the morning peak hours to explore how AV would affect traffic flow, in which the researchers vary:

1. The demand for drop-off and pick-up travel versus parking,
2. The supply of on-street and off-street parking, and
3. The price of curbside drop-off/pick-up space.



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## WHAT ARE WE DOING?

Three sets of scenarios will be simulated to explore the magnitude of the potential traffic flow and vehicle emissions problem from a shift from parking to drop-off/pick-up and potential policy interventions to minimize negative effects.

In the first scenario, the researchers will simulate a base case scenario, with the assumption that 100% of vehicle trips in the study area will park. This scenario will be contrasted with the opposite scenario, in which 100% of these trips are assumed to end via drop-offs.

Intermediate sensitivity scenarios will vary shares of parking demand and drop-off shares. Vehicle trips with purposes that involve long stays in the study area will park in off-street parking closest to their destination at time of arrival. Vehicles with shorter stays will be allocated to on-street parking closest to their destination at time of arrival.

In the second scenario, the simulation will incrementally convert on-street parking to drop-off space as represented in the study area parking inventory. Additionally, it will reduce the number of off-street parking facilities and increase the capacity of remaining facilities. AVs should allow for more effective use of existing parking capacity by replacing two rows of vehicles with multiple stacked rows of vehicles.

One study estimated that effective parking space could be increased by as much as 87%. Given the high land values in San Francisco's business district, there will likely be significant market pressure to re-develop parking structures for more profitable use. Off-street and on-street policy scenarios may be simulated separately and together. Simulation of Urban Mobility will simulate the effect of changes in parking supply and location on a passenger's decision to park or be dropped off, based on individual changes in relative access time (i.e., search, queuing, and walking) for parking, drop-off arrival, total change in traffic flow, such as congestion and vehicle miles traveled (VMT), and vehicle emissions.

In the third scenario, the results of previous scenarios

will be explored to adjust curbside drop-off costs to improve congestion and vehicle emission. The research team will calculate the revenues; and explore the current hourly, daily, and monthly parking rates to evaluate baseline and alternatives drop-off charges.

After reviewing the results of the scenarios, the research analysts will combine different shares of demand for parking and drop-off spaces with parking supply and curb charges to identify worst- and best-case outcomes.

## WHAT IS OUR GOAL?

The goal of this research is to gain insights into the following transportation policy questions:

1. How will incremental shifts from parking to drop-off-related vehicle travel impact traffic flow and emissions?
2. How will changes in the supply of on-street and/or off-street parking influence the relative demand for drop-off and parking; and what will be the effects on traffic flow and vehicle emissions?
3. How will changes in the cost of using on-street drop-off space influence the relative demand for drop-off and parking; and what will be the effects on traffic flow and vehicle emissions?

## WHAT IS THE BENEFIT?

California Department of Transportation (Caltrans) is currently researching the relationship between VMT and Greenhouse Gas emissions. It has been proposed that AVs could significantly impact this relationship.

This study will assist Caltrans in developing policies that will help in assessing this relationship, to provide the State with a sustainable transportation system that includes improved mobility and reduced environmental impacts.

## WHAT IS THE PROGRESS TO DATE?

The first Project Panel progress meeting occurred in early April 2019.

## IMAGES



How will incremental shifts from parking to drop-off-related vehicle travel impact traffic flow and emissions?