



# EXAMINING THE INTERPLAY BETWEEN ROAD ELEMENTS

*Research explores the interaction between medians, bike lanes and driveways to determine the effect road cross-sectional features have on roadway access points.*

## The Issue

One of the most common types of midblock crashes happens when a motorist turns left into a driveway, crossing the path of oncoming traffic and colliding with another vehicle. In a road with a non-traversable median, the possibility of such a midblock left turn is eliminated, but the median may have its own effect on travel time and operations. Medians and other road cross-sectional elements, such as bike lanes and on-street parking facilities, play a part in determining the behavior of drivers and the types of crashes that are likely to occur. The presence or absence of any of these features, and the alignment of driveways (straight across from each other, staggered, or unevenly spaced) all impact roadway safety and operations. Each possible configuration can have a unique effect on traffic movements, and it is a daunting task to map and study them all.

In the American Association of State Highway and Transportation Officials (AASHTO) publication *A Policy on Geometric Design of Highways and Streets*, commonly known as the *Green Book*, most of the supporting research for the spacing of driveways is based on standard highway design procedures. They include simple human factors and geometric principles, and have not been thoroughly evaluated based on a variety of road cross section configurations.

Researcher Karen Dixon of Oregon State University sought to close this research gap by evaluating the influences of select cross-sectional-related design elements, specifically median configurations and bicycle lanes, on driveways. In a research report titled "Influence of Road Cross Section on Access Spacing," Dixon looked at various center median and bicycle lane configurations and observed how they affect traffic at road access points.

## The Research

Dixon's primary research goal was to better understand how median and bicycle lane configuration can influence safety and operations at driveway locations. For example, a

### THE ISSUE

The placement of driveways and roadway cross-sectional elements in relation to each other has a direct affect on safety and driver behavior. Understanding the impacts of the various configurations of roadway elements is this project's main research goal.

### THE RESEARCH

Researchers collected data from five sites, all of which had:

- An unsignalized retail driveway at least 500 feet from the nearest traffic light;
- A through roadway with four lanes and more than 20,000 vehicles per day;
- Straight, flat geometry with the driveway intersecting the roadway at a visual 90 degree angle.

### THE IMPLICATIONS

The observations from this study clearly indicate that traffic volume, driveway density, and driveway orientation collectively play a role in the safety and operations along a corridor. The analysis demonstrated that higher traffic volume and more densely spaced driveways result in increased travel time.

*Photo: Driveway near a raised center median in southwest Portland, Oregon.*

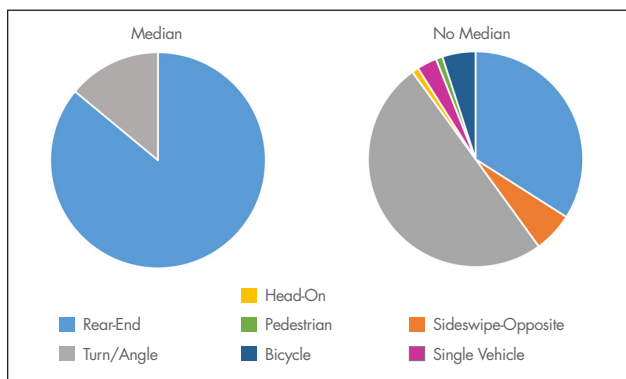
driver making a right turn to enter a road where there is a raised median, as opposed to a two-way left turn lane, can focus directly on approaching vehicles from the left. The research team found that a raised center median can result in shorter critical gap values for right-turn maneuvers out of driveways. "Critical gap" refers to the minimum gap between cars that drivers seeking to enter the roadway will accept. Drivers' gap acceptance behavior can be directly affected by the configuration of various roadway elements.

The research team evaluated eight physical sites and four simulated scenarios with different driveway spacing and roadway designs. The team used crash data, traffic data and roadway information from driveway locations in Oregon, Arkansas, and Oklahoma. They supplemented the data with digital videos acquired during field studies of the sites. The five sites in Oregon had bike lanes, while the two Arkansas sites and one Oklahoma site did not.

The team also performed simulation analysis in CORSIM to examine the influences of median type, traffic volume, and access density on traffic operational performance. Their focus was on the influence of crash severity and type, as well as the associated gap acceptance for turning maneuvers at mid-block driveway locations.

## Implications

For the crash analysis, the research team noted that the Oregon location with a raised median experienced only rear-end and angle crashes at the mid-block driveway locations. These findings suggest that the presence of a median can help to reduce a variety of crashes associated with mid-block driveway locations, including sideswipe crashes. They also used



### Distribution of Collision Types

This graph shows how the collision types along two study corridors in Oregon were affected by the presence of a raised median. The pie chart on the left is for a corridor with a non-traversable center median, while the chart on the right is for a corridor with a two-way left turn lane. The median allowed for far fewer incident types.

the traffic simulator to study "aligned" versus "staggered" driveway orientations.

Corridors with staggered driveway placement

experienced considerably greater delay per vehicle when compared to their aligned driveway counterparts.

There are numerous combinations of road features that can influence access spacing, and there is a lack of robust research on these various configurations and their potential conflicts. This report offers a better understanding of how driveway spacing and associated roadway cross-sectional features influence road safety. The observations from this study clearly indicate that traffic volume, driveway density, and driveway orientation play a role in safety and operations. The research team recommends future in-depth studies that individually focus on the influence of bicycle lanes at driveway locations, to gain a better understanding of the specific impact bicycle facilities may have on driver behavior at access points.

## PROJECT INFORMATION

TITLE: Influence of Road Cross Section on Access Spacing

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MORE INFORMATION  
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