Eugene Public Works
Engineering

Memorandum

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To: Jenessa Dragovich and Mike Mckerrow

From: Logan Telles, Public Works Engineering

Subject: Digital Billboards and Traffic Safety

Overview

At the request of the Planning and Development Department, Public Works has compiled a summary of key research relevant to the regulation of digital billboards in Eugene. The research highlighted in this brief memorandum does not represent the entirety of literature on the subject. The studies listed here do, however, fit in well with a broader field of research that documents concern about the traffic safety impacts of digital billboards. This memorandum also discusses the possibility of piloting digital billboards in Eugene prior to wider-scale installation. This document goes on to list roadway characteristics that may be of interest in developing digital billboard regulations and discusses the subject of cycle length briefly.

Research Summaries

Crash Studies

Definitively determining causality of a crash can be challenging, however, crash study research around digital billboards aims to identify increases, decreases, or consistencies in the occurrence of documented crashes that may be correlated with the installation of digital billboards. Some key research within this area includes:

Nation Center for Transportation Systems Productivity and Management: The United States Department of Transportation (USDOT) funded research into the effect of digital billboards on traffic safety with several university based research teams. It is important to note that the contents of the report reflect the conclusions of its authors and do not represent a formal position from USDOT on digital billboards. Some key findings from the consolidated report include:

The Safety Assessment of Digital Billboards in Florida: The USDOT consolidated report includes findings from a crash study out of Florida (see Chapter 3) that compared crash data at several digital billboard sites to control sites with similar roadway conditions. Researchers concentrated on high speed, low access facilities and found that, “it can be concluded that the difference in the crash rates between DBB influence areas and control sites in Florida varies

from site to site but overall there is a 25% increase (approximately) in crash rates in DBB influence areas". The study also found that fixed-object, sideswipe, and rear-end collisions were overrepresented in digital billboard influenced areas compared to control sites.

The Safety Assessment of Digital Billboards in Alabama: The USDOT consolidated report also includes crash study findings from researchers using a similar methodology in Alabama (see Chapter 4). The Alabama research team found that, "the presence of digital billboards increased the overall crash rates in areas of billboard influence compared to control areas downstream of the digital billboard locations by 29% in Alabama". Like the Florida research team, they found an overrepresentation of sideswipe collisions and rear end crashes. The sample size of severe crashes was too small to make conclusive determinations, but the research team stated that they believed there may be a relationship between crash severity and digital billboard influence for further exploration.

Eye-Tracking Studies

Eye-tracking studies take a different approach to identifying the impact of digital billboards on traffic safety. Research teams using this method seek to identify changes in driver behavior through direct observation, opposed to changes in documented crash history. To accomplish this, researchers use eye-tracking cameras that identify the number and duration of off-road glances a driver makes. Once fitted with the appropriate equipment, driver participants in eye-tracking studies are directed to takes routes past existing (and sometimes temporary) digital billboard installations. Some key research within this area includes:

Swedish National Road and Transport Research Institute: This 2012 study based in Stockholm observed the eye movement behavior of 41 drivers at four locations with digital billboard installations. These digital billboards did not include video and changed messages every seventh second (resulting in two to three messages as drivers passed). The drivers were not informed that digital billboards were the subject of the study until after the 40 minute drive was completed. The research team concluded that, "drivers had a significantly longer dwell time, a greater number of fixations and longer maximum fixation duration when driving past an electronic billboard". This means that drivers were observed spending more total time looking away from the road (across one or more glance), taking more glances away from the roadway and taking longer glances away from the road when passing a digital billboard. The study declined to take a formal position on whether digital billboards should be considered a traffic safety hazard by roadway authorities.

Simulator Studies

Simulator studies take yet another approach to evaluating the safety of billboards. While the body of literature around this method hasn't focused in on digital billboards specifically, multiple research teams have used computer simulated scenarios to demonstrate that there is an observable reduction in driver reaction time when presented with a traffic scene that includes billboard messaging. Some key research within this area includes:

Monash University Accident Research Center: This 2011 study based in Australia used computer simulation to measure differences in reaction time when inexperienced and elderly drivers were confronted with transportation environments that include billboards. These demographics were chosen due to the role age and experience can play in limiting reaction time. The researchers found that, “billboards can automatically attract attention when drivers are engaged in other tasks, delaying their responses to other aspects of the environment”. Moreso the team’s research indicates that, “the effect of billboards was particularly strong in scenes where response times are already lengthened by high levels of built or designed clutter”. In this context, the term built clutter refers to, “factors such as shopfronts along the road and high buildings on each side”, and the term designed clutter, “refers to the number of road signs and markings”. Conversely, “in the low clutter scenes, billboards did not impair response times” in the context of this study.

Regulatory Options

Pilot Study

Selecting pilot locations to evaluate the effect of digital billboards on traffic safety in Eugene may be a preferable alternative to introducing the new installations at a city-wide scale. Based on available research and the professional opinions of transportation staff, the selection of a roadway with low-access density and low active transportation volumes was identified as preferable. HWY 99 was identified as the most likely candidate location for a prospective pilot evaluation. Furthermore, selecting locations along HWY 99 that are offset from onramps and other merge points by 300 to 500 feet would be ideal. Given research findings on rear end and sideswipe collisions in digital billboard influenced areas, transportation staff would also like to select locations without a prevalent history of these types of collisions. Locations with a documented history of sever and fatal injuries should also be avoided in the selection of a study area. Transportation staff are available to conduct further analysis to identify specific locations along HWY 99 that meet this criteria. To provide comparison data an “upstream” portion of HWY 99 should be left without digital billboard installation during the duration of the prospective pilot.

Location Restriction

Based on available research and the professional opinions of transportation staff, there is particular concern around the effect digital billboards will have in denser urban areas. Urban areas with high bicycle volumes, high pedestrian volumes, access density, busy intersections, and on-ramps/off-ramps already have high attention demand for drivers.

The potential impact of digital billboards on driver attention and reaction time in these environments may warrant restricting the installment of digital billboards in areas with:

- Moderate to high pedestrian activity and demand
- Moderate to high bicycle activity and demand
- High density of residential and commercial driveways
- Areas with existing transportation equity concerns
- Corridors that have been identified as high crash streets in the Vision Zero Action Plan

Furthermore, offset requirements of 300 to 500 feet may be appropriate for:

- High volume intersections
- Intersections identified as high crash intersections in the City’s Vision Zero Action Plan
- Existing mid-block pedestrian crossings

- Freeway and highway on-ramps and off-ramps
- Lane merge points

Public Works staff is available to assist in identifying locations that meet this criteria.

Cycle Length

Based on the available information, transportation staff believe that longer cycle lengths are safer than shorter cycle lengths. Digital billboards with longer cycle durations present fewer messages as a driver advances through the area, theoretically prompting fewer glances away from the road. Less frequent image change on a digital billboard also means less activity in the driver's peripheral vision. While Public Works was unable to identify research comparing the safety of different cycle lengths, transportation staff would encourage PDD to consider cycle length requirements longer than the 8-10 second billboard industry standard.

Further Conversation

Public Works Engineering staff is available and happy to discuss research, regulation, and the idea of piloting implementation of digital billboard installations in greater detail.