Joint Transportation Research Program

Principal Investigator: Darcy M. Bullock, Purdue University, darcy@purdue.edu, 765.494.2226

Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

Sponsor: Indiana Department of Transportation, 765.463.1521

SPR-4600 2022

Impacts to Traffic Behavior from Queue Warning Truck: Current Pilot Project

Motivation

Work zone activities often result in slow traffic and/or forming a queue on interstates, which can increase crash risk for inattentive drivers. Back of queue crashes, particularly on high-speed interstates in advance of construction zones experiencing queuing, are a significant concern for all transportation agencies. In 2020, the Indiana Department of Transportation (INDOT) began deploying queue warning trucks ahead of work zones. Besides alerting the motorists visually, these queue trucks were also equipped with digital alerts that were transmitted to navigation systems. This study was initiated to evaluate the Indiana queue truck warning program.

Study

Telematics data from queue warning trucks and digital alerts was first deployed in May 2020. As of July 2022, a total of 53 trucks and 40 other emergency response vehicles have been deployed and alerting motorists in Indiana. Digital alerts covering more than 16,726 truck-hours were provided across Indiana interstates over a 27-month period. This study analyzed the impact of queue trucks with digital alerts on hard braking events. It also evaluated traffic speed reductions relative to the location of trucks.

Findings

- INDOT construction records (site manager) indicated 3,957 days of queue truck deployment since 2020. Telematics data however was broadcasted for 16,726 truck-hours from a total of 2,927 unique truck days. This discrepancy is most likely explained by gaps in telematics records provided by one of the newer digital alert providers that is still developing protocols for interfacing with transportation agencies.
- Hard-braking events (defined as any vehicle decelerations with a magnitude greater than 8.76 ft/s^2)

Queue warning truck (callout i) triggering alerts on Apple Maps.

is used as a measure for crash risk. These events were found to decrease by approximately 80% when queue warning trucks were used to alert motorists of impending queues.

- Traffic speeds were observed to gradually reduce from about 1,500 to 2,000 ft behind the deployed queue truck location. This suggests that queue trucks were alerting the drivers and reducing the traffic speeds ahead of the work zone.

Recommendations

These encouraging results support the further deployment of queue trucks and the integration of alerts for enhancing the safety of motorists behind work zone queues. It is important to note that queue truck drivers are a first line of defense and limiting their exposure is a challenge that will be a factor in future research. To increase the impact of in-vehicle digital alerts, particular attention should be devoted to strengthening relationships with automotive OEMs, navigation software companies, and truck fleets.

Recommended Citation for Report

Sakhare, R. S., Mahlberg, J., Mathew, J. K., Desai, J. Li, H., & Bullock, D. M. (2022). *Impacts to traffic behavior from queue warning truck: Current pilot project* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2022/26). West Lafayette, IN: Purdue University. https://doi.org/10.5703/1288284317448

View the full text of this technical report here: https://doi.org/10.5703/1288284317448

Published reports of the Joint Transportation Research Program are available at http://docs.lib.purdue.edu/jtrp/

PURDUE UNIVERSITY