

Appendix A – Crash Data

Date: March 2021

References

Wisconsin DOT Crash Data Portal

Introduction

This memo documents crash data from 2015 through 2019 near railroad crossings within the bus rapid transit project corridor.

Analysis Limits

The limits of the crash analysis are shown in the following figures. Crashes were analyzed from the railroad crossing to the next major intersection to cover any crashes that could have been caused by the interactions of vehicles and the railroad crossing.

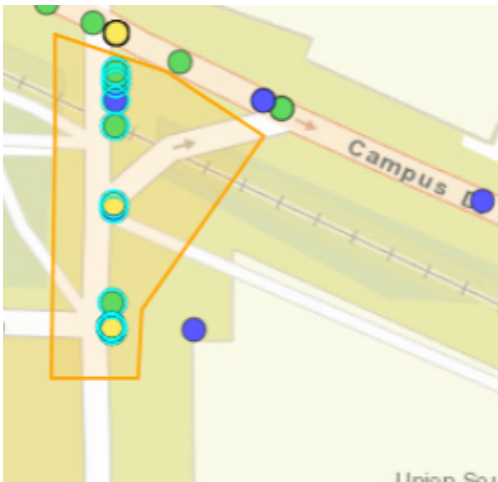


Figure 1 - Randall Avenue Crash Study Limits

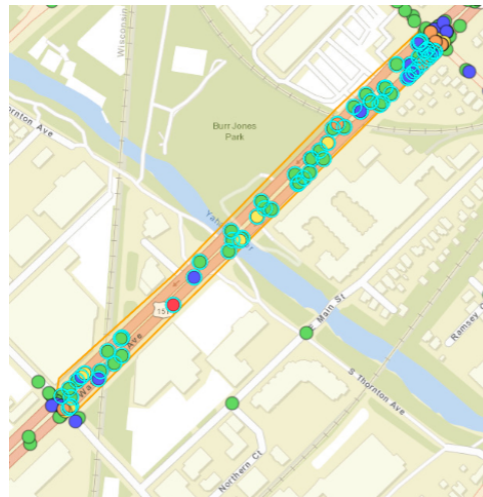


Figure 2 - East Washington Crash Study Limits

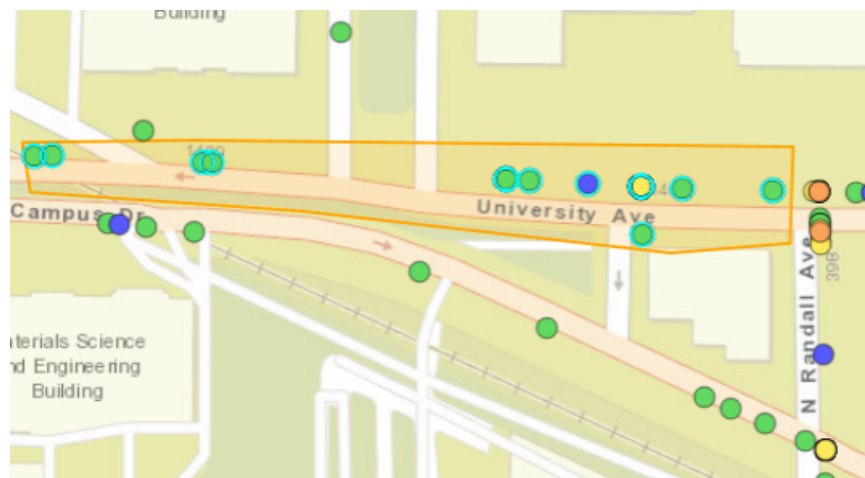


Figure 3 - University Avenue Crash Study Limits

Summary of Results

Table 1 and Table 2 summarize the number of crashes, crash rates and details involving rear-end collisions at each railroad crossing.

Table 1 - Crashes and Crash Rates Near Railroad Crossings

Location	U.S. DOT Crossing #	Direction	Segment Length (Miles)	AADT (Year)	Total Crashes	Crash Rate	Statewide Crash Rate*
Randall Avenue	391728A	NB	0.04	**	9	**	**
University Avenue	391729G	WB	0.12	17,450*** (2018)	17	444.85	464.01
USH 151 - Dickinson Street to First Street	177313F to 177841G	NB	0.28	25,200 (2019)	31	240.74	424.99
		SB	0.30	25,200 (2019)	20	144.96	424.99

*Used 2014-2018 Statewide Average Crash Rates (2019 not available at the time of the analysis).

** AADT is not available for Randall Avenue, so no crash rate can be calculated. There is no Statewide Peer Group that represents the functional classification of Randall Avenue.

*** AADT for University Avenue was assumed to be 50% of Count Site 131117, located west of the railroad crossing along Campus Drive.

Table 2 - Rear End Crashes near Railroad Crossings

Location	U.S. DOT Crossing #	Direction	Non-Bus Rear End Crashes	Bus Rear-End Crashes*	Severity**				
					K	A	B	C	PD
Randall Avenue	391728A	NB	6	0	0	0	1	1	4
University Avenue	391729G	WB	7	0	0	0	0	2	5
USH 151 - Near Dickinson Street	177313F	NB	0	1	0	0	0	1	0
		SB	4	0	0	0	0	1	3
USH 151 - Near First Street	177841G	NB	18	1	1	0	2	0	16
		SB	2	0	0	0	0	0	2

*Bus rear-end crashes only includes when a bus was directly involved in a crash and does not necessarily indicate all the crashes that occurred when buses were stopping or stopped at the railroad crossings.

** K = Fatal, A = Suspected Serious Injury, B = Suspected Minor Injury, C = Possible Injury, PD = Property Damage Only

The police reports for the two rear-end bus crashes and the fatality were analyzed. Summary of the police reports for each of those three crashes are in Table 3.

Table 3 - Police Report Information

Location	U.S. DOT Crossing #	Significance	Police Report Information
NB USH 151 (Near Dickinson)	177313F	Bus crash	Bus was stopping at the tracks and was rear-ended.
NB USH 151 (Near First Street)	177841G	Bus crash	Rear-end crash with vehicle following too close to bus. Bus stopped for traffic (not clear if RR signal or First St. signal).
NB USH 151 (Near First Street)	177841G	Fatal crash	Rear-end crash where individual was not wearing a seatbelt and was ejected from vehicle upon impact. Could not distinguish if this was a result of the RR signal or the First St. signal.

Discussion – Crash Indicators

Several characteristics of the railroad crossing locations are indicators of higher crash potential.

Right turning vehicles on Randall Avenue cross four pedestrian crossings and one bike lane, in addition to the railroad crossing. Drivers need to also monitor the signal and Johnson Street traffic to complete the turning movement, an acute angle that allows traffic to turn into the shoulder lane where buses are attempting to merge prior to the downstream bus stop. There are two stop bars due to the railroad crossing, with minimal storage between the far stop bar and the railroad tracks. Currently there is less than 12' of pavement from the railroad tracks to the stop bar on the right edge of the turn lane. The skew with Johnson Street, limited storage between the stop bar and railroad tracks, and merges between buses and right turning vehicles are all safety concerns.

The University Avenue railroad crossing is within an intersection, with the Babcock Drive right turn upstream and the Campus Drive/University Avenue turn lanes developing across the railroad crossing. Campus buildings north and south of the roadway require pedestrian and bicycle accommodations. Buses continuing on University Avenue or Campus Drive need to merge from the outside shoulder lane upstream of the railroad crossing. The multiple merging and diverging for various roadway users within the short distance is a safety concern.

The East Washington Avenue crossings have intersections directly upstream of the crossings, within 140' of the crossing near Dickinson Street and within 350' of the crossing near First Street. Additionally, there are driveways within 30' of the railroad crossings for three of the approaches, with one of the driveways located between the stop bar and railroad crossing. The proximity of intersections and access points adds complexity, on top of the acceleration and deceleration of vehicles required to stop at the railroad crossings which can surprise drivers. City buses have four potential stopping points per direction between the Dickinson Street to First Street block, with one signalized intersection, two railroad crossings, and two bus stops. The proposed BRT routes would reduce the stopping points to four (one signalized intersection, two railroad crossings and one bus stop) but would not eliminate the safety concern.

Discussion – Existing Safety Infrastructure

Measures to improve the railroad crossing safety have been implemented at each of the crossings.

There are existing flashing lights at all crossings within the BRT corridor to alert drivers when a train is present, as well as gates at the East Washington and Randall Avenue Crossings.

When a train is not present, vehicles identified in Section 346.45 of the Wisconsin State Statutes are still required to stop unless the crossing is signed as an exempt crossing. The University Avenue and Randall Avenue are signed as exempt, therefore no auxiliary stopping lanes are present. The East Washington Avenue railroad crossings have auxiliary stopping lanes; however the implementation of the BRT lanes will eliminate the auxiliary stopping lane for general purpose vehicles during peak hours. During off-peak hours the outside lane would still function as an auxiliary stopping lane.

Existing vision triangles meet current standards except for the Dickinson Street crossing which is substandard by 34' for WB traffic and 38' for EB traffic looking north along the tracks, and First Street which is substandard by 132' for EB traffic looking south along the tracks. Vision triangles are shown in Appendix C.

Conclusion

The Randall Avenue railroad crossing has minimal crashes but still has safety concerns. Realigning the right turn lane to intersect Johnson Street closer to perpendicular would keep pedestrians and vehicular traffic within the field of vision of turning vehicles and would increase the storage between the railroad crossing and the stop bar. The City of Madison recommends realigning the northbound right turn lane.

The University Avenue railroad crossing location, possibly the most complex location with the split of University Avenue, has the highest crash rate. The City of Madison recommends increasing roadway width to allow a transit lane to continue through the railroad crossing, shifting the bus merge downstream of the traffic signal.

The East Washington railroad crossing locations have lower crash rates than the statewide average, however 51% of the crashes are rear-end collisions with specific cases of crashes caused by buses stopping at the railroad tracks. Signing the crossings as exempt would eliminate situations where required vehicles are stopping at the crossing when there is no train, therefore reducing rear-end collision potential. The City of Madison recommends signing the crossings as exempt to eliminate stopping requirements, and thus potential crashes, when no train is present.