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MEMORANDUM

DATE: July 23, 2020
TO: Andrew Cannon
CC: Luis Diaz
FROM: JD Allen
RE: RGVMPO 2045 MTP – Safety Data Analysis

Introduction

Transportation safety data analysis provides planners, policy makers, and the public with a better understanding of where critical safety issues are occurring in the transportation system and what factors may be contributing to regional crashes and crash rates. As such, safety data analysis is a critical component of regional transportation planning.

The technical analysis in this memorandum reviews historical crash data within the Rio Grande Valley Metropolitan Area Boundary (RGVMAB) to assess key transportation safety issues on a regional scale for both motorized and non-motorized users. The Highway Safety Improvement Program (HSIP) requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The HSIP also requires a Strategic Highway Safety Plan (SHSP) that defines State safety goals and describes a program of strategies to improve safety in order to achieve a significant reduction in traffic fatalities and serious injuries on all public roads

The 2017 update to the Texas (SHSP) acknowledged a steady increase in roadway fatalities since 2012, despite efforts to improve roadway user behavior and upgrade roadway conditions. The SHSP maintains a vision of moving to zero deaths on roadways, and represents a multidiscipline collaboration aspiring to make Texas travel safer by reducing crashes, fatalities, and injuries by focusing on seven key emphasis areas, being distracted driving, impaired driving, intersection safety, older road users, pedestrian safety, roadway and lane departures, and speeding.

The analysis detailed in this memo is conducted to support the RGVMPO's contributions to the vision expressed in the SHSP and to support an effective data driven process for prioritizing transportation safety improvements in the region.

Crash counts and crash rates are examined by individual year in comparison to statewide data and as a 5-year rolling average for comparison to FAST Act Roadway Safety Performance Measures (PM1) and Texas statewide safety performance targets. Crashes by severity are compared to the regional totals to examine propensity for harm in the case of a crash.

A review of contributing factors was performed to gain insight on operational vulnerabilities and inform strategy development. Crash hotspots, and top crash intersections and segments are delineated to identify location specific safety needs.

In addition to identifying issues that need to be addressed, the results of this analysis can be used to inform the development of need and purpose for safety strategies and design elements in future transportation projects, as well as inform the assessment and scoring of proposed projects by providing data-driven benchmarks for safety performance measures. Reviewing regional safety patterns in comparison to statewide statistics and targets also provides the Rio Grande Valley Metropolitan Planning Organization (RGVMPO) with a benchmark and tools to assess and compare progress in contributing to PM1 statewide targets in subsequent reports. The iterative process of evaluating safety performance metrics and investments in safety improvements over time can help RGVMPO members, state, and federal planning partners continue to develop effective strategies to improve safety for the multimodal transportation system.

Data Overview

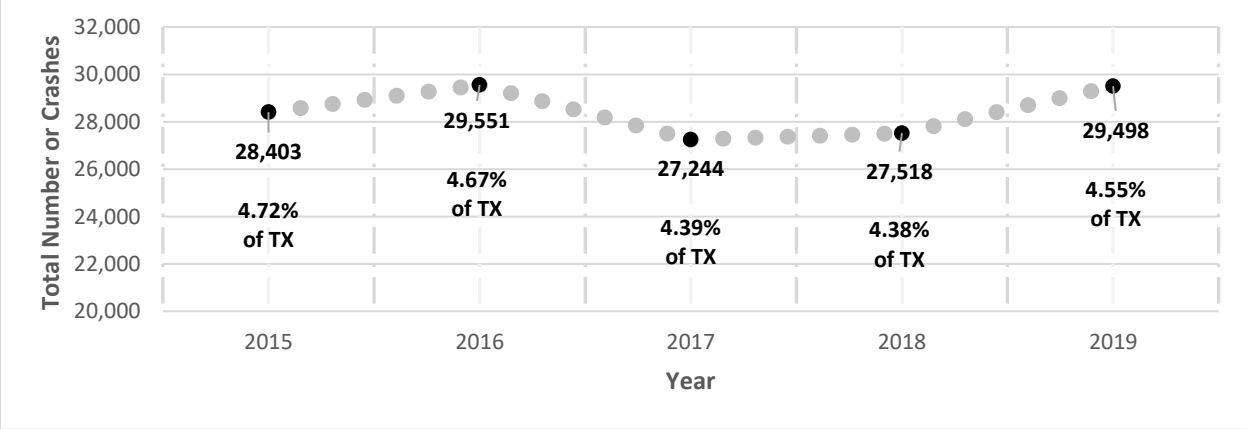
The data used in this analysis was obtained from the Crash Records Information System (CRIS) and covers the most recent five year period (2015-2019) of data available in support of the requirements set forward in the Safety Performance Management Measures Final Rule (49 CFR part 490). CRIS is maintained by the Texas Department of Transportation (TxDOT) and is a database that contains a collection of records regarding motor vehicle traffic crashes as submitted by law enforcement officers through a standardized crash report. These reports are processed to exclude personal information but include other crash details relevant to analysis, such as crash severity, contributing factors, time of day, location, and roadway condition. The summaries and figures in this analysis provide illustrations to better understand regional crash trends in the RGVMAB, including total crashes regionwide, crash rates, crashes by severity, and crashes involving pedestrians or bicyclists (active transportation crashes).

Crash Trends

Total Crashes by Year

Between 2015 and 2019, a total of 142,216 crashes occurred within the RGVMAB. Over this five-year period, the total number of crashes per year has remained between the range of 27,000 to 30,000, with the largest single-year total (29,551) occurring in 2019. The region experienced an 8% decrease in the total number of crashes between 2016 and 2017 and a 7% increase between 2018 and 2019. **Figure 1** summarizes the annual number of reported crashes in the region between 2015 and 2019.

Figure 1: Regional Crash Totals by Year and as a % of Total Statewide Crashes, 2015-2019



Total Crash Rates by Year

Crash rate is a metric that illustrates the ratio of crashes that occurred per vehicle miles traveled (VMT) within the region. This provides a method to normalize the gross crash count by including a consideration of roadway usage (i.e. VMT). Crash rates over the five-year period remain consistent, with a gradual decrease from 2016 to 2018 and a gradual increase from 2018 to 2019. Over this five-year period, VMT gradually increased from 22.5 million VMT to 25.2 million VMT. These trends reveal that crashes do not necessarily correlate directly with the amount of travel (i.e. VMT), as the crash rate did not consistently increase along with VMT. Annual VMT for 2015 to 2018 was retrieved from TxDOT's Roadway Inventory Annual Report. 2019 VMT estimation was extracted from the current regional Travel Demand Model (TDM). **Figure 2** shows the crashes per 100 million vehicle miles traveled for the region between 2015 and 2019.

Figure 2: Regional Crashes per 100 Million VMT by Year, 2015-2019

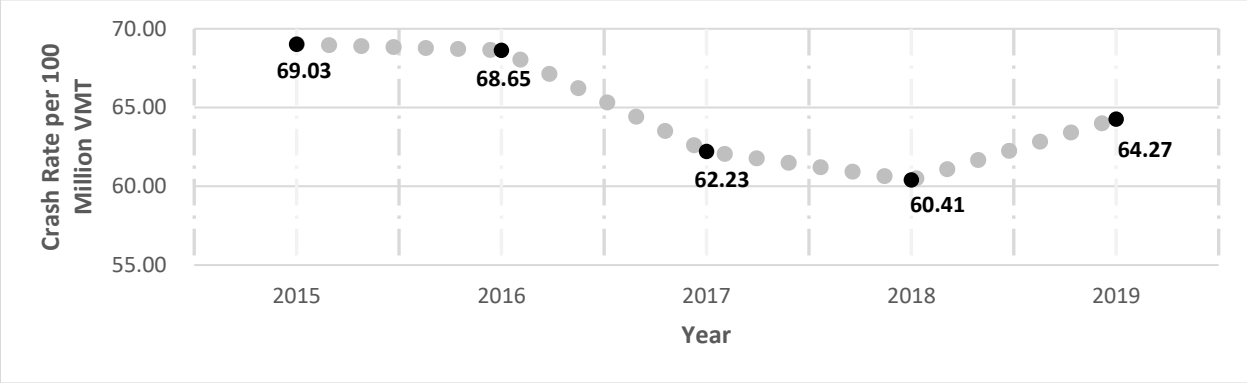
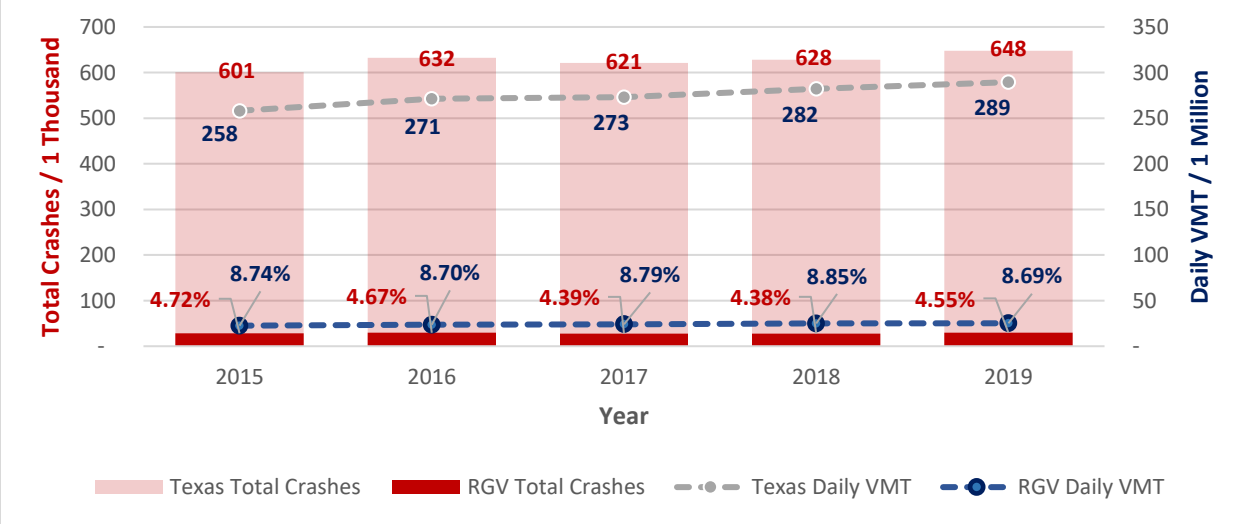


Figure 3 further illustrates the comparison of regional crashes to statewide crashes as a function of VMT. While the total number of crashes for the region is between 4.38% and 4.72% of the statewide total crash count by year, the region has represented a higher percentage of the statewide VMT, which indicates that the RGVMAB has a lower occurrence of crashes for every mile traveled when compared to the statewide rate for all crashes. Total crash counts shown in **Figure 3** are represented by the thousands and daily VMT is represented by the millions.

Figure 3: Regional Crash Totals and VMT by Year as a Percent of Statewide Values



Crashes by Severity

Crash severity is a crucial aspect of each reported accident because crashes that result in fatalities or serious injuries represent a higher risk to life and safety, and understanding where there are concentrations of these types of crashes can illuminate opportunities for operational or design improvements. The following section reviews crash data in three different ways – total crashes/crash rate, the total number/rate of crashes resulting in fatality, and the total number/rate of crashes resulting in serious injury – and compares the rolling averages of these values to those at the statewide level. The data represented in **Table 1** demonstrates that, on average, only 1.38% of crashes in the region resulted in a serious injury, and just under 0.31% resulted in a fatality.

Table 2 compares the regional five-year rolling average to the statewide average.

Table 1: : RGVMAB Crash Totals & Rates by Year and 2019 5 Yr. Rolling Average

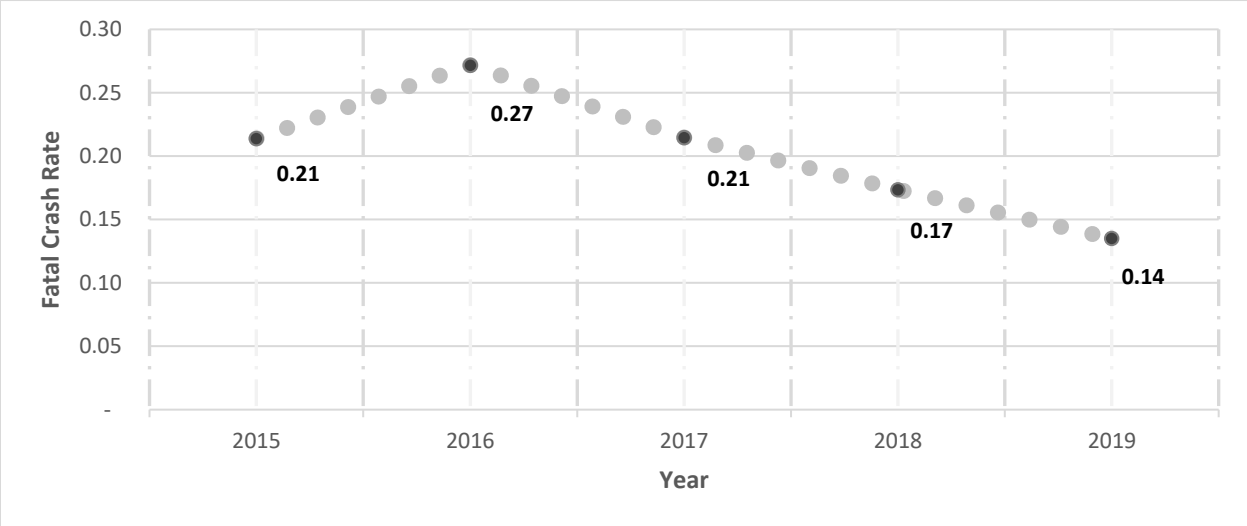
Measure	2015	2016	2017	2018	2019	2019 5 Yr. Rolling Average	% of Total
Number of Crashes	28,403	29,551	27,244	27,518	29,500	28,443.2	100%
Rate of Crashes per 100 million VMT	69.03	68.65	62.23	60.41	64.27	64.92	-
Number of Fatalities	88	117	94	79	62	88	0.309%
Rate of Fatalities per 100 million VMT	0.21	0.27	0.21	0.17	0.14	0.20	-
Number of Serious Injuries	384	421	398	338	427	393.6	1.384%
Rate of Serious Injuries per 100 million VMT	0.93	0.98	0.91	0.74	0.93	0.90	-

Table 2: RGVMAB and Statewide Comparison; 2019 5 Year Rolling Average

Measure	RGVMAB 2019 5 Yr. Rolling Average	TX 2019 5 Yr. Rolling Average	% of TX Crashes	TxDOT 2028 Target
Number of Crashes	28,443.2	626,172	4.54%	-
Rate of Crashes per 100 million VMT	64.92	124.53	-	-
Number of Fatalities	88	3,363	5.00%	3,708
Rate of Fatalities per 100 million VMT	1.01	1.35	-	1.16
Number of Serious Injuries	393.6	13,836	5.49%	-
Rate of Serious Injuries per 100 million VMT	4.49	6	-	-

Though the region experienced its second highest total number of crashes in 2019 (29,551) compared to the other four years in the five-year period, 2019 also had the lowest number of crashes resulting in fatality (62). The five-year rolling average rate of fatal crashes per 100 million VMT in the RGVMAB over the reporting period was 0.20. A comparison to the Statewide five-year rolling average rate of fatal crashes (1.35) indicates that fewer crashes in the region have resulted in fatality compared to the rest of the State over the last five years. **Figure 4** illustrates annual rates of fatal crashes and **Figure 5** shows annual rates of serious injury crashes. It is worth noting that while the total crash rate over the five-year period has varied with an increase in 2019, the rate of fatalities has decreased over the same period.

Figure 4: Regional Rate of Fatal Crashes per 100 Million VMT by Year, 2015-2019



In contrast to the downward trend in fatality rates, the rate of serious injury crashes seems to follow a similar trend in variance over the five-year period as the total crash rate.

Figure 5: Regional Rate of Serious Injury Crashes per 100 Million VMT by Year, 2015-2019

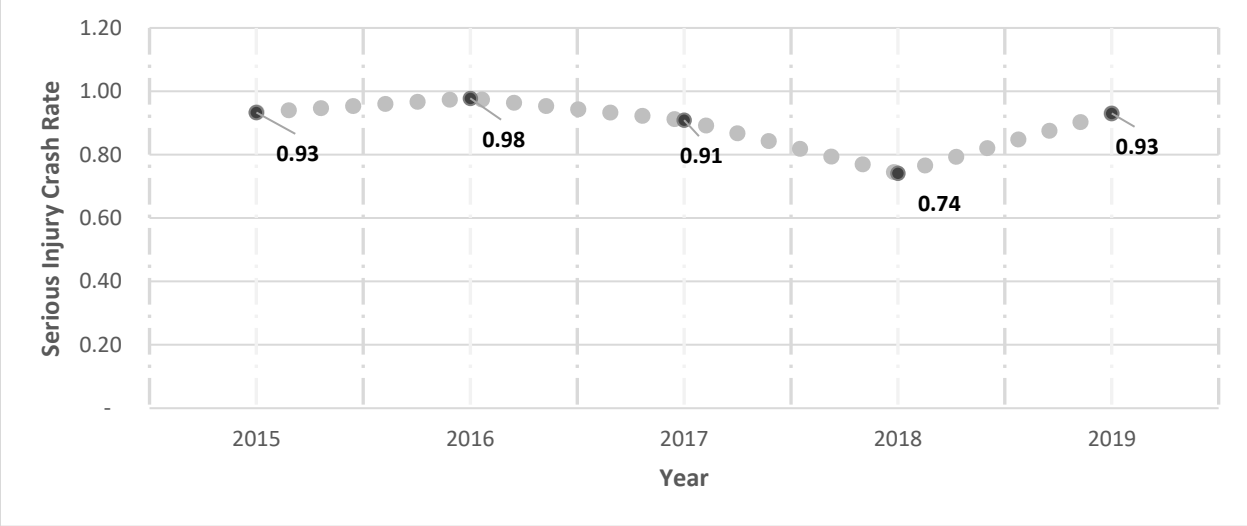
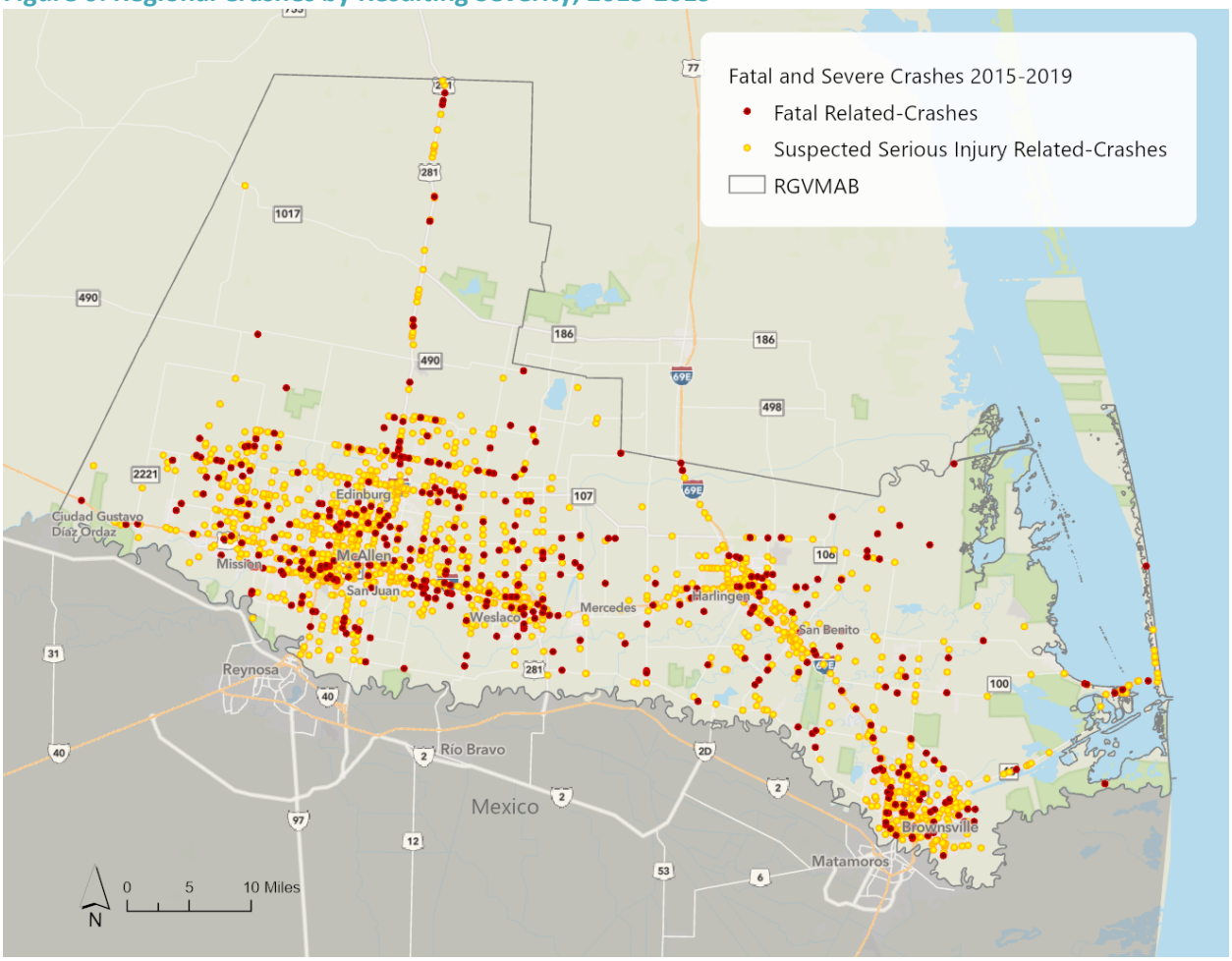


Figure 6 maps the location of all crashes resulting in fatality or serious injury between 2015 and 2019.

Figure 6: Regional Crashes by Resulting Severity, 2015-2019

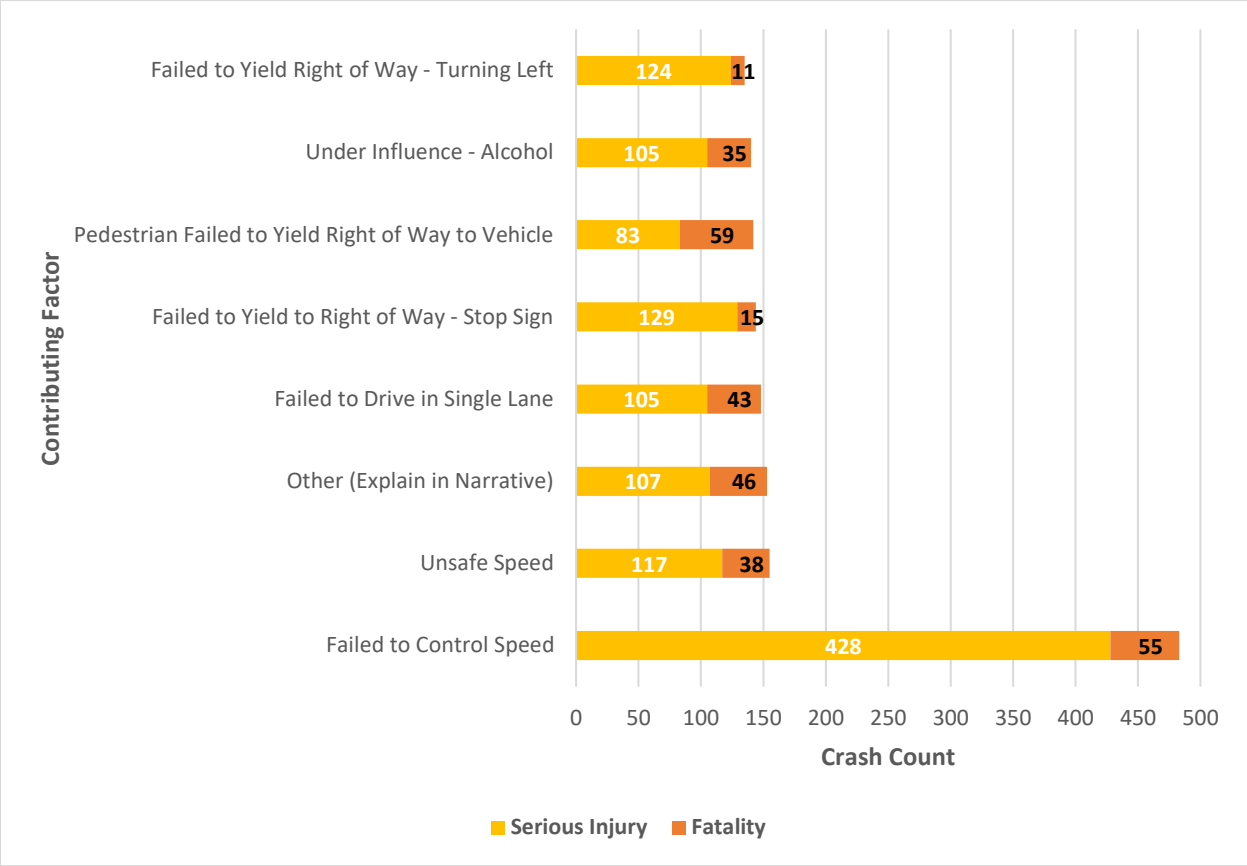


Top Contributing Factors

It is vital to understand common factors that contribute to crashes, especially those resulting in serious injuries or fatalities. Identifying the top contributing factors allows the RGVMPO and its planning partners to incorporate proven safety countermeasures and crash modification factors into the design and prioritization of future roadway investments in order to address or mitigate these contributing factors.

Of the top eight contributing factors, the top two (in terms of total crashes) involved speeding, while three others involved failing to yield the right of way. The top eight contributing factors are represented in **Figure 7** and categorized by crash severity.

Figure 7: Number of Fatal and Serious Injury Crashes by Contributing Factor, 2015-2019



FHWA has set out a variety of proven safety countermeasures, such as implementing a roundabout at an intersection with a high crash rate or installing walkways to increase safety for pedestrians on segments where pedestrian-related crashes were higher than others (**Figure 8**).

In some cases where the implementation of a proven safety countermeasure in response to a top contributing factor is not possible, a risk management approach can be used by applying crash modification factors. One example of this concept can be illustrated using the top contributing factor represented in **Figure 7**. Failure to control speed might indicate that the improvement of a roadway should incorporate traffic calming techniques, however, if the roadway is an interstate, the application of traffic calming measures would be prohibited.

In this case, several crash modification factors (CMF) could be considered with the goal to reduce the risk and/or severity of a crash where speeding was a factor. One such CMF would be to install cable rails in the clear zone for non-elevated portions of the interstate. A crash might still occur in this location, but the likely severity of the crash could be greatly reduced by the cable rail compared to the potential severity if no rail or concrete barriers were present.

Additionally, the consideration of safety countermeasures and CMFs can be used when scoring and comparing new roadways where no data is yet available. In these instances, the design and scope of the new roadway can be scored based on what safety countermeasures and CMFs it incorporates in comparison to the region's top contributing factors.

A new commercial corridor that implements access management should ostensibly receive a better score than a roadway that allows any number of driveways, as the first example has a higher likelihood of improving regional safety performance because it directly addresses the top contributing factor of failure to yield.

Point scale and range for this scoring process would need to be considered thoroughly and carefully to avoid creating a false sense of bias. **Figure 8** shows the safety countermeasures promoted by FHWA, and further detail can be found on FHWA's safety page.[1] Additional information on CMFs can be found on the CMF Clearinghouse.[2]

Figure 8: FHWA Proven Safety Countermeasures[3]

Active Transportation Crashes

Of the 142,203 (**Table 4**) crashes that occurred during the five-year period, a total of 2,238 crashes were categorized as active transportation crashes, which is 1.6% of the total number of crashes for the RGVMAB. **Table 3** shows the total and severity of active transportation crashes and five-year rolling average. Reviewing crash severity for non-motorized users, 5% resulted in a fatality.

[1] https://safety.fhwa.dot.gov/provencountermeasures/fhwasa18029/
[2] http://www.cmfclearinghouse.org/
[3] https://safety.fhwa.dot.gov/provencountermeasures/

Additionally, the five-year rolling average indicates that approximately 12% of active transportation accidents resulted in serious injuries.

Table 3: Regional Active Transportation Crashes, 2015-2019

Measure	2015	2016	2017	2018	2019	5 Year Rolling Average	Percent of AT Crashes Total
Total Number – AT Crashes	472	475	424	418	449	447.6	100%
AT Crashes Resulting in Fatality	25	30	26	23	19	24.6	5%
AT Crashes Resulting in Serious Injury	64	55	49	45	63	55.2	12%

Table 4 summarizes the five-year counts and percentage of active transportation crashes in comparison to regional totals for all crashes. While non-motorized crashes comprise only 1.57% of all crashes for this period, they comprise 26.14% of all fatal crashes.

Table 4: Comparison of Five-Year Crash Totals; Active Transportation vs. All Users, 2015-2019

Measure	All Users	Active Transportation	Percent of Measure
Crash Count	142,216	2,238	1.57%
Fatalities	440	115	26.14%
Serious Injuries	1,968	248	12.60%

Figure 9 shows the total number of active transportation crashes resulting in fatality per year throughout the region between 2015 and 2019.

Figure 9: Activation Transportation Crashes Resulting in Fatality by Year, 2015-2019

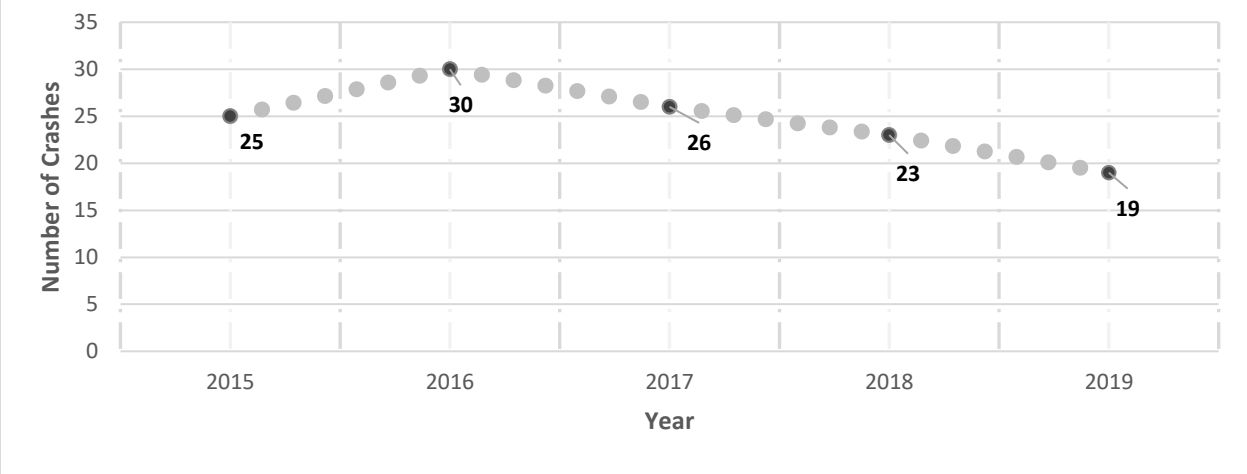
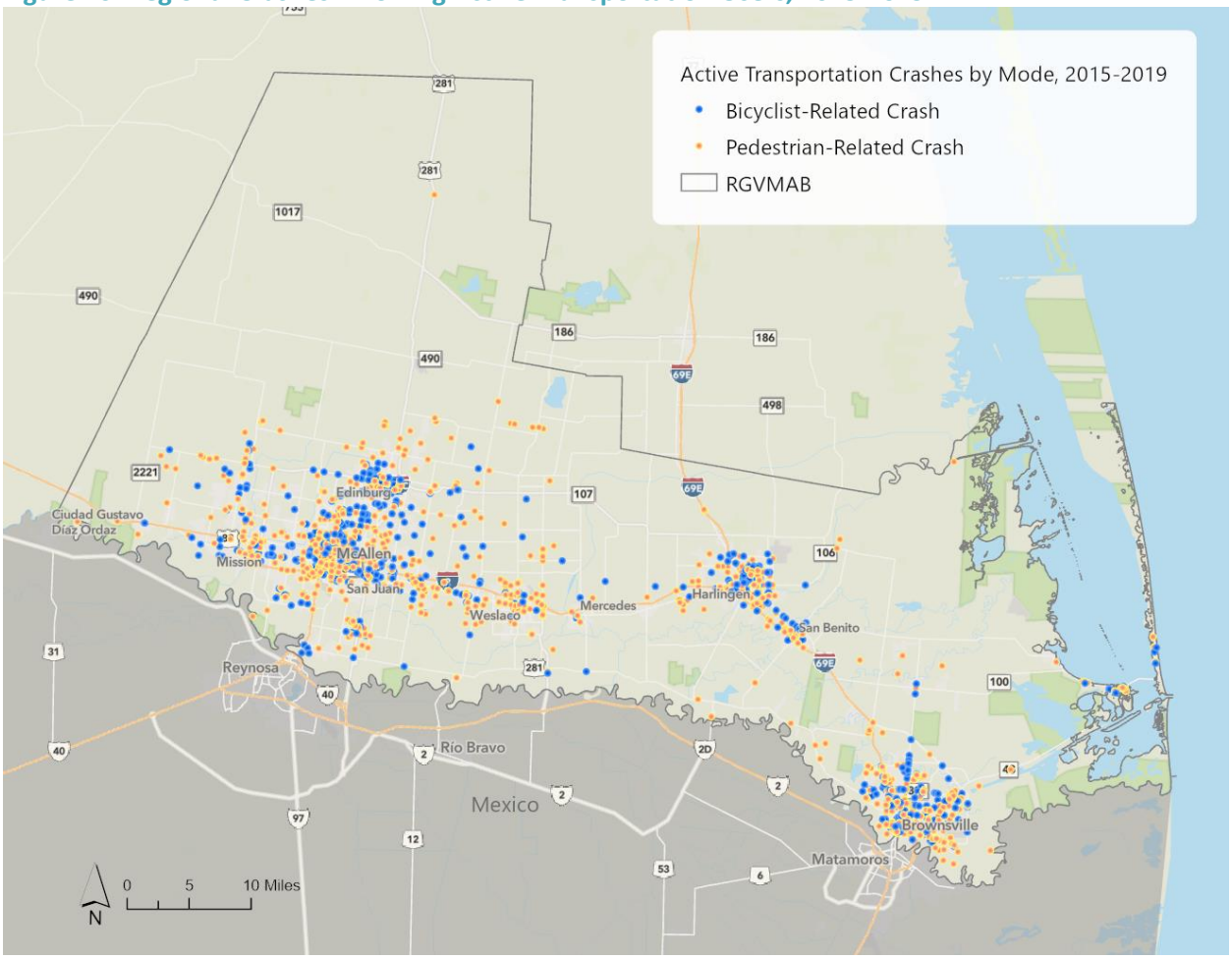


Figure 10 shows the location of crashes involving bicyclists and pedestrians throughout the region between 2015 and 2019.

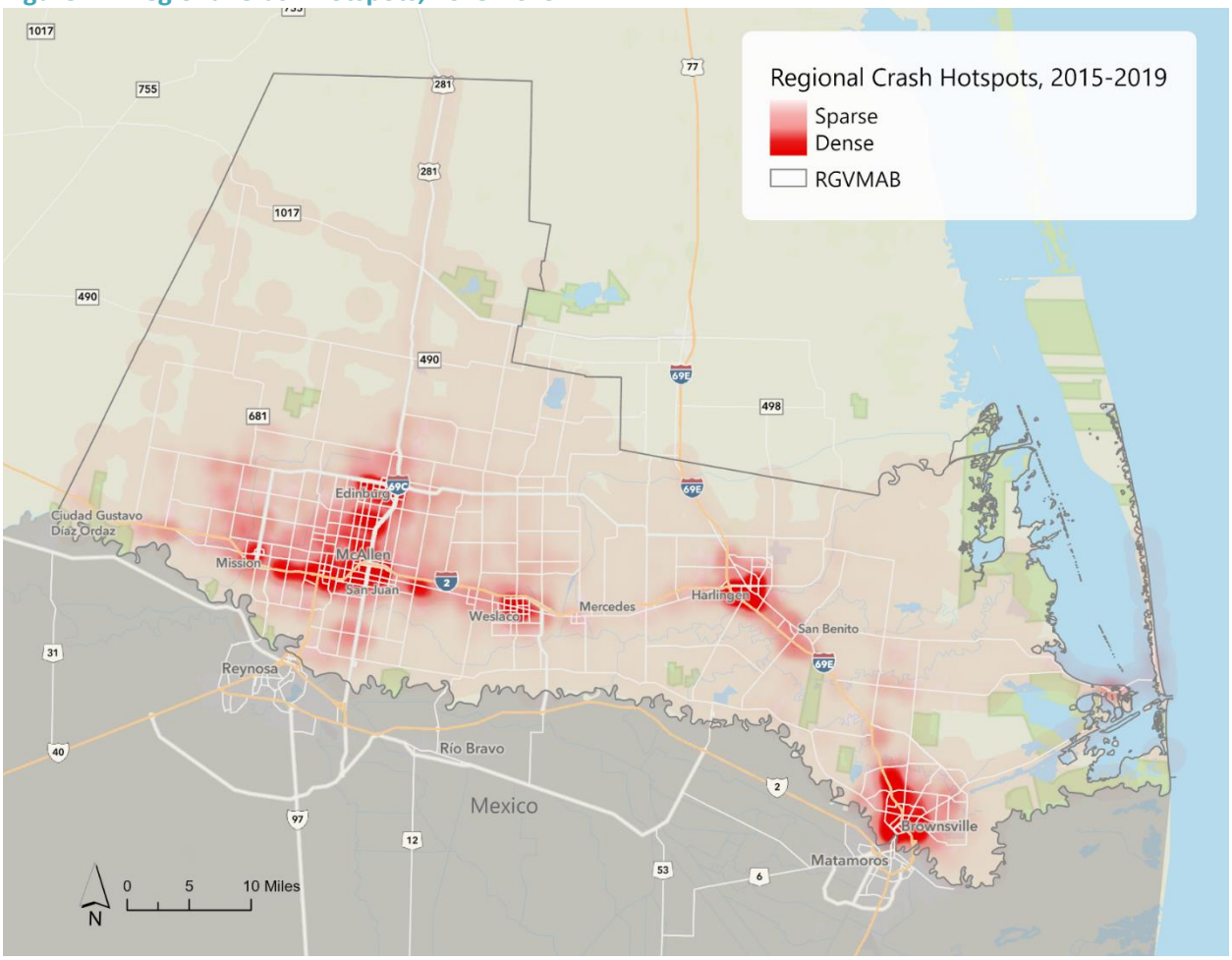
Figure 10: Regional Crashes Involving Active Transportation Users, 2015-2019



Crash Hotspots

Crash hotspots were identified within the RGVMAB through spatial analysis of intersections and roadway segments that experienced the highest number of crashes over the five-year period. Total crashes, crashes involving pedestrians, crashes involving bicyclists, and crashes resulting in serious injury or fatality are all considered in this analysis. **Figure 11** displays crash hotspots identified through geolocation of the collected crash data.

Figure 11: Regional Crash Hotspots, 2015-2019



Top Crash Intersections

Using the TDM network, a GIS points layer was generated to identify all intersections in the roadway network for the region. Along with crash point data, these intersection points were used to conduct a proximity analysis that associated intersection crashes to the nearest intersection. Texas crash data was filtered using attributes provided in the dataset that flagged crashes occurring at intersections. Once the crash data was narrowed down, the number of crashes for each intersection was calculated by assigning each crash to its closest intersection. The analysis below lists and summarizes the intersections that experienced the most crashes between 2015 and 2019.

Top Intersections – Total Crashes

Nine of the top twenty intersections with the highest total crashes are located along frontage roads. Two of the top twenty intersections are located on E. Ruben M. Torres Blvd., two on N. Cage Blvd., and two more are located on Harrison Ave./Tyler Ave. (Spur 206). The intersection of be E. Ruben M. Torres Sr. Blvd. at Old Hwy 77 topped the list with the highest total number of crashes (106) between 2015 and 2019. **Table 5** shows the number of crashes experienced at the top 20 crash intersections in the region and provides details on whether active transportation users were involved and how many fatal or serious injury crashes occurred at these locations.

Table 5: Top 20 Crash Intersections, 2015-2019

Intersection	Crash Count	Bicyclist Crashes	Pedestrian Crashes	Serious Injury Crashes	Fatal Crashes
E. Ruben M. Torres Sr. Blvd. & Old Hwy 77	106	0	0	24	0
E./W. Frontage Rd. (US-83) & S. Ware Rd.	86	0	1	1	0
Spur 206 & IH-69E	80	0	2	1	0
E./W. Frontage Rd. (US-83) & S. Shary Rd.	79	0	1	1	0
E./W. Frontage Rd. (US-83) & S. Bryan Rd.	67	0	0	1	0
E. Tyler Ave. (Spur 206) & S. 15th St.	67	1	3	0	0
E./W. Frontage Rd. (US-83) & N. Cage Blvd.	66	0	1	1	0
E. Earling St./E. Nolana Loop & N. Cage Blvd.	61	0	2	1	0
E. Rueben M. Torres Blvd. & N./S. Frontage Rd. (IH-69E)	56	0	0	1	0
W. Alton Gloor Blvd. & N./S. Frontage Rd. (IH-69E)	54	0	0	0	0
W. Price Rd. & N./S. Frontage Rd. (IH-69E)	54	0	0	0	0
Ed Cary Dr. & N./S. Frontage Rd. (IH-69E)	53	0	0	0	0
W. Wisconsin Rd. & S. McColl St.	53	1	0	2	0
US-83 & Jackson Rd.	50	1	1	1	0
E./W. Frontage (US-83) & S. 10th St.	47	1	3	2	0
Wilson Rd. & IH-69E	46	0	0	0	0
W. Ferguson Ave. & N. Cage Blvd.	46	0	0	0	0
TX-54-SPUR & IH-69E	45	1	0	1	0
Primera Rd./TX-499-Loop & N. 77 Sunshine Strip	44	0	0	1	0
BUS-83 & Alamo Rd.	43	0	0	0	0

Top Intersections – Crashes Involving Pedestrians

Out top twenty intersections for all crashes, eight of those intersections involved pedestrian collisions. Both the intersection of E. Tyler Ave. (Spur 206) & S. 15th St. and E./W. Frontage (US-83) & S. 10th St. involved three pedestrian crashes .

Top Intersections – Crashes Involving Bicyclists

Although the number of bicycle-related crashes accounts for around 0.5% of all crashes in the region, only five of those crashes took place at one of the top twenty intersections identified within the RGVMAB, which all reported involving just one bike related crash.

Top Intersections – Crashes Resulting in Serious Injury or Fatality

For intersections where crashes resulting in serious injury or fatality occurred over the five-year period, six of the intersections are located along frontage roads. The intersection of E. Rueben M. Torres Blvd. & Old Hwy 77 experienced 24 crashes involving serious injury during the five-year period, which is the highest amount of this type of crash for all intersections. None of the top twenty intersections involved any crashes that resulted in fatalities.

Top Crash Roadway Segments

To identify the roadway segments with the highest crash counts in the RGVMAB over the five-year period, the RGVMPO 2045 MTP utilizes the same proximity analysis used for the intersection hotspots

applied instead to the roadway segments in the RGVMAB. Intersection crashes were excluded from this analysis. The analysis first determines a 150-foot buffer around RGV TDM network segments. The next step is to assign any crashes within the buffer to a segment, indicating that the crash likely occurred along that portion of the roadway. The result of this analysis is a list of top roadway segments in the region with potential safety issues (i.e. road segments that experienced the highest number of crashes between 2015 and 2019).

Top Segments – Total Crashes

Seven of the top twenty high-crash segments are located along IH-2/US-83, indicative of both the high degree of traffic flowing along the freeway and the increased safety concerns generated by high-speed roadway facilities. Three other high-crash segments are located on IH-69E, three are located on IH-69C, and two are located on E. Ruben M. Torres Blvd./FM 802. The roadway segment of IH-2/US-83 from S. Jackson Rd. to Sugar Rd. topped the list with 664 crashes between 2015 and 2019.

Figure 12 presents the locations of both the top twenty intersections and segments with the highest crash total over the five-year period from 2015 to 2019.

Figure 12: Top 20 Most Dangerous Intersections & Segments, 2015-2019

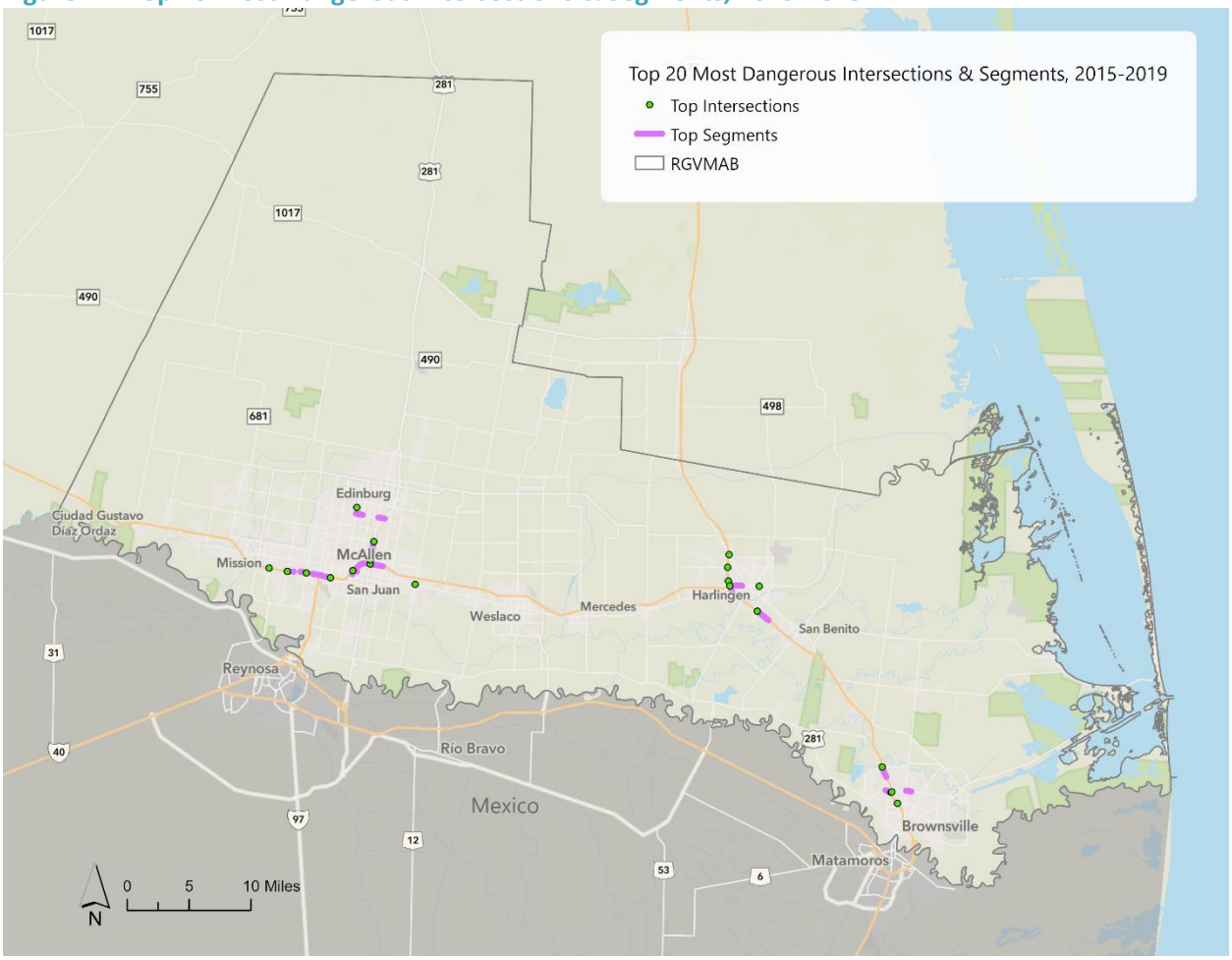


Table 6 describes the roadway segments that experience the largest number of crashes and provides a total number of crashes that occurred along these segments during the five-year period.

Table 6: Top 20 Crash Segments, 2015-2019

Roadway	Limit To	Limit From	Crash Count	Bike Crashes	Pedestrian Crashes	Serious Injuries	Fatal Crashes
I-2/US-83	Jackson Rd.	Sugar Rd.	664	0	2	3	0
I-2/US-83	N. Cage Blvd.	N. Veterans Blvd.	606	0	1	3	1
I-2/US-83	S. 23rd St.	S. 10th St.	558	0	0	6	1
I-69E	Spur 206	W. Lincoln Ave.	555	0	0	6	0
N. Cage Blvd./I-69C	W. Sioux Rd.	W. Earling St.	455	0	1	4	0
SS 206	I-69E	S. F St.	425	2	3	1	2
I-2/US-83	Sugar Rd.	N. Cage Blvd.	406	0	0	0	1
I-2/US-83	S. Shary Rd.	S. Taylor Rd.	370	0	2	4	0
W. Trenton Rd.	S. McColl St.	Jackson Rd.	344	0	0	4	0
N. Cage Blvd/I-69C	IH-2	E. Ferguson Ave.	292	0	1	1	0
I-69E	Morrison Rd.	W. Alton Gloor Blvd.	289	0	2	7	1
Jackson Rd.	W. Kelly Ave.	US-83-BR	287	1	1	1	0
I-69E	Ed Carey Dr.	Helen Moore Rd.	261	0	1	4	1
N. Cage Blvd./I-69C	E. Ferguson Ave.	W. Sioux Rd.	250	0	0	1	0
US-83-BR	Jackson Rd.	S. Casa Rd.	246	1	0	4	0
I-2/US-83	Bentsen Rd.	S. Ware Rd.	244	0	0	3	0
I-2/US-83	S. 29th St.	S. 23rd St.	232	0	1	2	1
E. Rueben M. Torres Blvd.	McFadden Dr.	Old Hwy 77	209	0	1	2	2
W. Trenton Rd.	S. Closner Blvd.	I-69C	201	0	0	0	0
E. Ruben M. Torres Blvd.	Paredes Line Rd.	Hudson Blvd.	171	0	1	1	0

Top Segments; Crashes Involving Pedestrians

Focusing on roadway segments with relatively high counts of crashes involving pedestrians, four of the top segments are along I-2/US-83. The roadway segment that experienced the highest number of crashes involving pedestrians is SS 206 from I-69E to S. F St. with three crashes between 2015 and 2019.

Top Segments; Crashes Involving Bicyclists

Analysis of crashes involving cyclists revealed that there are three segments where this type of crash occurred. SS 206 from I-69E to S. F St. experienced the highest number of accidents (2) involving bicycles

between 2015 to 2019. The other two segments recorded one cyclist related crash each, which were the segments of US-83-BR from Jackson Rd. to S. Casa Rd. and Jackson Rd. from W. Kelly Ave. to US-83-BR.

Top Segments; Crashes Resulting in Serious Injury or Fatality

Of the top twenty roadway segments with the highest total number of crashes resulting in serious injury or fatality, thee of the top five are located on I-69E, and the other two are located along I-2/US 83. The segment of I-69E from Morrison Rd. to W. Alton Gloor Blvd. topped the list with eight (8) crashes resulting in serious injury or fatality over the five-year period.

Conclusion

The primary takeaways from the RGVMPO 2045 MTP safety analysis for the RGVMAB include:

- Although crash locations occur in areas of higher VMT, they do not necessarily correlate directly with the amount of travel (i.e. VMT), as the crash rate did not consistently increase along with VMT over the five-year period.
- The serious injury and fatality rates for the RGVMAB are all significantly lower in comparison to the Texas statewide average.
- The total number of crashes involving pedestrians is around 2.41 times higher than the number of crashes involving cyclists.
- The interstates and frontage roads within the region seem to have the highest crash rates and should be considered a priority when considering safety improvements.

The RGVMAB is a very large region and although some segments may be viewed as having higher crash rates than others, all crash hotspots within the region should be reviewed to determine proper safety improvements moving forward. The analysis of observed crash hotspots and overall safety trends is intended to help the RGVMPO and its planning partners prioritize projects and safety improvement strategies based on a data driven approach to address regional safety and mobility. This information is also intended to help the MPO's planning partners identify factors that contribute to crash prevalence and severity (including speed, lack of pedestrian and bicycle facilities, and geometric design issues) that can be used to inform future planning efforts and project identification moving forward in future efforts.