

High Injury Network

The High Injury Network (HIN) is a data-driven analysis conducted in the City of Mansfield to identify corridors and intersections requiring enhanced safety measures based on road segments and intersections that have experienced a higher-than-average rate of crashes resulting in fatal, severe, and minor injuries. The HIN employs the High Safety Manual Critical Crash Rate Method, considering crashes, road classifications, and traffic volumes.

Critical Crash Rate Method

Calculating critical crash rates involves comparing roadway segments with similar functional classes and contexts, normalized by vehicle miles traveled (VMT). If the observed crash rate on a segment exceed the expected crash rate, it is flagged to potentially be added to the HIN. Since the critical crash rate method requires several intermediate calculations to arrive at a final crash rate, an ARCGIS Pro model was created to complete these calculations for each segment on the City's network. The creation of the HIN follows the three critical steps outlined below:

1 Assigning Data to Road Segments

Calculating the critical crash requires four data inputs: roadway functional classification, context, daily traffic volumes, and weighted crash counts. Crashes were assigned weights of 12 for fatal crashes, 3 for severe injury crashes, and 1 for minor injury crashes. This assignment ensured that areas with high injury crashes were prioritized in the development of the HIN. Similarly, traffic volume and functional classifications were also assigned to the roadways during this step.

2 Calculate Variables or Critical Crash Rate

The critical crash rate variables were calculated using equations from the Highway Safety Manual. This rate is determined by comparing the observed crash rate with the expected crash rate. The observed crash rate is based on the actual crashes at each segment per 100 million VMT. The expected average crash rate, also expressed per 100 million VMT, accounts for normalized daily traffic volumes for each functional class. After calculating both values for a segment, the equation identifies segments with a higher crash rate than expected for their classification, traffic volume, and weighted crash counts.

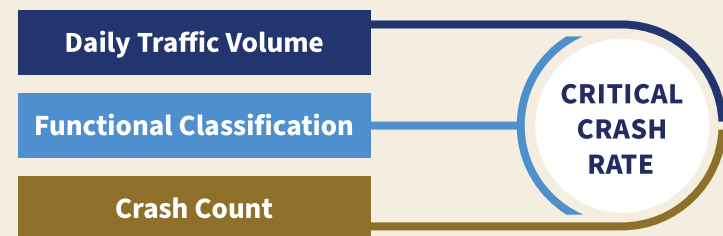
3 Calculate Critical Crash Rate Ratio

After inputting all variables, a ratio is calculated to identify segments with higher-than-average rates of fatal, serious, and minor injury crashes. If this ratio is greater than 1.0, or if the observed crash rate exceeds the critical crash rate, it indicates that the segment's crash history is higher than other road segments of similar functional classification and context.

Segments and intersections with a ratio of 1.0 or higher were considered for inclusion in the High Injury Network (HIN). The critical crash rate is essential for differentiating whether a street should be included in the HIN. By incorporating this rate into our analysis, we can more accurately identify streets with a high frequency of severe crashes, thus prioritizing corridors effectively and maximizing the impact on reducing injuries and fatalities.

Exhibit 25 on page 97 displays the Critical Crash Rate results from the GIS model.

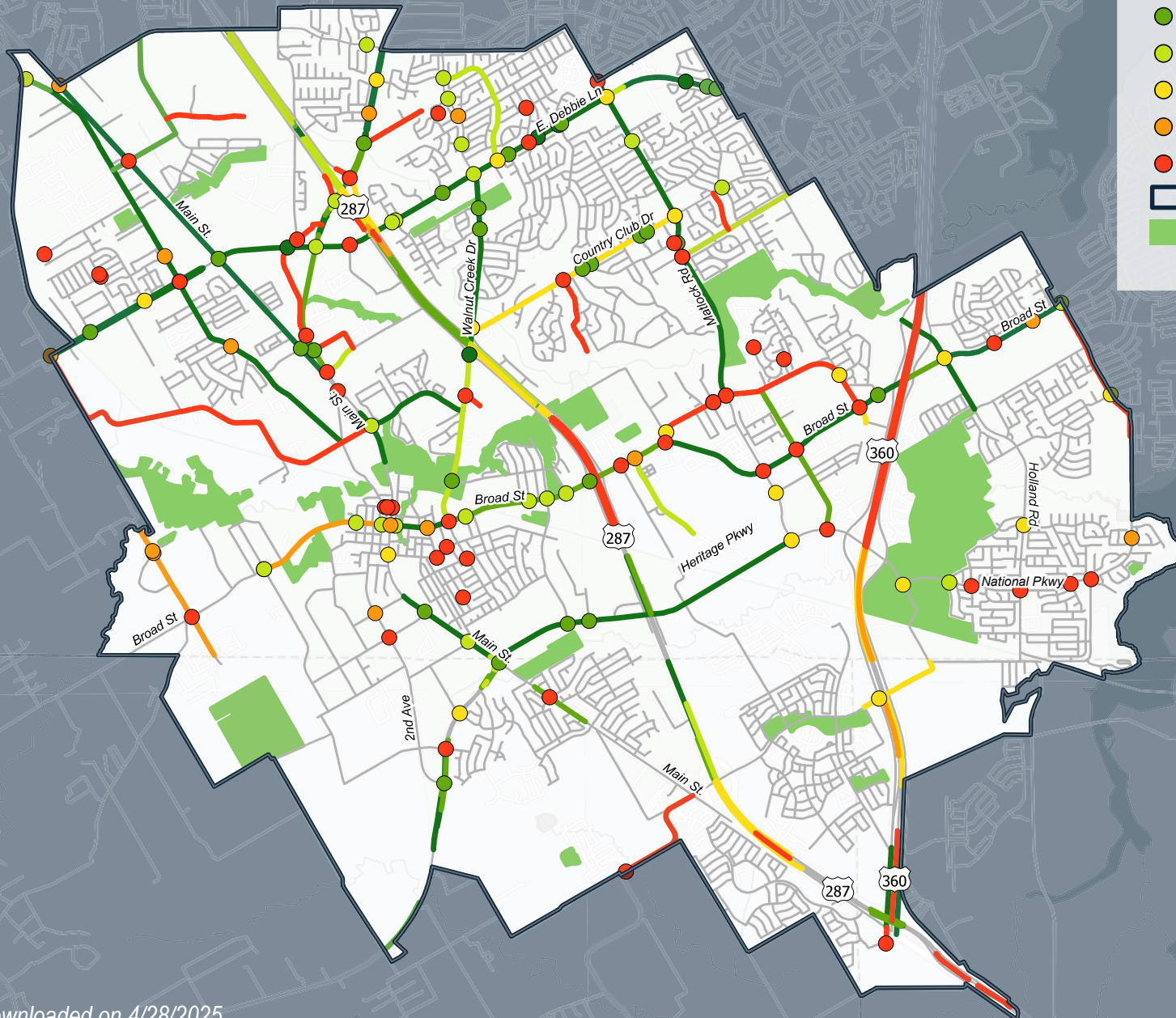
FIGURE 40. HIN DATA INPUTS



Crash Rate Ratios

Sources: City of Mansfield, Replica, TXDOT CRIS Database (2020-2024)*

EXHIBIT 25. CRASH RATE RATIOS



LEGEND

Crash Rate Ratios

- Less than 0.20
- 0.21 - 0.40
- 0.41 - 0.60
- 0.61 - 0.80
- 0.81 - 0.99
- Greater than 1

Mansfield Limits

Parks

High Injury Network Results

Creating the High Injury Network (HIN) requires both a qualitative and quantitative approach. While the critical crash rate method identifies locations with higher-than-average crash rates, finalizing the network necessitates further post-processing. This involves a qualitative approach by asking the following questions:

- » What segments and intersections can be identified from the results?
- » What gaps between segments can be closed?
- » How can the amount of road network mileage be minimized?
- » How can the number of fatal, severe injuries, and minor injury crashes be maximized?

This post processing provides a qualitative analysis beyond the data because it is important to look at these corridors from a human perspective that is validated by the data input. Ultimately, the goal of the HIN selection process is to maximize the total fatal, severe, and minor injury crashes on the least mileage of roads on the network. The final HIN for the City of Mansfield comprises 7.4% of the total road network while capturing 85.7% of all fatal crashes, 64.7% of KABs, and 61.5% of bicycle and pedestrian KAB crashes. The map for the Mansfield HIN is displayed in **Exhibit 26** on page 100. **Table 24** below lists each intersection and **Table 25** on page 99 lists each segment and that was included on the HIN.

TABLE 24. HIGH INJURY NETWORK INTERSECTIONS (2020–2024)

HIN INTERSECTIONS	TOTAL CRASH COUNT	CRASH SEVERITY			DAILY VOLUME (AADT)
		K	A	B	
W. Oak St. & N. Main St. (BUS 287)	6	0	1	1	8,900
Vinewood Dr. & S. Main St.	5	0	1	2	2,500
W. Broad St. & Retta Rd.	17	0	1	3	5,600
Hadley Ln. & Barrington Way	3	0	0	2	1,200
Saving Place Dr. & N. Walnut Creek Dr.	21	0	1	6	3,600
Airport Dr. & S. 2nd Ave.	17	0	1	7	1,100
Saint Matthew Dr. & St. Charles Dr.	2	0	0	2	1,100

TABLE 25. HIGH INJURY NETWORK SEGMENTS (2020–2024)

ROAD NAME	FROM	TO	TOTAL CRASH COUNT	CRASH SEVERITY			DAILY VOLUME (AADT)
				K	A	B	
Matlock Rd.	Mansfield Webb Rd.	Ragland Rd.	281	2	4	41	26,800
Cannon Dr.	E. Broad St.	E. Broad St.	174	0	5	37	5,200
E. Broad St.	N. Mitchell Rd.	Cannon Dr.	345	0	4	62	21,400
FM 157	Newt Patterson Rd.	Turner Warnell Rd. (Northeast)	588	2	22	102	33,400
Debbie Ln.	US HWY 287	City Boundary (North East)	547	1	9	84	31,400
Lone Star Rd.	S. Matlock Rd.	Britton Rd.	43	0	3	8	5,400
N. Miller Rd.	Cannon Dr.	Heritage Pkwy.	64	0	0	15	2,200
Newt Patterson Rd.	FM 1187	N. Main St.	63	0	4	15	800
Russell Ln.	FM 157	FM 157	52	0	3	9	100
W. Broad St.	Billingslea Dr.	N. Walnut Creek Dr.	107	0	6	25	10,100
Country Club Dr.	N. Walnut Creek Dr.	Matlock Rd.	146	0	2	25	14,500
E. Broad St.	N. Holland Rd.	N. Day Miar Rd.	88	0	2	20	13,800
FM 1187	Newt Patterson Rd.	Cardinal Rd.	80	0	2	19	19,200
N. Day Miar Rd.	E. Broad St.	E. Seeton Rd.	43	0	2	3	15,700
N. Main St.	Legacy Wy.	FM 157/ BUS 287	64	0	3	19	8,200
National Pkwy.	Calloway Dr.	Seeton Rd.	43	0	2	12	4,900
BUS 287/ N. Main St.	Nelson Wyatt Rd.	Turner Warnell Rd. (Northwest)	40	1	0	16	8,200
Heritage Pkwy.	National Pkwy.	Britton Rd.	14	0	1	3	1,200
Lone Star Rd.	City Boundary (South West)	S. Main St.	23	0	0	4	4,300
S. 2nd Ave.	City Boundary (South West)	Klein Tools Blvd.	71	1	4	14	22,200