SOUTHWEST BUTLER COUNTY

Multi-Municipal Safety Action Plan

Appendix C: Safety Analysis

PARTNERING TOGETHER for the Southwest Butler County Safety Action Plan

CRANBERRY TOWNSHIP

HARMONY BOROUGH

Jackson Township
Established 1854

ZELIENOPLE BOROUGH
INCORPORATED MAY 29, 1840
1840

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Section C1. Safety Analysis

The following Appendix discusses crash history and trends in the four-municipality study area in southwest Butler County, Pennsylvania including Cranberry Township, Jackson Township, Zelienople Borough, and Harmony Borough. To better understand the context of the crash history in the study area, it is important to understand the wider context of crash trends in the state of Pennsylvania. These statistics point to a fatal and serious injury crash peak in 2020 followed by a general decline of these crash types. There is an inverse trend showing an increase in non-motorized (pedestrian and cyclist involved) crashes across the state since 2020.

According to the US DOT Federal Highway Administration State Highway Safety Report for Pennsylvania, the 5-year average of fatalities was reported to be 1161.6 across the state for the 5-year period ending in 2023 (**Figure C1.1** and **Table C1.1**), with an average fatality rate of 1.180 fatalities per 100 million vehicle miles traveled (MVMT) **(Figure C1.2** and **Table C1.2**).

The 5-year average of serious injuries caused by crashes was reported to be 4,738.6 serious injuries across the state (**Figure C1.3** and **Table C1.3**), with an average rate of 4.806 per 100 million VMT (**Figure C1.4** and **Table C1.4**). Trends between 2017 to 2023 generally show both average fatality rates increasing and serious injury rates increasing.

The 5-year average of Non-Motorized Fatalities and Serious Injuries has been steadily increasing, with an average of 830.2 Non-Motorized Fatalities and Serious Injuries crashes occurring per year (**Figure C1.5**and **Table C1.5**). Locally-driven safety projects and policies can contribute to improving statewide averages.

In addition to Federal safety reporting, PennDOT puts together a Strategic Highway Safety Plan (SHSP), the most recent of which was updated in 2022. The plan has safety focus areas including lane departure crashes, speeding and aggressive driving, seatbelt usage, impaired and distracted driving, intersection safety, vulnerable road user safety including pedestrians, bicyclists, and motorcyclists, commercial vehicles, mature and inexperienced drivers, and work zone safety.

FIGURE C1.1– NUMBER OF FATALITIES, PENNSYLVANIA STATEWIDE

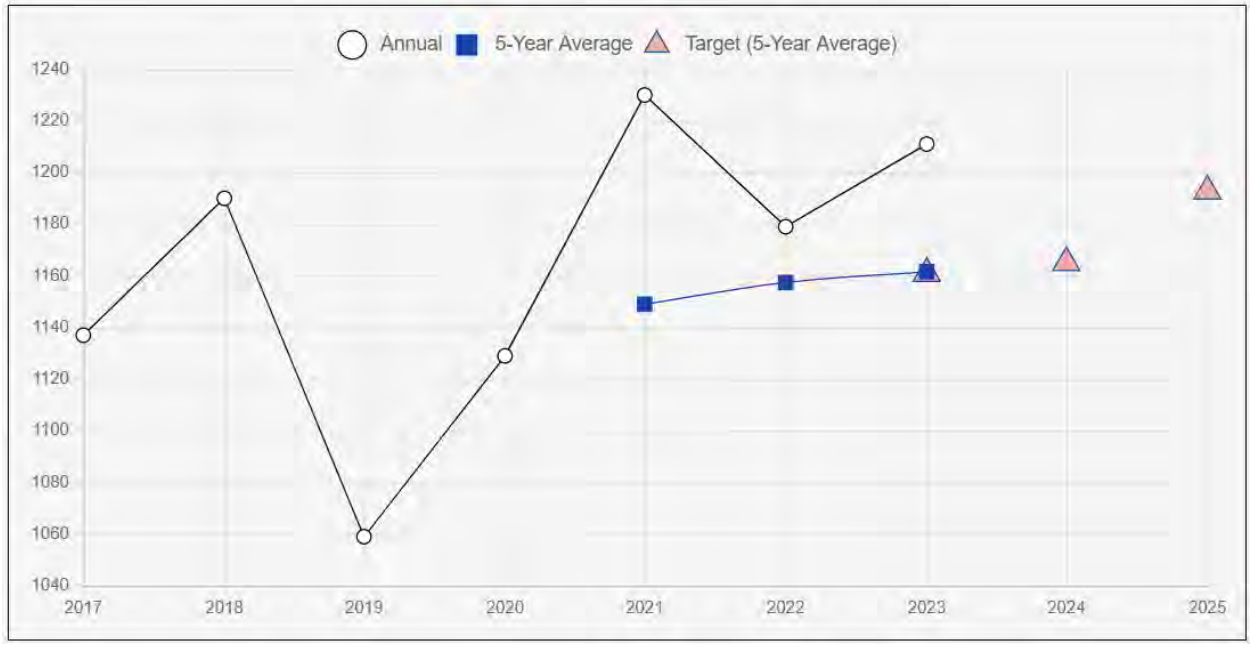


TABLE C1.1 – FATALITY TRENDS, PENNSYLVANIA STATEWIDE

Fatalities	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual	1,137	1,190	1,059	1,129	1,230	1,179	1,211		
5-Year Average					1,149.0	1,157.4	1,161.6		
Target (5-Year Average)							1,160.9	1,165.1	1,192.8

FIGURE C1.2 – FATALITY RATE (PER 100 MILLION VMT), PENNSYLVANIA STATEWIDE

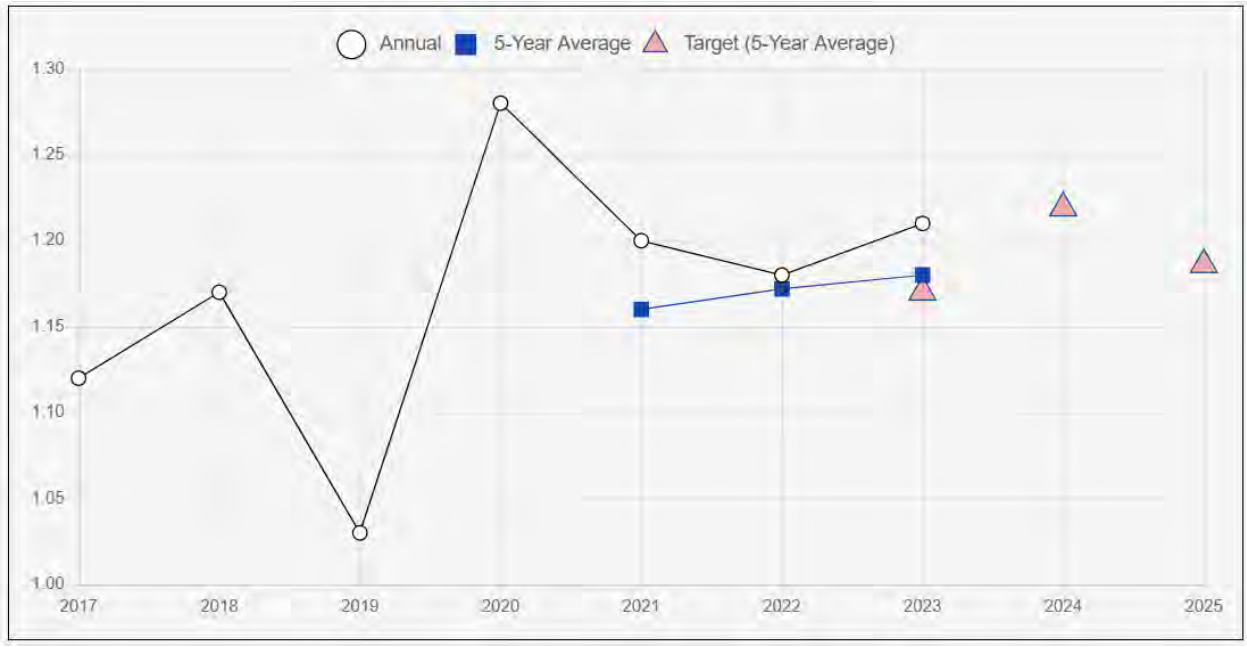


TABLE C1.2 – FATALITY RATE TRENDS, PENNSYLVANIA STATEWIDE

Fatality Rate (per 100 million VMT)	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual	1.12	1.17	1.03	1.28	1.20	1.18	1.21		
5-Year Average					1.160	1.172	1.180		
Target (5-Year Average)							1.170	1.219	1.186

FIGURE C1.3 – SERIOUS INJURIES, PENNSYLVANIA STATEWIDE

TABLE C1.3 – SERIOUS INJURIES TRENDS, PENNSYLVANIA STATEWIDE

Serious Injuries	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual	4,227	4,504	4,675	4,425	5,122	4,686	4,785		
5-Year Average					4,590.6	4,682.4	4,738.6		
Target (5-Year Average)							4,893.2	4,721.0	4,832.6

FIGURE C1.4 - SERIOUS INJURY RATES, PENNSYLVANIA STATEWIDE

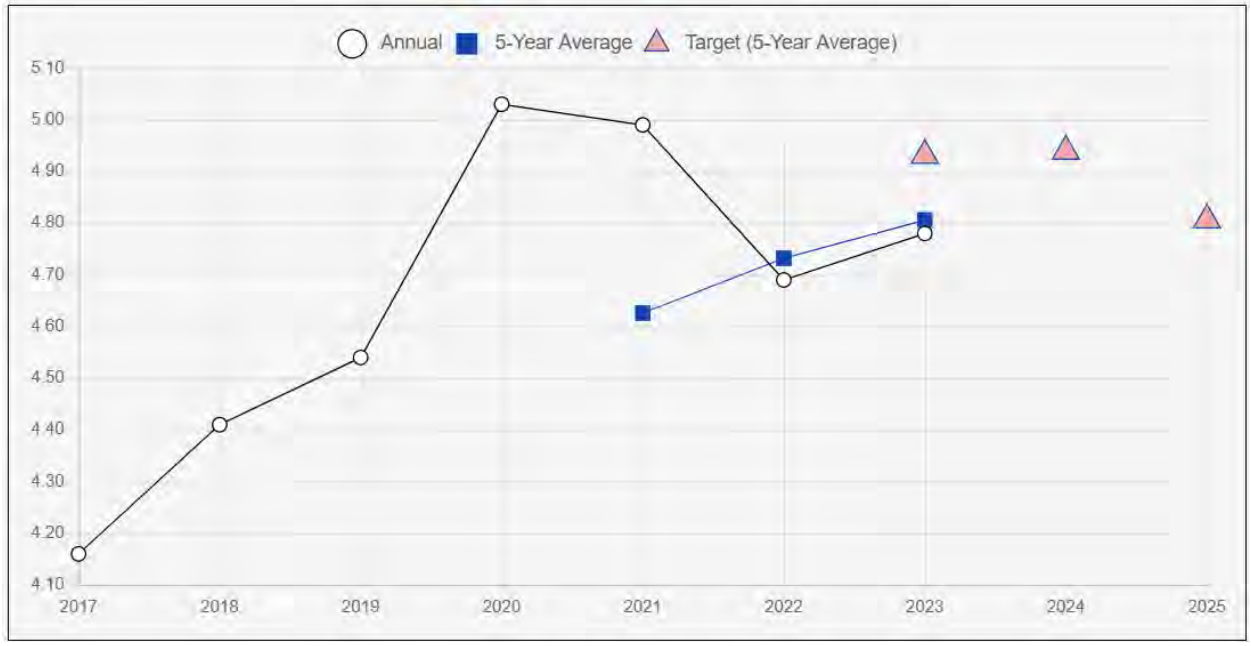


TABLE C1.4 – SERIOUS INJURY RATE TRENDS, PENNSYLVANIA STATEWIDE

Rate of Serious Injuries (per 100 million VMT)	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual	4.16	4.41	4.54	5.03	4.99	4.69	4.78		
5-Year Average					4.626	4.732	4.806		
Target (5-Year Average)							4.931	4.939	4.806

FIGURE C1.5 - NUMBER OF NON-MOTORIZED FATALITIES AND SERIOUS INJURIES, PENNSYLVANIA STATEWIDE

TABLE C1.5 – NON-MOTORIZED FATALITIES AND SERIOUS INJURIES TRENDS, PENNSYLVANIA STATEWIDE

Number of Non-Motorized Fatalities and Serious Injuries	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual	745	814	814	668	854	855	960		
5-Year Average					779.0	801.0	830.2		
Target (5-Year Average)							811.3	817.6	916.8

Section C2. Safety Data Processing

Crash data was gathered from PennDOT's Pennsylvania Crash Information Tool (PCIT) which includes crashes on both state-owned and locally-owned roadways. The 5-year analysis period is between January 1, 2019 and December 31, 2023. Using a full calendar year of data is standard practice in crash assessments, as annualized numbers provide a direct comparison to state and national averages over the same reporting period. The crash records contain information including date, time, location, collision type, maximum severity of the crash, contributing factors, environmental factors, vehicle and driver information with driver condition and contributing behaviors. The crash locations were mapped in Geographic Information System (GIS) software and crash patterns were assessed statistically. Interstate 79 mainline crashes were excluded from the study area analysis as there is a separate interstate safety program and these crashes are studied at higher levels by other agencies.

Section C3. Crash Types

Crash type distribution provides insight into the predominant conflict patterns within the study area. A total of 1,739 crashes were recorded between 2019 and 2023. As shown in **Table C3.1**, angle crashes represent the largest share (30%), closely followed by hit fixed object (26%) and rear end collisions (24%). Together, these three crash types comprise 80% of all reported crashes.

- Angle crashes (30%) typically occur at intersections or driveways and signal challenges associated with turning movements, sight distance limitations, and conflicting vehicle paths. These are prominent throughout the study area, particularly in denser commercial areas along U.S. 19 and SR 228.
- Hit fixed object crashes (26%) occur frequently along higher-speed segments, suggesting issues such as lane departure, roadside hazards, or driver loss of control.
- Rear-end crashes (24%) may reflect congestion, fluctuating speeds, and queueing near signalized intersections and closely spaced driveways.
- Less common crash types such as sideswipes (4%), head-on crashes (2%), backing collisions (0.2%), and pedestrian crashes (1%) account for the remainder.

Fatal and Serious Injury (FSI) crash types reveal similar patterns. **Table C3.2** shows that among the 59 FSI crashes in the study area, angle crashes (31%) and hit fixed object crashes (24%) remain the most prevalent, followed by rear end crashes (19%). Head on crashes, while infrequent overall, represent 10% of FSI crashes, underscoring their higher severity potential. Pedestrian crashes comprise 8% of FSI crashes despite representing only 1% of all crashes, a notable imbalance indicating increased vulnerability.

Exhibit C3.1 demonstrates that angle and rear end crashes cluster in the most congested portion of the study area along the two major roadways, U.S. 19 and SR 228 in Cranberry Township, with other notable clusters along SR 68, SR 528, and Rochester and Rowan Roads. The rear end pattern follows U.S. 19 through Jackson Township and Zelienople Borough. Hit fixed object crashes are more dispersed along lower volume state and local road segments, especially those with horizontal or vertical curvature (bends and hills).

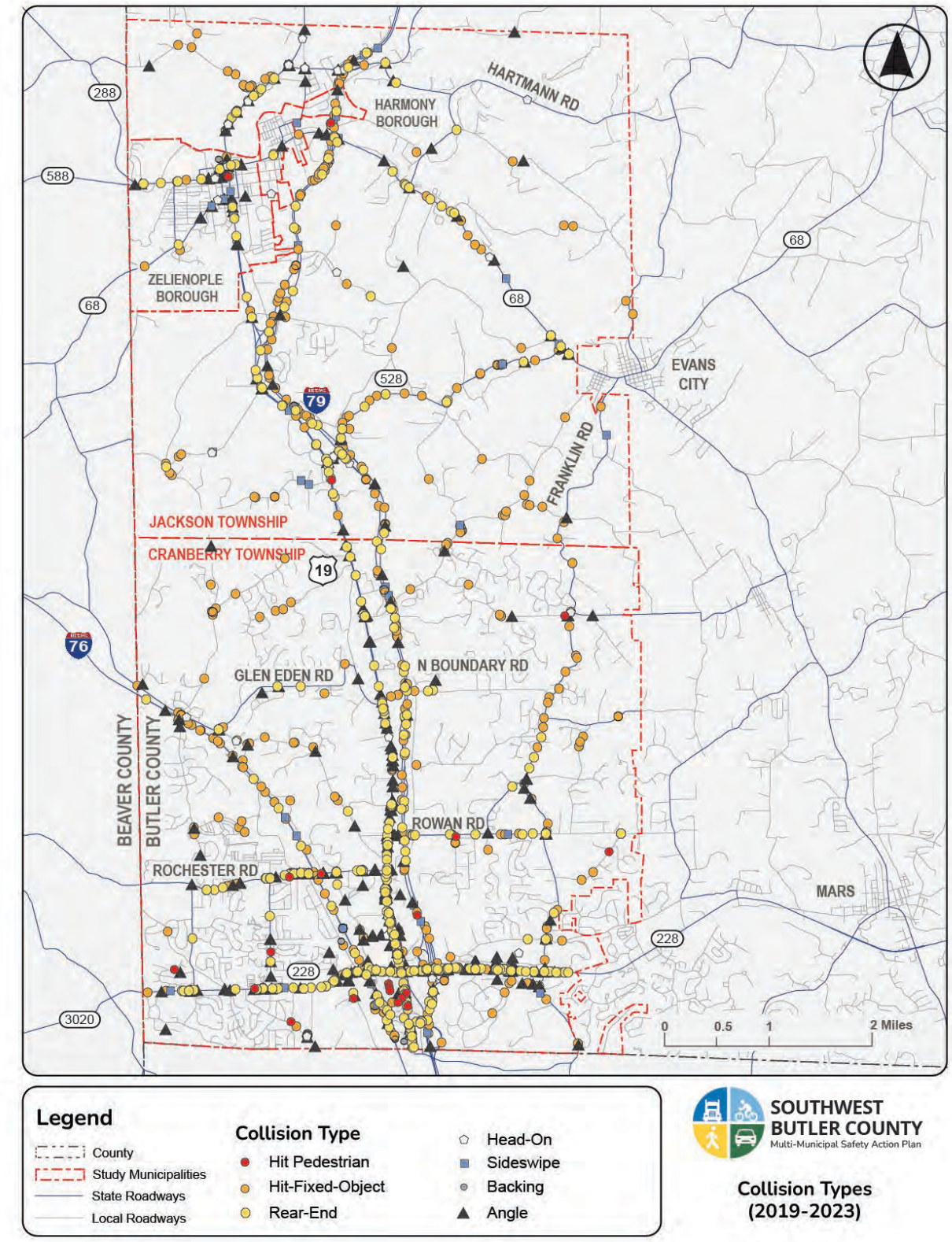
TABLE C3.1 – CRASH TYPE BREAKDOWN (ALL)

Crash Type	2019-2023	
	Total	Percentage
Angle	528	30%
Hit-Fixed-Object	449	26%
Rear-End	425	24%
Other / Unknown / Non-Collision	211	12%
Sideswipe	61	4%
Head-On	42	2%
Hit Pedestrian	19	1%
Backing	4	0.2%
Total	**1739**	**100%**

TABLE C3.2 – CRASH TYPE BREAKDOWN (FSI ONLY)

FSI Crash Type	Fatal	Serious Injury	Total	% FSI by Type
Angle	4	14	18	31%
Hit-Fixed-Object	1	13	14	24%
Rear-End	3	8	11	19%
Head-On	1	5	6	10%
Hit Pedestrian	2	3	5	8%
Other / Non-Collision	2	3	5	8%
Total	**13**	**46**	**59**	**100%**

EXHIBIT C3.1 – COLLISION TYPES (2019–2023)



Section C4. Crash Severity

Crash severity trends help identify the extent of crash outcomes within the study area. As shown in **Table C4.1**, most crashes during the 2019 to 2023 period resulted in property damage only (63%), followed by suspected minor injuries (19%). More severe outcomes are less frequent, but remain a significant concern:

- 13 fatal crashes (1%)
- 46 suspected serious injury crashes (3%)
- Total FSI crashes: 59 (3.4%) of all crashes

Although small in percentage, FSI crashes have an outsized impact on community safety.

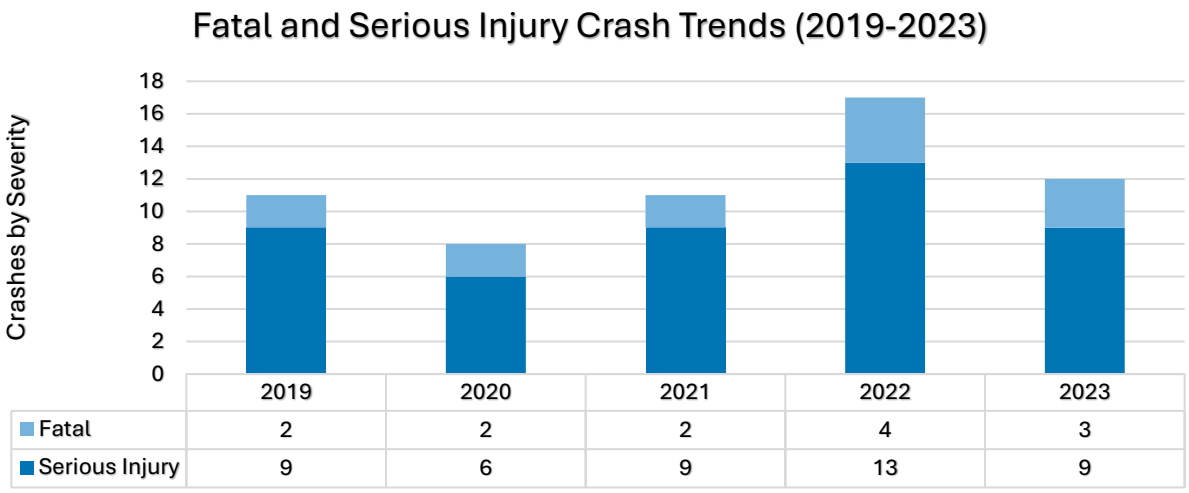
Figure C4.1 illustrates year-to-year variation in severe outcomes. Fatal crashes remained relatively low but consistent at 2 to 4 per year, while serious injuries fluctuated between 6 and 13 annually. The highest number of serious injuries occurred in 2022, correlating with a noticeable concentration of FSI crash locations in the center of the study area as shown in **Exhibit C4.1**.

Spatial distribution of severity levels, as depicted in **Exhibit C4.2**, shows clusters of injury crashes around major corridors and intersections with high turning activity. FSI crashes are more common along higher-speed routes, including the primary north / south corridors where wider roadway geometry and limited access control contribute to higher speeds.

TABLE C4.1 – MAXIMUM SEVERITY DISTRIBUTION (ALL CRASHES) (2019–2023)

Maximum Severity	# of Crashes	Percentage
Property Damage Only	1,092	63%
Suspected Minor Injury	332	19%
Injury-Unknown Severity / Unknown	149	9%
Possible Injury	107	6%
Suspected Serious Injury	46	3%
Fatal	13	1%
Total	**1,739**	**100%**

FIGURE C4.1 – FATAL AND SERIOUS INJURY CRASH TRENDS (2019–2023)



	2019	2020	2021	2022	2023
Fatal	2	2	2	4	3
Serious Injury	9	6	9	13	9

EXHIBIT C4.1 – CRASH SEVERITY (2019–2023)

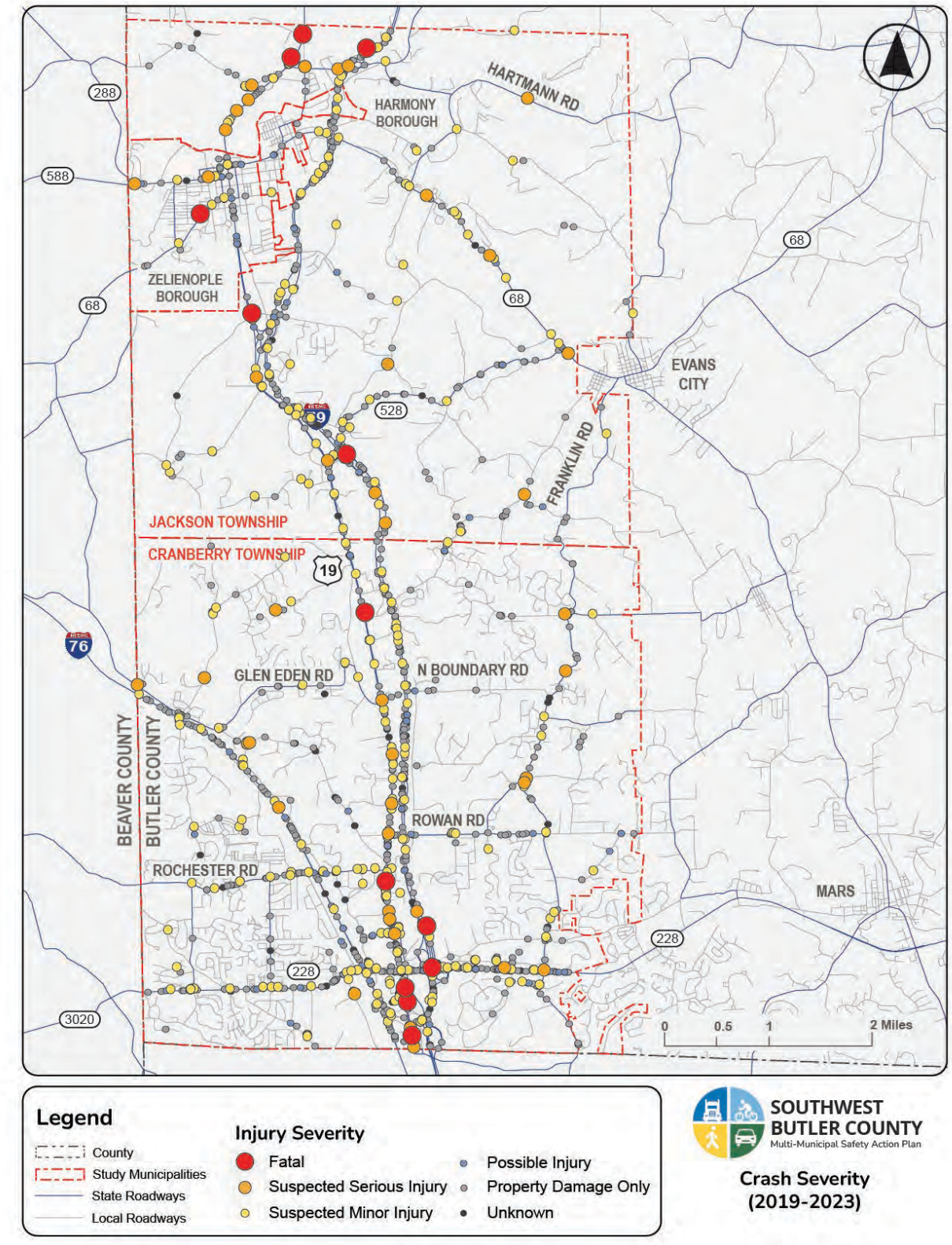
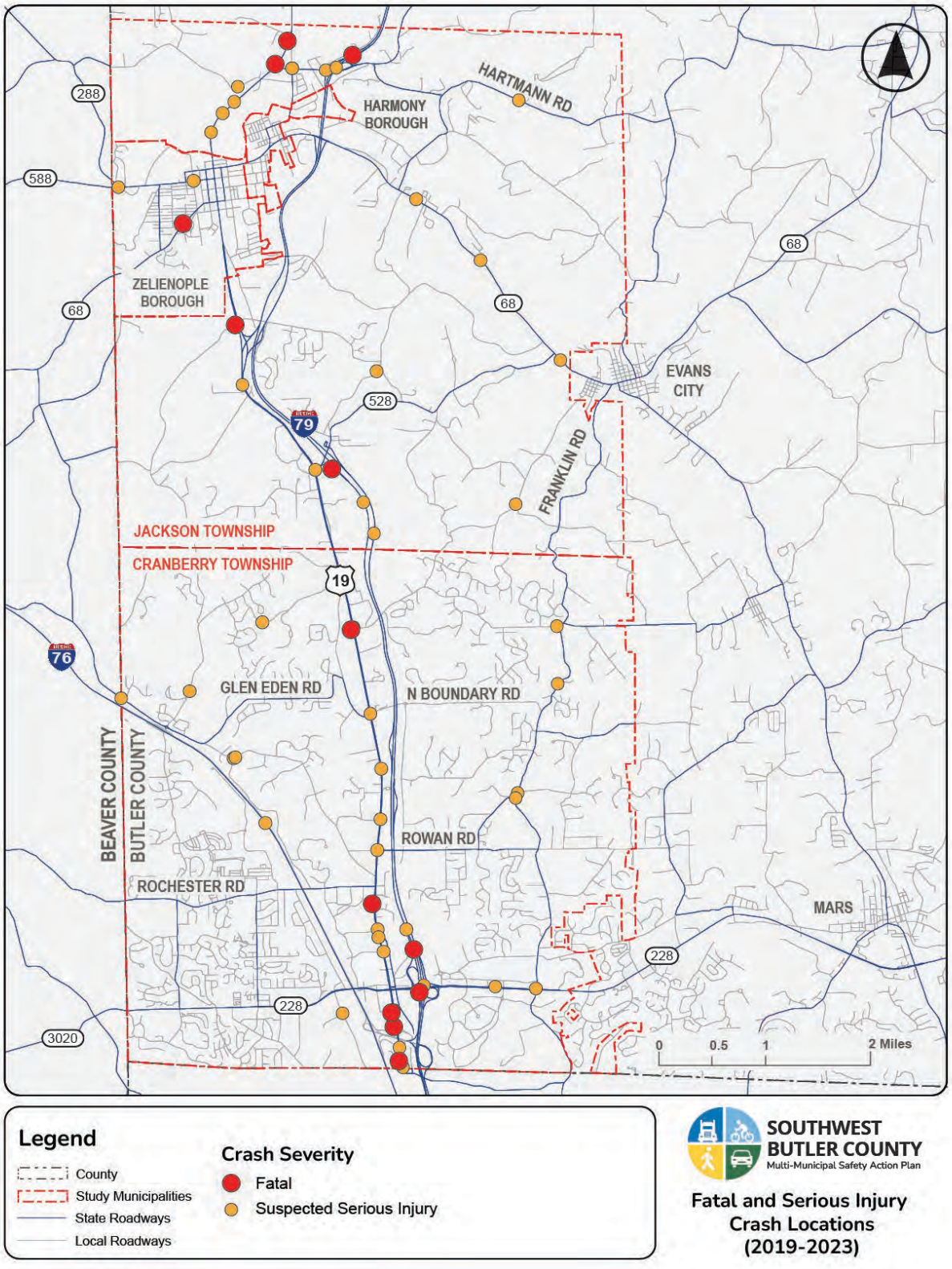


EXHIBIT C4.2 – FATAL AND SERIOUS INJURY CRASH LOCATIONS (2019–2023)



Section C5. Temporal Distribution

Temporal crash patterns help illustrate how seasonal, weekly, and daily behaviors influence crash occurrence.

As shown in **Figure C5.1**, crash totals vary considerably throughout the year, with the highest crash activity occurring in the fall months. The peak month is October, with 184 crashes, followed by December with 182 crashes and November with 175 crashes. These three months represent the most active crash period within the five-year dataset, likely due to increased traffic volumes due to school being back in session, light and weather conditions, and travel related to shopping and holidays.

Crash totals are lower in the early spring and gradually increase through late summer before rising sharply in the fall. This pattern may reflect factors such as changing daylight conditions, seasonal travel activity, and transitional weather conditions typical of the late-year period. FSI crashes follow a similar distribution, with elevated counts also occurring in the fall months.

- Crash frequency by day of the week is shown in **Figure C5.2**:
- Crashes increase notably on Fridays with a peak of 304 crashes.
- Saturday and Thursday also show elevated totals.
- Sundays see the fewest crashes, and weekday crash frequencies remain relatively consistent Monday through Thursday.

The distribution suggests that higher weekend and pre-weekend travel demand, combined with shopping and regional traffic patterns, contribute to increased crash exposure. FSI crashes mirror these patterns, increasing on higher-volume days.

FIGURE C5.1 – MONTHLY DISTRIBUTION OF CRASHES (2019-2023)

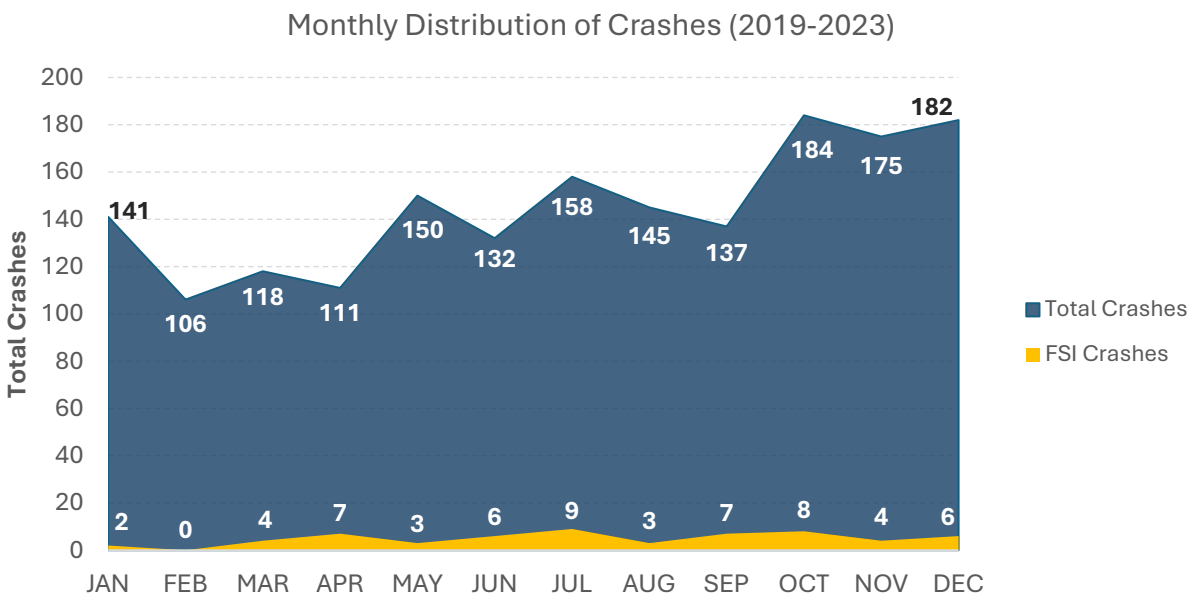
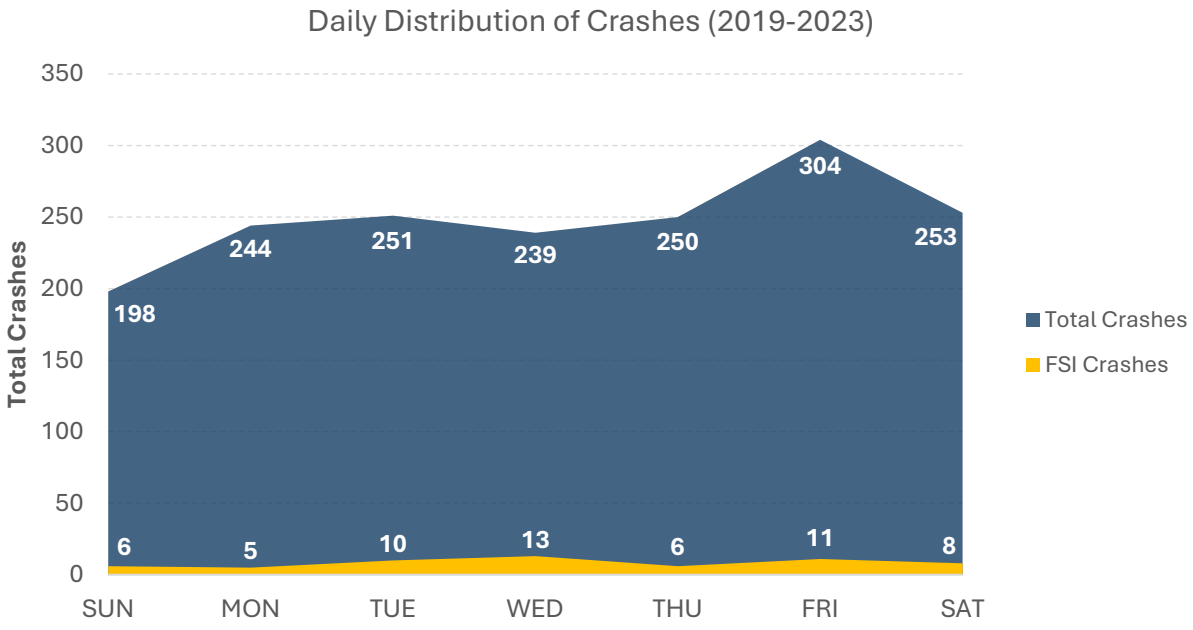


FIGURE C5.2 – DAILY DISTRIBUTION OF CRASHES (2019-2023)



Section C6. Contributing Environmental Factors

Environmental conditions play a significant role in crash occurrence. The study area exhibits patterns consistent with regional weather, illumination, and seasonal roadway conditions.

As shown in **Table C6.1**, most crashes (75%) occur on dry pavement, consistent with overall exposure patterns. However, 19% occur during wet conditions, highlighting the sensitivity of drivers to slick road conditions. 6% occur on icy or snowy surfaces, though winter storms may still contribute to reduced visibility and increased crash risk.

FSI crashes (**Table C6.2**) occur primarily on dry surfaces (88%), indicating that severe outcomes are more strongly associated with higher-speed environments or risky behaviors rather than adverse pavement conditions.

Similarly, weather data for all crashes in **Table C6.3** indicates:

- 73% of all crashes occur in clear weather, reflecting normal driving conditions.
- 26% occur during precipitation, and these conditions produce 17% of FSI crashes (**Table C6.4**).

Illumination patterns (**Table C6.5** and **C6.6**) show that:

- Daylight crashes account for 64% of all crashes.
- Dark conditions account for 33% of all crashes, which are disproportionately high relative to traffic time-of-day exposure.
- FSI crashes occur 63% in daylight and 32% in darkness.

The proportion of severe crashes occurring in darkness-despite lower nighttime traffic volumes-indicates elevated crash risk after dark, possibly due to speed, reduced visibility, or impaired driving.

TABLE C6.1 – ROADWAY SURFACE CONDITIONS, ALL CRASHES (2019-2023)

Roadway Surface Conditions	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Dry	255	192	285	284	283	1299	75%
Wet or Water	79	68	57	61	74	339	19%
Ice, Frost, Snow	26	26	10	31	5	98	6%
Other/ Unknown	0	0	1	1	1	3	0.2%
Total	**360**	**286**	**353**	**377**	**363**	**1739**	**100%**

TABLE C6.2 – ROADWAY SURFACE CONDITIONS, FATAL AND SERIOUS INJURY CRASHES (2019-2023)

Roadway Surface Conditions	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Dry	10	7	11	15	9	52	88%
Wet or Water	1	1	0	2	3	7	12%
Ice, Frost, Snow	0	0	0	0	0	0	0%
Sand, Mud, Dirt, Gravel	0	0	0	0	0	0	0%
Total	**11**	**8**	**11**	**17**	**12**	**59**	**100%**

TABLE C6.3 – WEATHER CONDITION, ALL CRASHES (2019-2023)

Weather Condition	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Clear	276	188	277	265	259	1265	73%
Precipitation	79	94	75	107	102	457	26%
Other/ Unknown	5	4	1	5	2	17	1%
Total	**360**	**286**	**353**	**377**	**363**	**1739**	**100%**

TABLE C6.4 – WEATHER CONDITION, FATAL AND SERIOUS INJURY CRASHES (2019-2023)

Weather Condition	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Clear	11	6	11	13	8	49	83%
Precipitation	0	2	0	4	4	10	17%
Other/ Unknown	0	0	0	0	0	0	0%
Total	**11**	**8**	**11**	**17**	**12**	**59**	**100%**

TABLE C6.5 – ILLUMINATION TYPE, ALL CRASHES (2019-2023)

Illumination Type	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Daylight	229	179	229	235	238	1110	64%
Dark	117	96	119	127	109	568	33%
Dusk or Dawn	14	9	5	14	16	58	3%
Other/ Unknown	0	2	0	1	0	3	0%
Total	**360**	**286**	**353**	**377**	**363**	**1739**	**100%**

TABLE C6.6 – ILLUMINATION TYPE, FATAL AND SERIOUS INJURY CRASHES (2019-2023)

Illumination Type	Year						
	2019	2020	2021	2022	2023	Total	Percentage
Daylight	7	5	9	9	7	37	63%
Dark	4	3	1	6	5	19	32%
Dusk or Dawn	0	0	1	2	0	3	5%
Other/ Unknown	0	0	0	0	0	0	0%
Total	**11**	**8**	**11**	**17**	**12**	**59**	**100%**

Section C7. Vulnerable Roadway Users

Vulnerable Roadway Users (VRU) crashes, involving pedestrians and cyclists, are a critical component of the Action Plan due to their high severity potential. **Table C7.1** shows 21 total VRU crashes between 2019 and 2023:

- 17 pedestrian crashes
- 4 cyclist crashes

While these crashes represent a small share of total collisions, their severity is disproportionately high. Several years recorded multiple pedestrian crashes, including four in 2019 and four in 2023. Cyclist crashes were infrequent but increased slightly in 2023. **Figure C7.1** illustrates relatively low but fluctuating VRU crash totals throughout the five-year period.

Spatial patterns in **Exhibit C7.1** demonstrate that VRU crashes cluster in areas with pedestrian activity, including:

- Residential neighborhoods
- Intersections with limited crossing infrastructure
- Large retail areas and major parking lots

These locations typically feature multiple conflict points, driveway density, and pedestrian exposure.

TABLE C7.1 – NUMBER OF CRASHES INVOLVING PEDESTRIAN OR CYCLISTS (2019–2023)

Year	2019	2020	2021	2022	2023	Total
Hit Cyclist	0	1	0	1	2	4
Hit Pedestrian	4	4	2	3	4	17
Total	4	5	2	4	6	21

FIGURE C7.1 – PEDESTRIAN AND CYCLIST INVOLVED CRASHES (2019-2023)

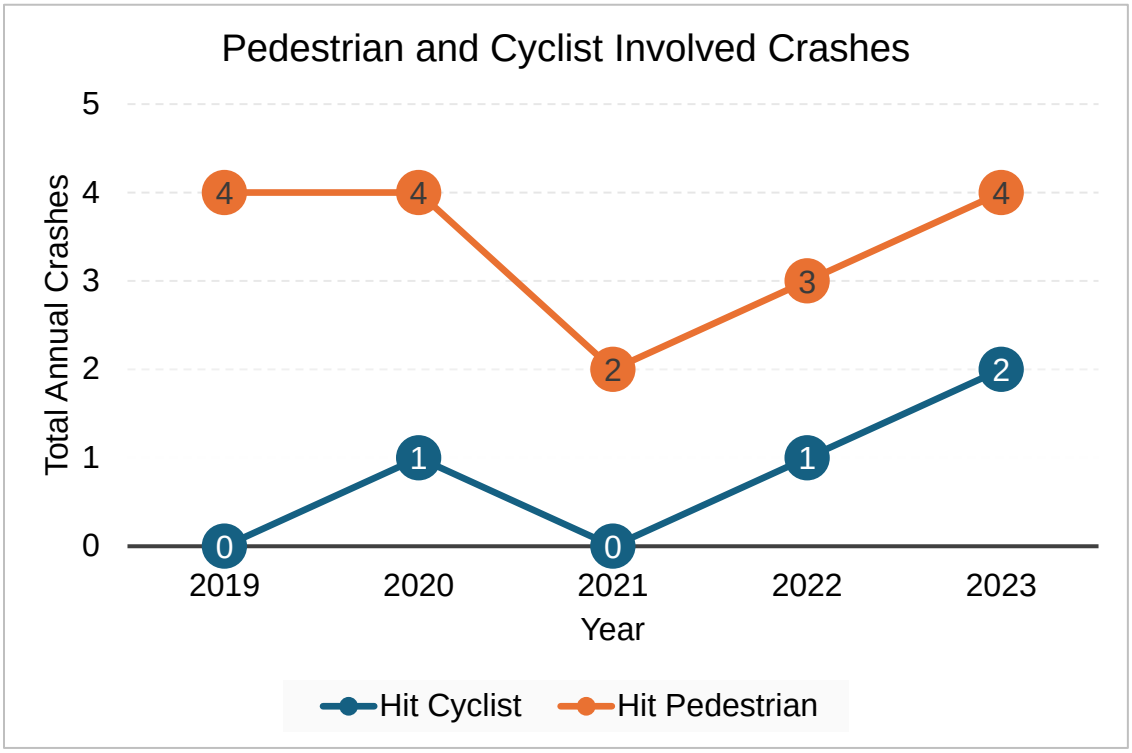
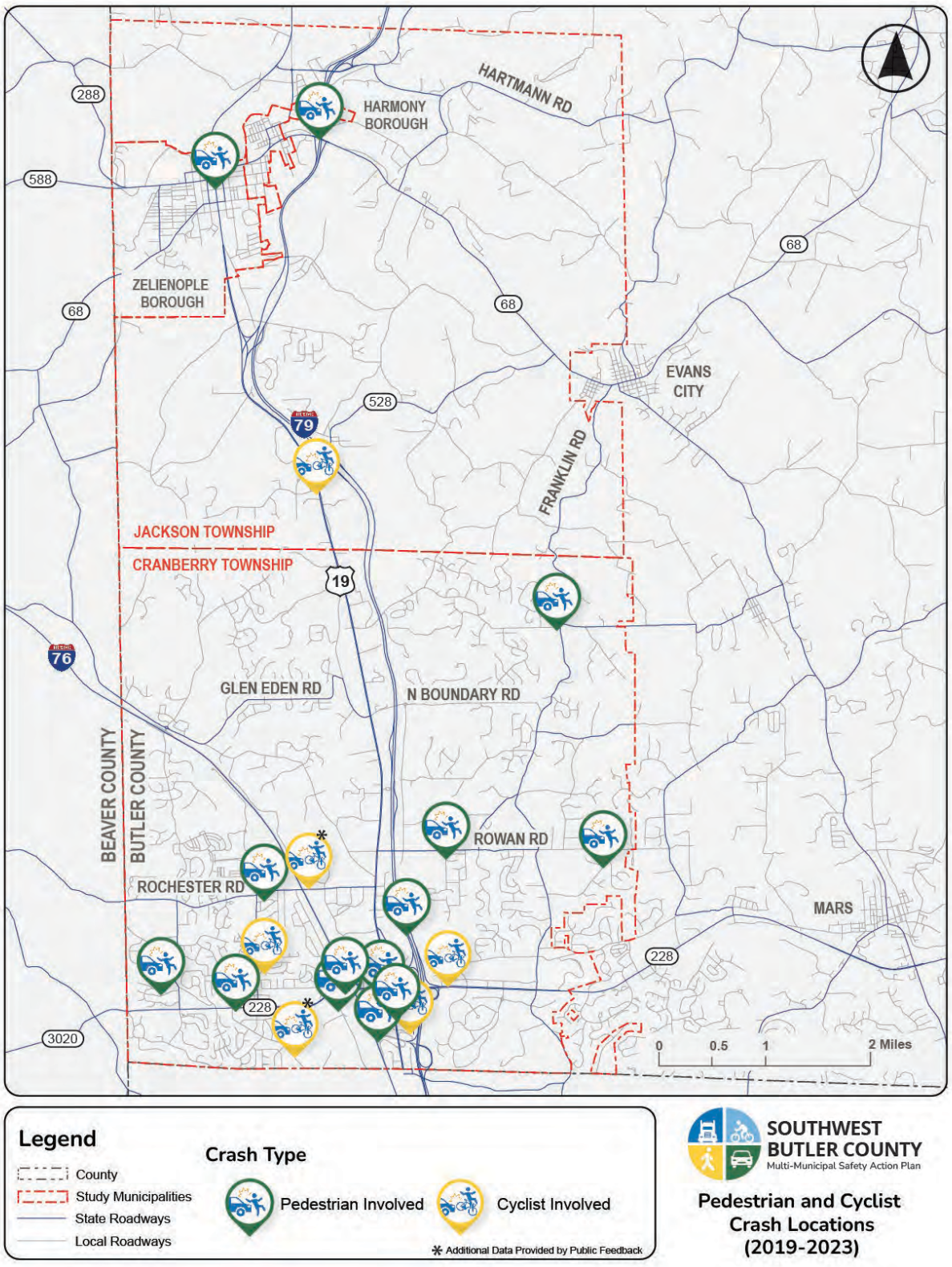


EXHIBIT C7.1 – PEDESTRIAN AND CYCLIST INVOLVED CRASH LOCATIONS (2019–2023)



Section C8. Crash Buffer Analysis

The transportation network in the study area was assessed using an intersection crash cluster analysis and uniform segment crash analysis. Crash rate calculations rely on Average Annual Daily Traffic (AADT) volume data, historical crash data, and segment lengths. The segments generally follow locations where count data was available from PennDOT's Traffic Information Repository (TIRe). For segments where count data was not readily available, a neighboring segment's count data was asserted or estimated to develop an approximate crash rate for comparison.

The roadway network was broken into intersections and segments at key locations to determine the **High Injury Network (HIN),** which represents the location of the majority of Fatal and Serious Injury crashes. For the buffer analysis, corridor segments change when traffic volumes change, and intersection clusters occur at the junction of two or more corridor segments. A buffer analysis was conducted; a 250' buffer was extended from the center of each intersection to assign crashes to intersections within their area of influence, or to a neighboring segment.

The crash data was manually assessed to refine and assign crashes to segments or intersections. Approximately 66% of total crashes were captured by the buffer analysis. The remaining crashes are scattered throughout the transportation system, typically on smaller roads without AADT data where a crash rate could not be readily calculated.

Section C9. Intersection Analysis

70 unique intersection buffers were included in the analysis. The intersection-level buffer analysis highlights locations with the highest total crash frequencies or FSI crash frequencies. **Exhibit C9.9** presents total crash rates for intersection buffers across the study area and labels the Top 10. A complete list of intersection crash rates using total crashes can be found in **Table C9.1.**

The three highest intersection crash rates for **all** crashes are:

1. Freshcorn Rd. at Heights Dr. (1.68 crashes per 1 MVMT)
2. Thorn Hill Rd. at Rolling Rd. (1.65 crashes per 1 MVMT)
3. Zehner School Rd. at Gudekunst Rd. (1.14 crashes per 1 MVMT)

Exhibit C9.2 presents FSI-only crash rates for intersection buffers across the study area and labels the Top 10. A complete list of intersection crash rates using FSI crashes can be found in **C9.2.**

The three highest intersection crash rates for **FSI** crashes are:

1. Graham School Rd. at Unionville Rd. (0.30 FSI crashes per 1 MVMT)
2. Franklin Rd. at Rowan Rd./Hope Rd. (0.16 FSI crashes per 1 MVMT)
3. Franklin Rd. at Ehrman Rd. (0.15 crashes per 1 MVMT)

EXHIBIT C9.1 – INTERSECTION BUFFER CRASH RATES & TOP 10 RANKING (TOTAL CRASHES)

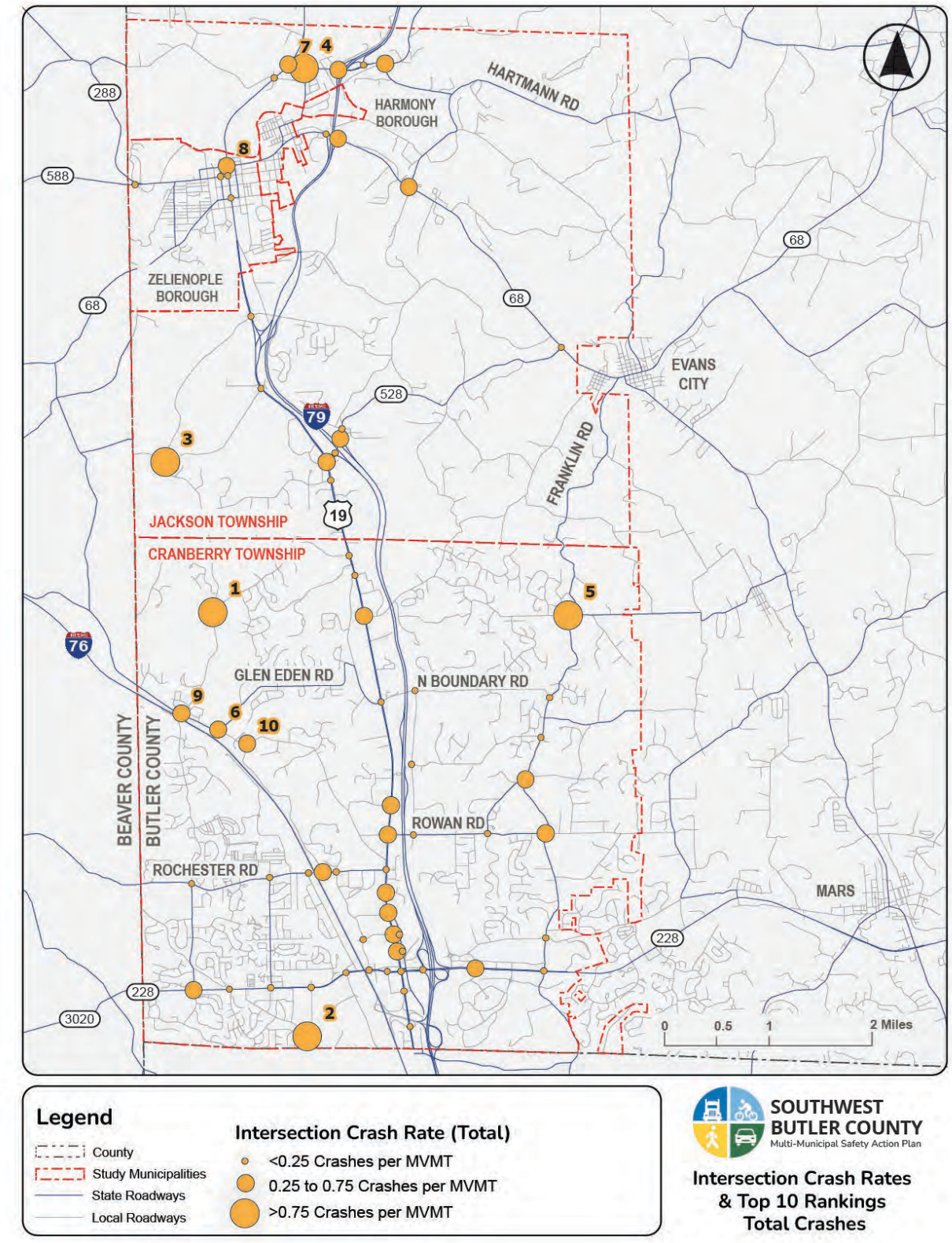


EXHIBIT C9.2 – INTERSECTION BUFFER CRASH RATES & TOP 10 RANKING (FSI CRASHES)

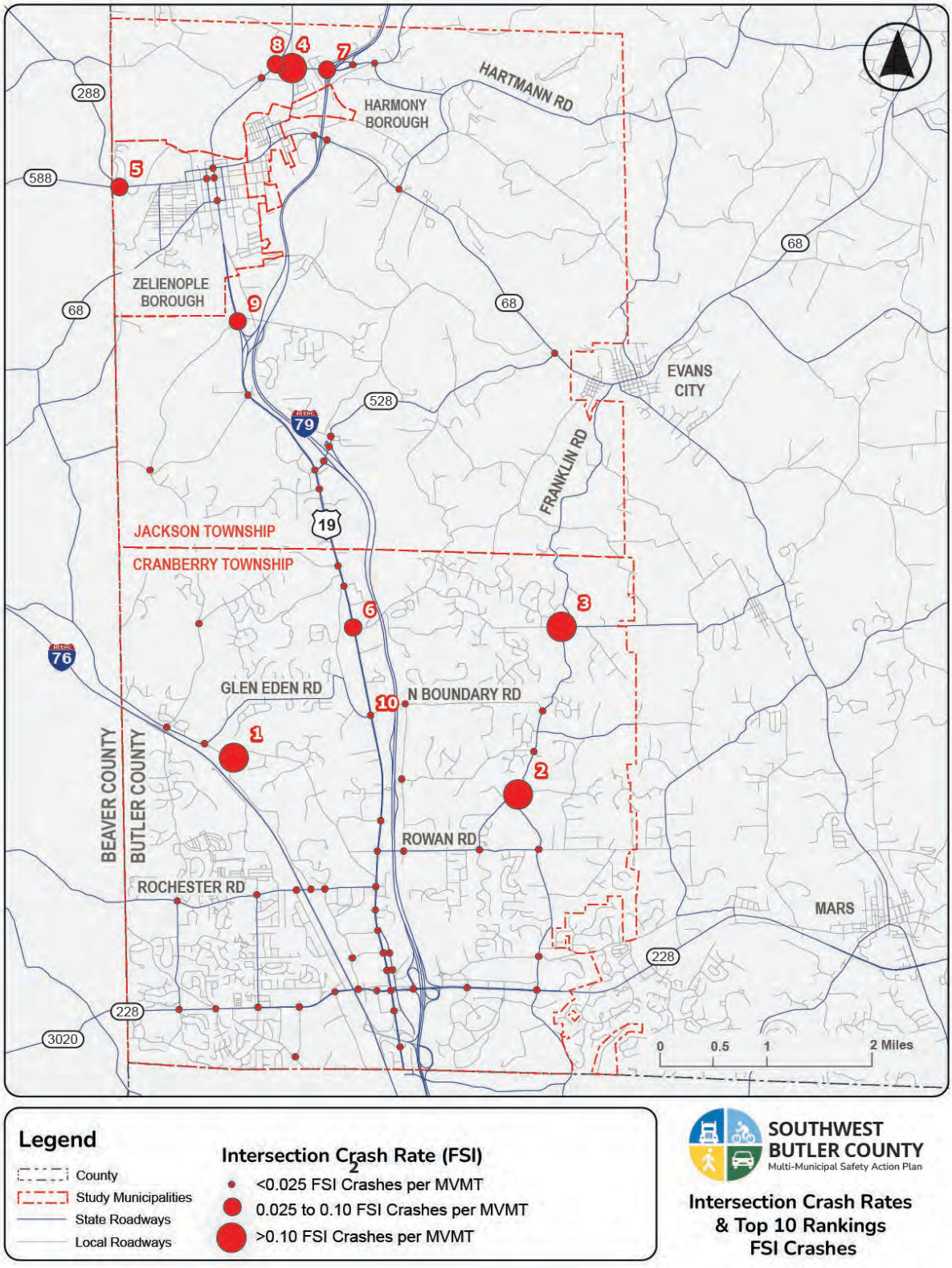


TABLE C9.1 - INTERSECTION CRASH CLUSTERS, ALL CRASHES RANKED, 2019 – 2023

Location	Crashes		Intersection Crash Rate (per million VMT)	
	Total	FSI	Total	Rank
Freshcorn Rd. at Heights Dr.	5	0	1.68	1
Thorn Hill Rd. at Rolling Rd	22	0	1.65	2
Zehner School Rd. at Gudekunst Rd.	2	0	1.14	3
Little Creek Rd. at Mercer Rd.	14	2	0.81	4
Franklin Rd. at Ehrman Rd.	5	1	0.76	5
Glen Eden Rd. at Unionville Rd.	6	0	0.64	6
U.S. 19 at Little Creek Rd.	13	1	0.56	7
U.S. 19 at Grandview Ave.	14	0	0.51	8
Powell at Glen Eden Rd.	4	0	0.47	9
Graham School Rd. at Unionville Rd.	3	2	0.46	10
U.S. 19 at Progress Ave.	21	1	0.45	11
Rochester Rd. at Graham School Rd.	14	0	0.45	12
U.S. 19 at Short St	32	0	0.39	13
SR 3020 at Powell Rd.	11	0	0.37	14
U.S. 19 at SR 528	17	1	0.36	15
I-79 SB Ramps at Little Creek Rd.	7	1	0.35	16
U.S. 19 at Dutilh Rd.	27	1	0.34	17
Franklin Rd. at Peters Rd.	9	0	0.33	18
I-79 NB to SR 0068	5	0	0.33	19
Franklin Rd. at Rowan Rd. /Hope Rd.	4	2	0.31	20
U.S. 19 at Cranberry Square Dr.	24	1	0.30	21
U.S. 19 at Rowan Rd.	22	1	0.29	22
U.S. 19 at Ehrman Rd.	10	2	0.29	23
U.S. 19 at American Way	21	0	0.27	24
SR 228 at Cranberry Woods Dr.	13	0	0.27	25
Little Creek Rd. at Seneca School Rd.	3	0	0.26	26
I-79 NB Ramp at SR 528	5	0	0.26	27
Hartmann Rd. at Evans City Rd.	4	0	0.26	28
I-79 SB Ramp at SR 528	5	0	0.25	29
New Castle St. at S Clay St.	5	0	0.25	30
Dutilh at Short St.	1	0	0.25	31
Dutilh Rd. at Cranberry Square Dr.	1	0	0.25	31
U.S. 19 at Fanker/Wise Rd.	5	0	0.24	33
U.S. 19 at N Boundary Rd.	11	1	0.24	34
SR 3020 at Executive Dr.	11	0	0.22	35
SR 228 at Franklin Rd.	11	1	0.21	36
SR 528 at Joe Deener Rd.	3	0	0.20	37
Franklin Rd. at Mars Rd.	5	0	0.20	38

Location	Crashes		Intersection Crash Rate (per million VMT)	
	Total	FSI	Total	Rank
U.S. 19 at Tollgate School Rd.	6	1	0.19	39
Franklin Rd. at T309	1	0	0.19	40
Rowan Rd. at Marshall Rd.	4	0	0.19	41
SR 68 at SR 528	5	0	0.19	42
Rochester Rd. at Thomson Park Dr.	7	0	0.17	43
U.S. 19 at I-76 Off Ramps	12	1	0.17	44
Marshall Rd. at T309	1	0	0.16	45
SR 3020 at McIntyre Ln./Commonwealth Dr.	7	0	0.15	46
U.S. 19 at St. Francis Way	14	2	0.15	47
Rochester Rd. at Haine School Rd.	5	0	0.14	48
U.S. 19 at SR 228	19	0	0.13	49
I-79 SB at SR 0068	2	0	0.13	50
Franklin Rd. at N Boundary Rd.	1	0	0.13	51
U.S. 19 at Heights Dr.	4	0	0.12	52
Executive Dr. at Cranberry Square Dr.	3	0	0.12	53
SR 228 at I-79 SB Ramps	11	0	0.12	54
Rochester Rd. at Robinhood Dr.	4	0	0.12	55
SR 3020 at Valley Forge Dr.	3	0	0.12	56
SR 3020 at Haine School Rd.	3	0	0.10	57
N Boundary Rd. at Marshall Rd.	1	0	0.09	58
U.S. 19 at Lutz Rd.	4	0	0.09	59
SR 3020 at Connector	3	0	0.06	60
U.S. 19 at Old Route 19	2	0	0.06	61
U.S. 19 at New Castle St.	2	0	0.06	62
U.S. 19 at Zehner School Rd.	2	0	0.06	63
Peters at Rowan	1	0	0.06	64
New Castle St. at SR 288	1	1	0.06	65
U.S. 19 at Beaver St./SR 68	2	0	0.06	66
U.S. 19 at Rochester Rd.	5	0	0.05	67
I-79 NB Ramps at Little Creek Rd.	1	0	0.05	68
Rochester Rd. at Powell Rd.	1	0	0.03	69
SR 3020 at Thornhill Rd.	1	0	0.03	70

TABLE C9.2- INTERSECTION CRASH CLUSTERS, FSI CRASHES RANKED, 2019 - 2023

Location	Crashes		Intersection Crash Rate (per million VMT)	
	Total	FSI	FSI	Rank
Graham School Rd. at Unionville Rd.	3	2	0.30	1
Franklin Rd. at Rowan Rd. /Hope Rd.	4	2	0.16	2
Franklin Rd. at Ehrman Rd.	5	1	0.15	3
Little Creek Rd. at Mercer Rd.	14	2	0.12	4
New Castle St. at SR 288	1	1	0.06	5
U.S. 19 at Ehrman Rd.	10	2	0.06	6
I-79 SB Ramps at Little Creek Rd.	7	1	0.05	7
U.S. 19 at Little Creek Rd.	13	1	0.04	8
U.S. 19 at Tollgate School Rd.	6	1	0.03	9
U.S. 19 at N Boundary Rd.	11	1	0.02	10
U.S. 19 at Progress Ave	21	1	0.02	11
U.S. 19 at SR 528	17	1	0.02	12
U.S. 19 at St. Francis Way	14	2	0.02	13
SR 228 at Franklin Rd.	11	1	0.02	14
U.S. 19 at I-76 Off Ramps	12	1	0.01	15
U.S. 19 at Rowan Rd.	22	1	0.01	16
U.S. 19 at Dutilh Rd.	27	1	0.01	17
U.S. 19 at Cranberry Square Dr.	24	1	0.01	18

Section C10. Segment Analysis

96 unique intersection buffers were included in the segment analysis. Segment-level analysis identifies longer stretches of roadway between intersection buffers. **Exhibit C10.1** presents total crash rates for segment buffers across the study area and labels the Top 10. A complete list of segment crash rates using total crashes can be found in **Appendix A.**

The three highest segment crash rates for **all** crashes are:

1. Cranberry Square Dr. from Executive Dr. to U.S. 19 (674.457 crashes per 100 MVMT)
2. Lutz Rd. from Zehner School Rd. to U.S. 19 (461.87 crashes per 100 MVMT)
3. Fanker Rd. from Dutch Rd. to U.S. 19 (413.707 crashes per 100 MVMT)

Exhibit C10.2 presents FSI-only crash rates for segment buffers across the study area and labels the Top 10. A complete list of segment crash rates using FSI crashes can be found in **Appendix A.**

The three highest segment crash rates for **FSI** crashes are:

1. Freshcorn Rd. from Heights Dr. to Glen Eden Rd. (66.365 crashes per 100 MVMT)
2. Glen Eden Rd. from Carlyle Dr. to Powell Rd. /Freshcorn Rd. (31.985 crashes per 100 MVMT)
3. Franklin Rd. from T 313/Callery Rd. to North Boundary Rd. (26.434 crashes per 100 MVMT)

The crash history analysis summarizes when, where, and under what conditions crashes occurred within the study area from 2019 to 2023. The results identify clear safety concerns across intersections and roadway segments, with angle, hit fixed object, and rear-end crashes comprising the majority of collisions. These patterns are closely tied to turning conflicts, access density, speed differentials, and roadside conditions, particularly along higher-speed routes and commercial corridors.

Although most crashes resulted in property damage only, fatal and serious injury (FSI) crashes occur disproportionately along high-speed arterials and rural roadways, at complex intersections, and in areas with changing roadway context. Vulnerable roadway user crashes show elevated severity and cluster in areas with pedestrian activity and limited sidewalks and crosswalks. This study pairs the crash history findings with a Road Safety Audit and stakeholder input to identify and prioritize corridors for safety improvements aimed at reducing crash frequency and severity.

EXHIBIT C10.1 – ROADWAY SEGMENT CRASH RATES & TOTAL 10 RANKING (TOTAL CRASHES)

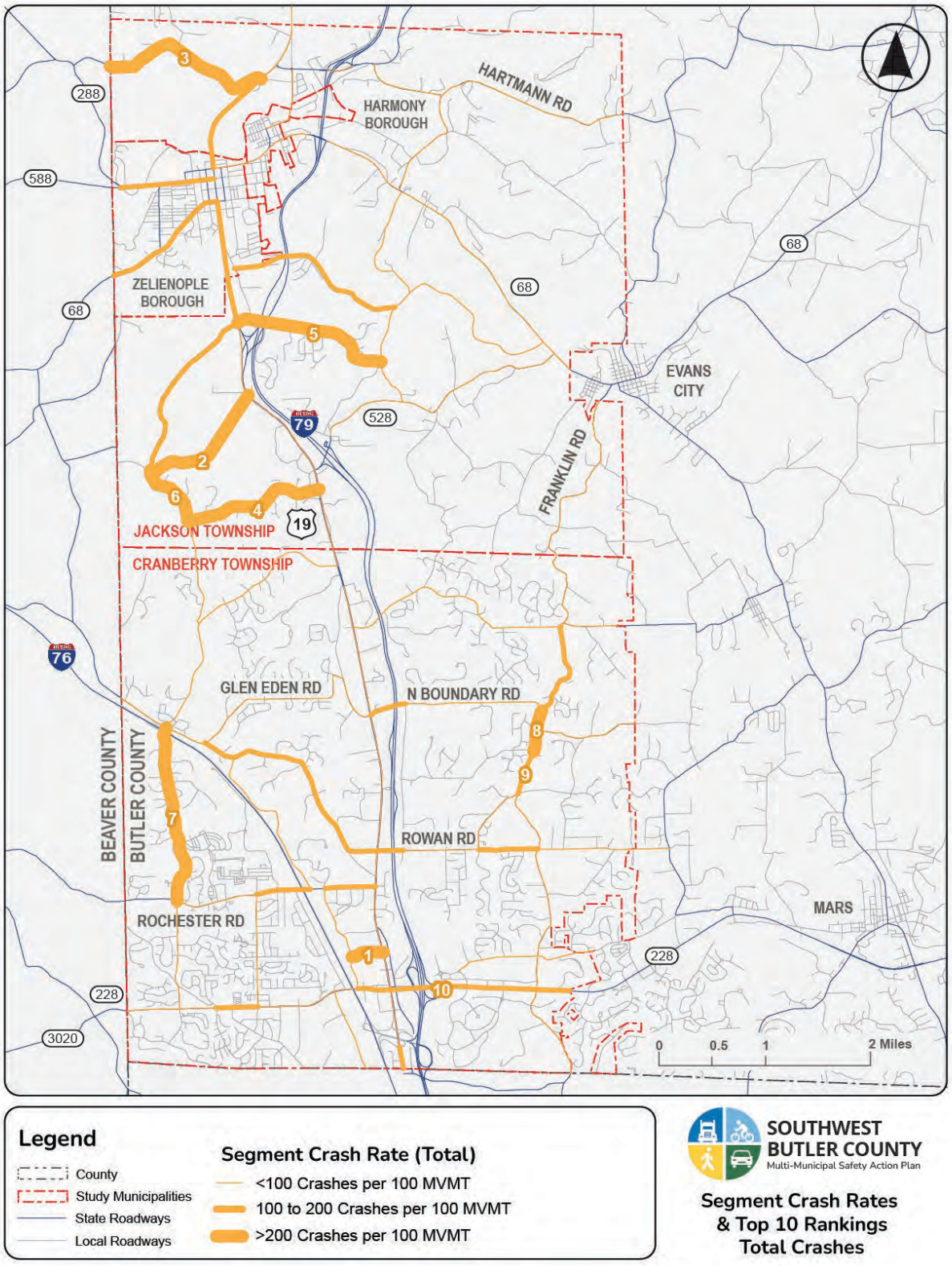


EXHIBIT C10.2 – ROADWAY SEGMENT CRASH RATES & TOTAL 10 RANKING (FSI CRASHES)

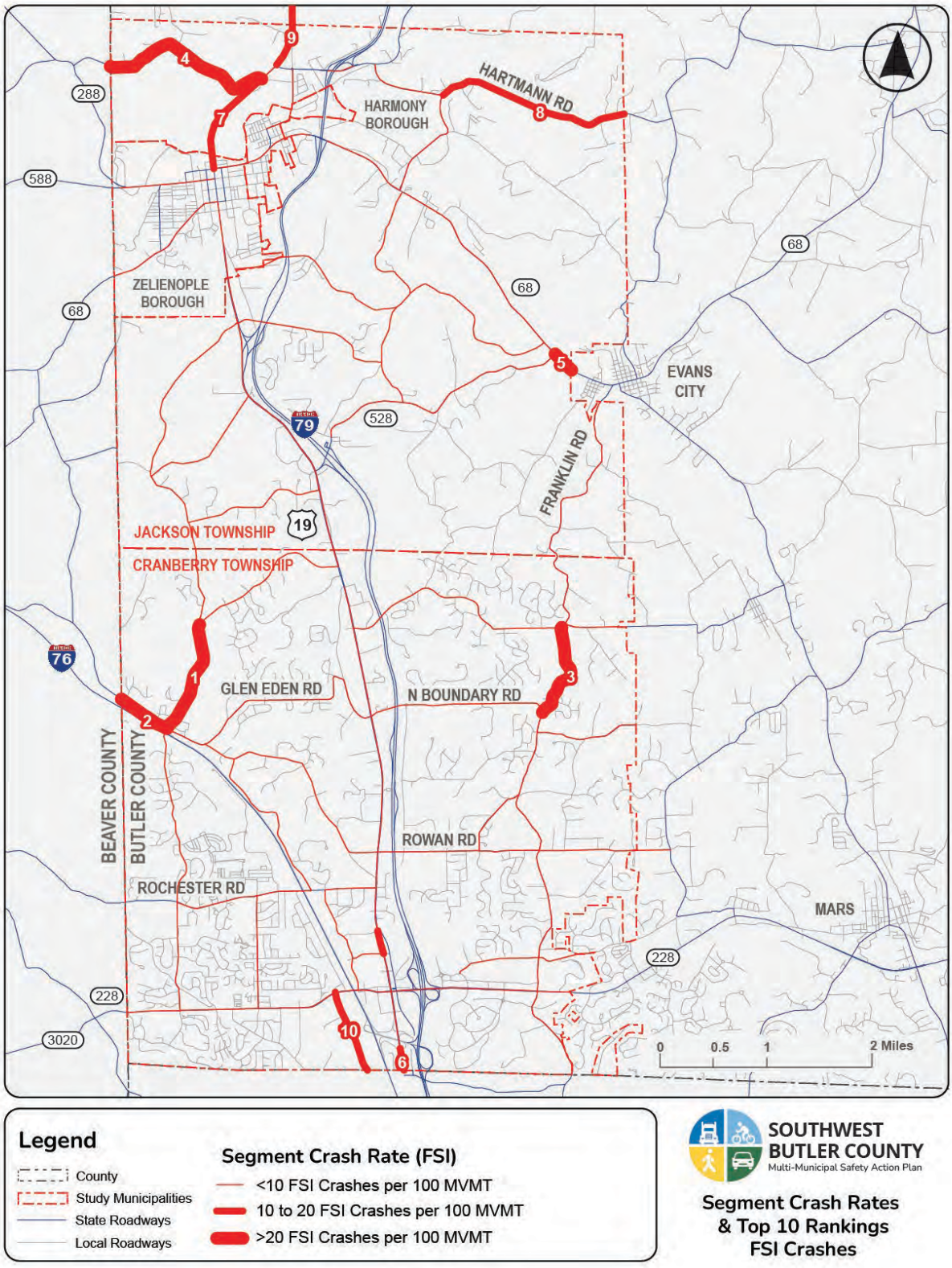


TABLE C10.1- SEGMENT CRASH RATE ANALYSIS, TOTAL CRASHES RANKED (2019–2023)

Location	From Street	To Street	Crashes		Entering ADT	Length (mi)	Crash Rate (per 100 million VMT)	
			Total	FSI			Total	Rank
Cranberry Square Dr.	Executive Dr.	U.S. 19	13	0	5,000	0.21	674.4569	1
Lutz Rd.	Zehner School Rd.	U.S. 19	3	0	300	1.19	461.867	2
Fanker Road	Dutch Rd.	U.S. 19	17	1	1,377	1.64	413.7074	3
Zehner School Rd.	T300/Freshcorn Rd.	U.S. 19	5	0	809	1.26	267.9425	4
Tollgate School Rd.	U.S. 19	Ridge Rd.	2	0	293	1.43	261.5075	5
Zehner School Rd.	Gudekunst Rd.	T300/Freshcorn Rd.	2	0	809	0.56	240.0905	6
Powell Rd.	Glen Eden Rd.	Rochester Rd.	8	0	1,200	1.62	225.2289	7
Franklin Road	N Boundary Rd.	T 309 W	3	0	2,466	0.30	221.2424	8
Franklin Road	T 309 W	Rowan Rd. / T 309 E	3	0	2,466	0.34	197.5501	9
SR 228	I-79 SB Ramps	Cranberry Woods Dr.	35	0	23,480	0.42	196.4324	10
SR 68	Muntz Run Rd.	U.S. 19	21	1	5,053	1.20	189.3352	11
SR 3020	Parkwood Dr. /Valley Forge Dr.	Haine School Rd.	13	0	12,706	0.30	184.6756	12
Rowan Rd.	U.S. 19	Marshall Rd.	5	0	9,935	0.16	177.4299	13
SR 588	SR 288	U.S. 19	21	1	9,130	0.74	170.7931	14
SR 3020	Executive Dr.	Old Freedom Rd.	6	0	22,302	0.09	168.7189	15
Unionville Rd.	Glen Eden Rd.	Graham School Rd.	2	0	3,000	0.22	167.1051	16
Rochester Rd.	Robinhood Dr.	Graham School Rd.	2	0	16,565	0.04	150.6501	17
SR 228	Cranberry Woods Dr.	Franklin Rd.	36	1	23,480	0.57	147.8909	18
SR 3020	Old Freedom Rd.	U.S. 19	2	0	22,302	0.03	141.2419	19
Peters Rd.	Rowan Rd. /Canterbury Trail	Franklin Rd.	7	0	5,946	0.47	136.9716	20
Franklin Road	T 313/Callery Rd.	N Boundary Rd.	5	1	2,466	0.84	132.1713	21
Rochester Rd.	Haine School Rd.	Robinhood Dr.	11	0	16,565	0.29	127.3529	22
Evans City Road	Perry Way	Ridge Rd.	4	0	1,028	1.71	124.3382	23
U.S. 19	Fanker Rd. /Wise Rd.	E Grandview Ave	22	3	10,407	0.95	121.4611	24
U.S. 19	I-76 Ramps	Freeport Rd.	12	2	33,909	0.16	118.676	25

Location	From Street	To Street	Crashes		Entering ADT	Length (mi)	Crash Rate (per 100 million VMT)	
			Total	FSI			Total	Rank
North Boundary Rd.	U.S. 19	Marshall Rd.	2	0	3,664	0.26	116.0746	26
Gudekunst Rd.	Zehner School Rd.	U.S. 19	1	0	300	1.66	109.7757	27
SR 228	U.S. 19	I-79 SB Ramps	10	0	42,813	0.12	107.3774	28
SR 228	Franklin Rd.	Rebecca Ln.	9	0	17,773	0.27	102.7779	29
Rochester Rd.	Thomson Park Dr.	U.S. 19	12	0	16,565	0.39	102.0999	30
U.S. 19	E Beaver St.	Gudekunst Rd.	13	0	6,555	1.07	101.9302	31
Unionville Rd.	Graham School Rd.	U.S. 19	10	0	3,000	1.81	100.8868	32
Executive Dr.	Cranberry Square Dr.	SR 3020	4	0	10,335	0.21	99.48878	33
SR 3020	Commonwealth Dr. /McIntyre Ln.	Executive Dr.	5	0	22,302	0.13	97.217	34
Callery Rd.	Franklin Rd.	Del Rey Ministries	1	0	1,118	0.51	96.92536	35
Graham School Rd.	Unionville Rd.	Rochester Rd.	3	0	1,200	1.50	91.08414	36
T 335	Little Creek Rd.	Main St.	2	0	2,093	0.62	84.22805	37
U.S. 19	Brandt Dr. /Dutilh Rd.	Cranberry Square Dr.	8	1	42,369	0.12	83.7645	38
Commonwealth Dr.	Freedom Rd.	Sechler Law Firm	6	1	5,461	0.75	80.51488	39
Plains Church Rd.	Franklin Rd.	Callery Rd. (Short)	1	0	693	0.99	80.11293	40
SR 3020	Thorn Hill Rd.	Commonwealth Dr. /McIntyre Ln.	9	0	22,302	0.28	78.75261	41
Franklin Road	SR 228	Freeport Rd. /Mt Pleasant Rd.	11	0	8,537	0.90	78.3921	42
Executive Dr.	Brandt Dr.	Cranberry Square Dr.	2	0	10,335	0.14	78.1833	43
Little Creek Rd.	I-79 SB Ramps	I-79 NB Ramps	2	0	9,026	0.16	77.29631	44
Freshcorn Rd.	Zehner School Rd.	Heights Dr.	1	0	829	0.91	72.66188	45
SR 68	SR 528	China Kitchen	3	1	13,363	0.17	71.7128	46
SR 528	I-79 Ramps	SR 68	28	0	9,063	2.41	70.301	47
U.S. 19	Cranberry Square Dr.	Short St.	4	0	42,369	0.07	69.58782	48
SR 68	U.S. 19	I-79 SB Ramp	9	0	7,427	0.96	69.40679	49
SR 68	Hartmann Rd.	SR 528	17	2	6,618	2.09	67.37148	50
Haine School Rd.	Rochester Rd.	SR 3020	7	0	5,870	0.97	67.12722	51
SR 3020	Autumn Hill Dr.	Powell Rd.	7	0	12,706	0.45	66.77697	52

Location	From Street	To Street	Crashes		Entering ADT	Length (mi)	Crash Rate (per 100 million VMT)	
			Total	FSI			Total	Rank
Freshcorn Rd.	Heights Dr.	Glen Eden Rd.	1	1	829	1.00	66.365	53
Glen Eden Rd.	Unionville Rd.	U.S. 19	9	0	3,664	2.10	64.01206	54
Franklin Road	Evans City	T 313/Callery Rd.	7	0	2,497	2.54	60.40502	55
U.S. 19	Glen Eden Rd.	Progress Ave	24	1	25,528	0.91	56.44395	56
Ehrman Rd.	U.S. 19	Franklin Rd.	8	0	3,564	2.20	55.97229	57
U.S. 19	Ogle View Rd. /Rowan Rd.	Rochester Rd.	10	0	40,527	0.24	55.77525	58
U.S. 19	Little Creek Rd.	Fanker Rd. /Wise Rd.	1	0	10,407	0.10	53.95769	59
Hartman Rd.	Seneca School Rd.	Knauff Ln.	3	0	3,026	1.02	53.13377	60
Seneca School Rd.	Little Creek Rd.	Hartmann Rd.	2	0	3,133	0.68	51.56931	61
Glen Eden Rd.	Powell Rd. /Freshcorn Rd.	Unionville Rd.	1	0	3,664	0.30	49.86026	62
U.S. 19	Rochester Rd.	American Way	5	1	42,369	0.13	49.59236	63
SR 3020	Haine School Rd.	Thorn Hill Rd.	6	0	22,302	0.30	49.58041	64
Franklin Road	Rowan Rd. / T 309 E	Peters Rd.	4	0	8,819	0.51	48.34722	65
Rochester Rd.	Powell Rd.	Haine School Rd.	10	0	16,565	0.68	48.33059	66
Ridge Rd.	Magill Rd.	Lindsay Rd.	1	0	1,200	0.95	48.06409	67
Heights Rd.	Freshcorn Rd.	U.S. 19	2	0	1,595	1.53	44.94024	68
Rowan Rd.	Marshall Rd.	Peters Rd. /Canterbury Trail	5	0	9,935	0.62	44.37141	69
U.S. 19	Progress Ave	Ogle View Rd. /Rowan Rd.	4	0	25,528	0.19	44.16978	70
Rowan Rd.	Peters Rd. /Canterbury Trail	Franklin Rd.	1	0	2,072	0.60	43.75895	71
U.S. 19	Old Route 19	Ehrmann Rd.	4	0	16,996	0.31	42.00995	72
SR 68	I-79 NB Ramp	Hartmann Rd.	4	0	7,100	0.76	40.85322	73
Magill Rd.	SR 68	Ridge Rd.	1	0	1,200	1.14	40.16628	74
U.S. 19	Zehner School Rd.	Heights Dr.	8	0	16,996	0.65	39.56949	75
Franklin Road	Peters Rd.	Hilmont Dr. /Mars Rd.	6	0	8,819	0.98	38.18242	76
U.S. 19	Gudekunst Rd.	Lutz Rd.	5	1	12,277	0.62	36.19875	77
North Boundary Rd.	Marshall Rd.	Franklin Rd.	3	0	3,664	1.25	35.83626	78

Location	From Street	To Street	Crashes		Entering ADT	Length (mi)	Crash Rate (per 100 million VMT)	
			Total	FSI			Total	Rank
U.S. 19	SR 528	Zehner School Rd.	1	0	16,996	0.09	35.79389	79
SR 3020	Powell Rd.	Parkwood Dr. /Valley Forge Dr.	2	0	12,706	0.25	34.27326	80
Glen Eden Rd.	Carlyle Dr.	Powell Rd. /Freshcorn Rd.	1	1	3,664	0.47	31.98479	81
U.S. 19	St Francis Way	I-76 Ramps	5	1	33,909	0.25	31.86066	82
U.S. 19	T333	Little Creek Rd.	2	1	5,484	0.68	29.45338	83
Ridge Rd.	Magill Rd.	SR 68	1	0	1,200	1.63	27.929	84
Franklin Road	Hilmont Dr. /Mars Rd.	SR 228	1	0	8,819	0.22	27.86084	85
Thomson Park Rd.	Rochester Rd.	Brandt Dr.	2	0	10,335	0.41	26.1333	86
U.S. 19	Short St.	SR 228	2	0	42,369	0.10	26.01155	87
U.S. 19	American Way	Brandt Dr. /Dutilh Rd.	2	0	42,369	0.10	25.84755	88
U.S. 19	Ehrmann Rd.	Glen Eden Rd.	6	0	16,996	0.76	25.61177	89
Hillmont Rd.	Franklin Rd.	Sycamore Dr. (Short)	1	0	4,396	0.50	25.01834	90
Peters Rd.	Franklin Rd.	Myoma Rd.	3	0	5,618	1.20	24.34163	91
U.S. 19	SR 228	St Francis Way	2	0	47,505	0.10	22.7325	92
U.S. 19	Lutz Rd.	SR 528	9	0	25,205	0.87	22.44002	93
Mars Rd.	Cranberry Woods Dr.	Franklin Rd.	1	0	4,981	0.70	15.79653	94
Hartman Rd.	Seneca School Rd.	Evans City Rd.	1	1	2,018	1.82	14.9359	95
Powell Rd.	Rochester Rd.	Freedom Rd.	1	0	4,604	0.94	12.59452	96

TABLE C10.2 - SEGMENT CRASH RATE ANALYSIS, FSI CRASHES RANKED (2019–2023)

Location	From Street	To Street	Crashes		Entering ADT	Length (mi)	Crash Rate (per 100 million VMT)	
			Total	FSI			Total	Rank
Freshcorn Rd.	Heights Dr.	Glen Eden Rd.	1	1	829	1.00	66.365	1
Glen Eden Rd.	Carlye Dr.	Powell Rd. / Freshcorn Rd.	1	1	3,664	0.47	31.98479	2
Franklin Rd.	T 313/Callery Rd.	N Boundary Rd.	5	1	2,466	0.84	26.43425	3
Fanker Rd.	Dutch Rd.	U.S. 19	17	1	1,377	1.64	24.33573	4
SR 68	SR 528	Evans City Boundary	3	1	13,363	0.17	23.90427	5
U.S. 19	I-76 Ramps	Freeport Rd.	12	2	33,909	0.16	19.77934	6
U.S. 19	Fanker Rd. /Wise Rd.	E Grandview Ave	22	3	10,407	0.95	16.56288	7
Hartman Rd.	Seneca School Rd.	Evans City Rd.	1	1	2,018	1.82	14.9359	8
U.S. 19	T333	Little Creek Rd.	2	1	5,484	0.68	14.72669	9
Commonwealth Dr.	Freedom Rd.	Sechler Law Firm	6	1	5,461	0.75	13.41915	10
U.S. 19	Brandt Dr. /Dutilh Rd.	Cranberry Square Dr.	8	1	42,369	0.12	10.47056	11
U.S. 19	Rochester Rd.	American Way	5	1	42,369	0.13	9.918471	12
SR 68	Muntz Run Rd.	U.S. 19	21	1	5,053	1.20	9.015964	13
SR 588	SR 288	U.S. 19	21	1	9,130	0.74	8.133003	14
SR 68	Hartmann Rd.	SR 528	17	2	6,618	2.09	7.926057	15
U.S. 19	Gudekunst Rd.	Lutz Rd.	5	1	12,277	0.62	7.23975	16
U.S. 19	St Francis Way	I-76 Ramps	5	1	33,909	0.25	6.372133	17
SR 228	Cranberry Woods Dr.	Franklin Rd.	36	1	23,480	0.57	4.10808	18
U.S. 19	Glen Eden Rd.	Progress Ave	24	1	25,528	0.91	2.351831	19

Section C11. Summary

The crash history analysis summarizes when, where, and under what conditions crashes occurred within the study area from 2019 to 2023. The results identify clear safety concerns across intersections and roadway segments, with angle, hit fixed object, and rear-end crashes comprising the majority of collisions. These patterns are closely tied to turning conflicts, access density, speed differentials, and roadside conditions, particularly along higher-speed routes and commercial corridors.

Although most crashes resulted in property damage only, fatal and serious injury (FSI) crashes occur disproportionately along high speed arterials and rural roadways, at complex intersections, and in areas with changing roadway context. Vulnerable roadway user crashes show elevated severity and cluster in areas with pedestrian activity and limited sidewalks and crosswalks. This study pairs the crash history findings with a Road Safety Audit and stakeholder input to identify and prioritize corridors for safety improvements aimed at reducing crash frequency and severity.