Stamford Vision Zero Action Plan

Crash Analysis & HIN | 05.08.24

Executive Summary

Between 2019 and 2023, the City of Stamford, CT, reported 206 fatal and serious injury crashes, an average of about 41 per year over the five-year period (37 serious injuries and 4 fatalities annually). Motor vehicle crashes comprise the vast majority of crashes, as well as the majority of serious injuries and fatalities (also known as KSI, killed or serious injury crashes). However, when pedestrian and bicyclist crashes occur, they tend to be more severe.

A systemic analysis reveals the relative severity of different types of crashes and types of crash locations:

- **Crashes by Mode:** While bicyclists and pedestrians comprise just 3% of crashes during this time period, they represent 27% of serious injuries and fatalities (24% as pedestrians and 3% as bicyclists). Pedestrian crashes are 10x more likely to result in a KSI than motor vehicle crashes, and bicycle crashes are 4x more likely to result in KSI than motor vehicle crashes.
- **Motor Vehicle Crash Types:** While rear end, angle, and sideswipe crashes are the most common motor vehicle crash types, the most severe crash types are fixed object crashes (where a motor vehicle strikes a parked car, tree, or other non-moving object) and head on collisions.
- **Pedestrian Serious Injuries Near Key Attractors:** Crashes and KSI were assessed by their proximity to locations that tend to attract pedestrians. Eight percent of pedestrian-related KSI crashes occurred near a school, 29% near parks, and 10% near affordable housing. The impact to pedestrians near these land uses is most pronounced around parks, indicating a need for pedestrian safety investments near these community assets.
- **Intersection Crashes:** While signalized intersections comprise just 11% of total intersections, 58% intersection KSI occur at these locations. Intersection crashes and KSI are also far overrepresented at non-local intersections – where a collector and/or arterial meet. KSI are over 5x more likely at these locations than the average Stamford intersection.
- **Segment Crashes:** As roadways have more lanes, higher speeds, and additional daily volumes, the likelihood of crashes and KSI increase on those corridors. While arterials comprise just 14% of roadway mileage in Stamford, 48% of crashes and 59% of KSI occur on these roadways.

- **Equity Assessment:** Based on an equity score comprised of demographic and socio-economic factors, areas with a high equity need are overrepresented in the city's crashes and KSI. Only 13% of roadway miles occur in above average equity areas, while 35% of KSI and 42% of bicycle and pedestrian injuries and fatalities occur in these neighborhoods.

A high injury network (HIN) was developed to support Stamford in prioritizing safety projects throughout the city. The HIN includes both intersection and segment locations, and it was developed based on four equally-weighted attributes: KSI crash history, a typology risk assessment, relative KSI crash history across different typologies, and pedestrian and bicycle crash history. Based on this approach, three tiers of priority corridors were identified, with Tier 1 acting as the HIN. Within this network:

- Tier 1 captures 41% of KSI and 45% of bicycle and pedestrian crashes on just 3% of intersections and 4% of roadway miles.
- Tiers 1-3 capture 59% of KSI and 76% of bicycle and pedestrian crashes on just 6% of intersections and 15% of roadway miles.

Description of Data

This crash analysis for Stamford was conducted using crash data from the Stamford Police Department for the years 2019 through 2023. All highway crashes along I-95 and the Merritt Parkway were removed prior to analysis. The resulting dataset included 18,317 total crashes, an average of 3,663 per year. Stamford's data only includes reported crashes that meet the department's definition of a crash and reporting requirements. Therefore, crashes that were not reported to law enforcement and crashes that did not involve a motor vehicle (e.g., cyclist-fixed object) are not included in this analysis.

The Stamford Police Department data included 16 fatal crashes in its data; it did not include 4 fatal crashes that occurred in Stamford in recent years. This can occur when a crash is still under investigation; the crash database is not updated until the fatal crash's attributes have been finalized. These four additional fatal crashes are noted in Table 1 and the fatal crash total. However, they are excluded from the remainder of the analysis, as complete attributes about these crashes were not available.

Descriptive Statistics

This section will focus on summarizing crash trends by year, mode, and crash severity. Total crashes are generally summarized based on the number or proportion of crashes that resulted in serious injuries or fatalities. However, for bicycle and pedestrian crashes, all injuries are often included. This allows for a larger sample size from which we can identify crash trends.

Annual Description of Trends

Between 2019 and 2023, Stamford saw 206 serious injuries and fatalities. Over this period, there were 186 crashes resulting in serious injuries and 20 crashes resulting in fatalities, an

average of 37 serious injuries and 4 fatalities annually. This represents one roadway fatality each year for every 34,000 residents. Stamford saw a spike in fatalities in 2022 and 2023, with 7 and 6 fatalities, respectively. Table 1 breaks down crashes by year and severity.

Table 1. Crashes by Year

Year	Total Crashes	Total Serious Injury Crashes	Total Fatal Crashes
2019	4,442	35	2
2020	3,056	33	3
2021	3,669	46	2
2022	3,567	32	7
2023	3,583	40	6
Total	**18,317**	**186**	**20**

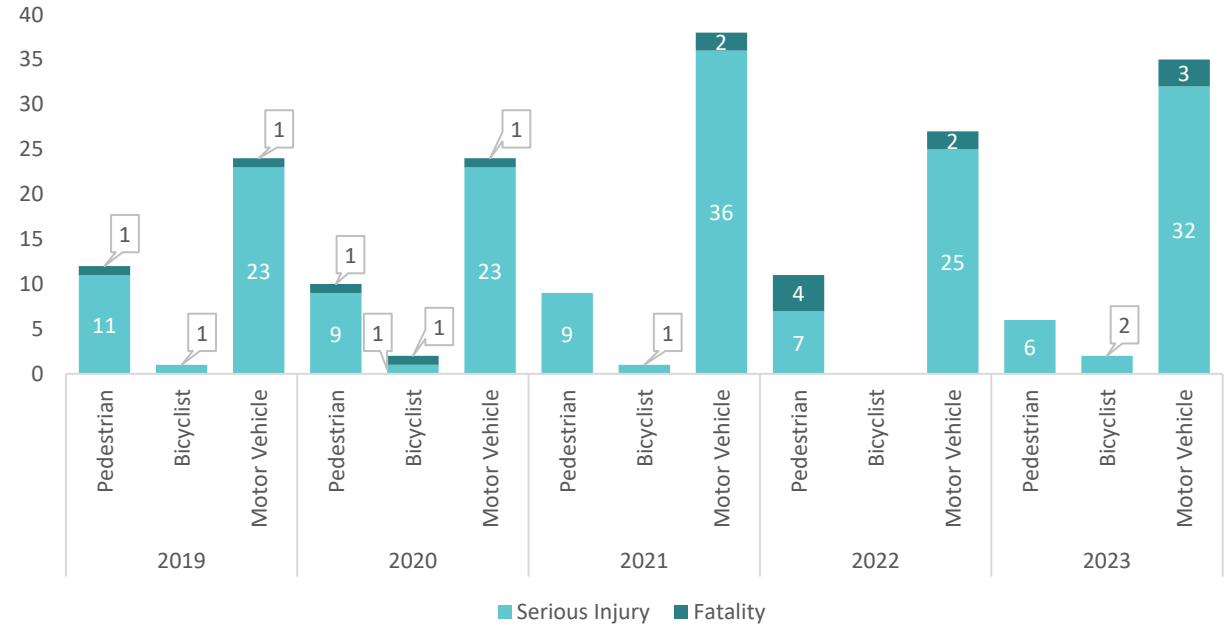
The fatal crashes are listed chronologically below:

- 8/26/2019 Intersection of Ludlow Street and Canal Street
- 11/13/2019 Intersection of Washington Boulevard and Tresser Boulevard
- 6/22/2020 West Hill Road near West View Lane
- 9/24/2020 Newfield Avenue between Vine Road and Gray Farms Road
- 11/6/2020 Intersection of Commerce Road and Harvard Avenue
- 7/19/2021 Intersection of Bridge Street and Washington Boulevard
- 11/22/2021 Intersection of N State Street and Elm Street
- 1/22/2022 Intersection of Greyrock Place and Broad Street
- 3/23/2022 Intersection of I-95 South Bound Exit 9 and E Main Street (Route 1)
- 4/13/2022 Intersection of Washington Boulevard and Tresser Boulevard
- 7/3/2022 Newfield Avenue near Meadows Lane
- 9/28/2022 Intersection of Seaton Road and Courtland Avenue
- 12/3/2022 Intersection of Main Street and Washington Boulevard
- 12/20/2022 Shippan Avenue near Cummings Park entrance
- 1/1/2023 Intersection of Greenwich Avenue and Pulaski Street
- 4/14/2023 Intersection of High Ridge Road and Bird Song Lane
- 5/26/2023 Intersection of Hamilton Avenue and E Main Street (Route 1)
- 7/26/2023 Wire Mill Road near Studio Road
- 11/21/2023 West Main Stret near Alvord Lane
- 12/19/2023 High Ridge Road near Yale Court

Fatalities and Injuries by Mode

Between 2019 and 2023, Stamford saw an average of 29.6 motor vehicles, 9.6 pedestrians, and 1.2 bicyclist fatalities and serious injuries annually. This number includes 6 total pedestrian fatalities, 1 bicyclist fatality, and 9 total motor vehicle fatalities over 5 years. Figure 1 depicts crashes resulting in fatalities and serious injuries categorized by mode and year.

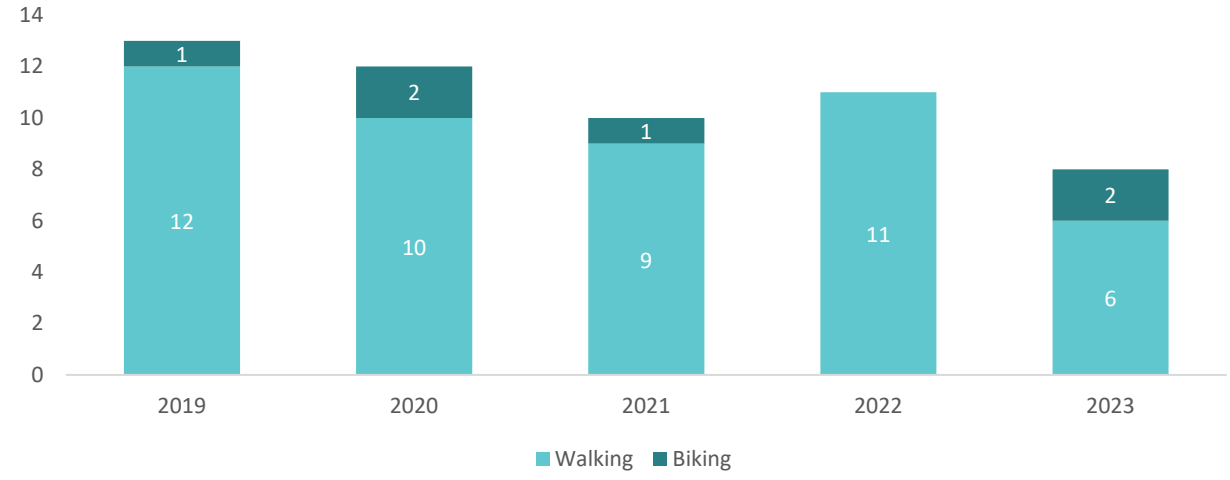
Figure 1. Count of Fatal and Injury Crashes by Mode



Bicycle and Pedestrian Fatalities and Total Injuries

In order to obtain a more comprehensive understanding of bicycle and pedestrian crashes, trends in annual fatalities and total injuries were also examined for these modes. Over the period from 2019 to 2023, Stamford recorded an average of 10 pedestrian and 1 bicyclist fatalities and injuries annually, resulting in an average of 11 annual bicycle and pedestrian fatalities and injuries. The annual breakdowns are depicted in Figure 2.

Figure 2. Bicyclists and Pedestrians Killed or Injured (2019-2023)



Description of Users

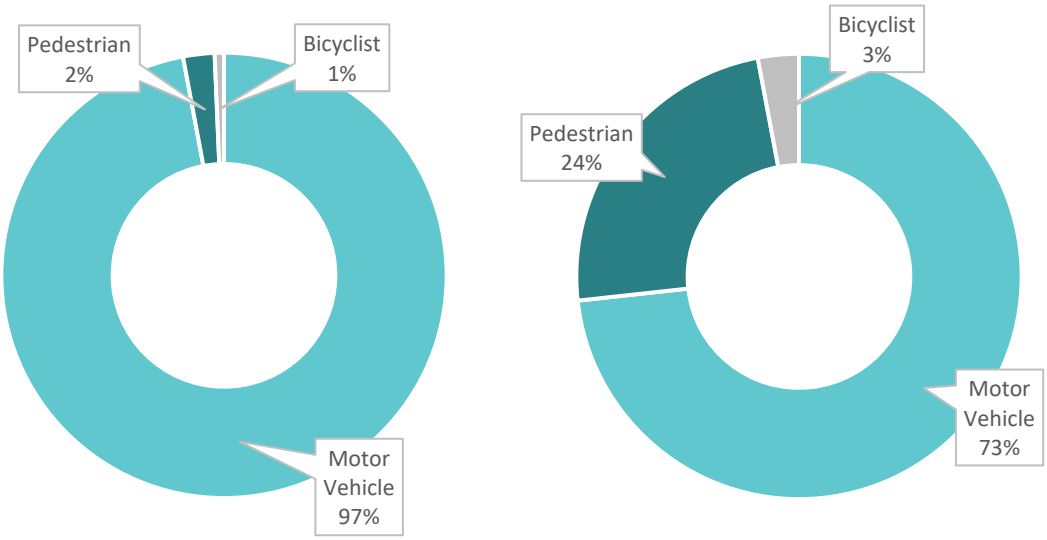
The crash data has been broken down to investigate three types of roadway users.

- **Pedestrians:** These individuals travel on foot, using sidewalks, crosswalks, and pedestrian pathways to get around.
- **Bicyclists:** Bicyclists use bicycles as their primary mode of transportation. They may ride on bike lanes, shared roads, or dedicated bike paths.
- **Motorists:** Motorists travel using motor vehicles such as cars, trucks, or motorcycles. They use roads and highways to commute or travel between destinations.

Since 2019, 97% of all crashes in Stamford involved only motor vehicles, while pedestrians and bicyclists were involved in 2% and 1% of total crashes, respectively. Despite being involved in just 3% of total crashes, bicyclists and pedestrians in Stamford collectively accounted for 27% of serious injuries and fatalities. Figure 3 illustrates all crashes within 5 years by mode as well as fatal and serious injury crashes only within 5 years by mode.

This demonstrates that, on average, pedestrian and bicyclist crashes tend to be more severe than motor vehicle crashes. While just 1% of motor vehicle crashes result in a serious injury or fatality, 12% and 5% of pedestrian and bicycle crashes, respectively, result in a serious injury or fatality.

Figure 3. Share of Total Crashes and KSI by Mode (2019-2023)



Temporal Crash Trends

Temporal crash trends identify variations in the frequency and severity of Stamford traffic incidents over specific time periods, including daily, monthly, and seasonal cycles. Analysis of these patterns can help to identify risk factors and inform targeted interventions for improving road safety.

The following section examines temporal trends for all crashes where a person involved was killed or seriously injured (KSI) across all modes and crashes involving any severe bicyclist and pedestrian injuries.

Time of Day and Day of Week

Trends in the time of day and day of the week when crashes are prevalent can be used to develop evidence-based regulations, optimize resource allocation, and inform infrastructure planning as well as heighten emergency response preparedness during peak crash times. Table 2 illustrates crash trends relative to the average hour – if every hour throughout the week had the same number of serious and fatal crashes, then each cell would have the number 1. Where numbers are greater than 1, serious and fatal crashes occur disproportionately during this time of day or day of the week.

Fatalities & Serious Injuries

Time of Day: A fair share of KSI crashes occurred during the overnight hours, with 26% of all KSI crashes from 2019 to 2023 occurring between 10pm and 4am. This highlights the necessity of tackling nighttime road safety issues, potentially through improved visibility strategies and focused awareness initiatives.

Sixty-five percent of KSI crashes occurred in the daytime (5am-7pm). This implies that while nighttime travel carries a greater risk of fatalities, the seriousness of daytime crashes warrants equal consideration.

Day of Week: About 19% of all fatal crashes occurred on weekends. As 34% of KSI crashes occur on the weekends, the rate of crashes per weekend day is higher than per weekday, with Saturday the most dangerous day for severe crashes.

Table 2. Distribution of Serious Injury and Fatal Crashes by Time of Day and Day of Week

Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.0	1.8	0.0	0.0	0.9	0.9	4.5	5%
1	1.8	1.8	0.9	0.0	0.0	0.9	0.9	4%
2	1.8	0.9	0.0	0.0	0.0	0.0	1.8	3%
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
4	0.9	0.0	0.0	0.0	0.0	0.0	1.8	2%
5	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1%
6	1.8	0.9	0.0	0.9	1.8	0.9	0.9	4%
7	0.0	0.9	0.9	1.8	0.0	1.8	0.9	4%
8	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1%
9	0.0	0.0	0.9	0.0	0.0	0.0	1.8	2%
10	0.9	2.7	0.9	0.0	2.7	0.9	0.9	5%
11	0.0	0.0	0.9	1.8	1.8	0.9	1.8	4%
12	0.0	0.0	0.0	0.9	1.8	0.0	2.7	3%
13	0.9	1.8	1.8	0.9	0.9	3.6	1.8	7%
14	0.0	0.0	0.0	0.9	0.9	0.9	0.9	2%
15	0.0	0.9	1.8	0.9	0.9	0.0	1.8	4%
16	2.7	0.9	1.8	1.8	2.7	0.9	1.8	7%
17	0.9	2.7	3.6	1.8	0.9	0.9	2.7	8%
18	0.9	0.0	1.8	0.0	0.0	3.6	0.9	4%
19	3.6	3.6	3.6	0.0	2.7	0.9	0.0	9%
20	0.9	2.7	1.8	0.0	0.0	0.0	1.8	4%
21	1.8	0.9	1.8	0.9	1.8	1.8	0.9	6%
22	0.0	0.9	1.8	0.0	1.8	3.6	2.7	6%
23	0.9	0.9	0.9	0.0	1.8	0.9	4.5	6%
	12%	14%	15%	7%	14%	14%	23%	

Bicycle & Pedestrian Injury Crashes

Table 3 below illustrates the distribution of bicycle and pedestrian-related serious injuries and fatal crashes by time of day and day of week over five years.

Time of Day: Over half of all injury crashes involving bicyclists and pedestrians occur during commuting hours. Nearly 37% of injury cyclist and pedestrian crashes occurred in evening hours between 4pm-8pm and an additional 21% occurred between 7am-10am.

This highlights the significance of directing safety initiatives during this particular timeframe, which can include educational campaigns and infrastructure enhancements near locations frequently visited by pedestrians and cyclists for commuting, such as schools, business hubs, and transit stations.

Day of Week: Weekdays emerge as periods of elevated risk for cyclist and pedestrian injury crashes. Considering time-of-day patterns, it suggests that weekdays pose greater dangers, likely due to heightened commuting activity as individuals travel to and from work or school. The larger presence of bicyclists and pedestrians sharing roads with other motor vehicles during these peak times may amplify the risk of crashes.

Table 3. Distribution of Bicycle & Pedestrian Injury and Fatal Crashes by Time of Day and Day of Week

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
0	1.1	0.0	0.0	0.0	0.4	0.4	1.1	2%
1	0.4	0.0	0.7	0.0	0.0	0.0	0.4	1%
2	0.4	0.0	0.0	0.0	0.0	0.0	0.7	1%
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
4	0.0	0.0	0.0	0.4	0.0	0.4	0.0	0%
5	0.0	0.7	0.0	0.0	0.4	0.0	0.0	1%
6	0.4	1.4	0.0	1.4	0.7	2.1	0.0	4%
7	0.0	1.8	1.1	1.8	2.5	2.1	0.7	6%
8	0.4	0.7	1.1	3.2	1.4	2.1	1.1	6%
9	1.1	0.0	1.1	0.7	1.4	1.1	0.7	4%
10	1.1	1.8	2.1	1.1	0.7	0.0	1.1	5%
11	0.0	0.7	1.8	0.4	0.4	1.4	1.8	4%
12	0.4	0.7	3.2	1.4	0.7	1.1	2.5	6%
13	1.1	1.1	1.4	0.4	1.1	1.4	0.7	4%
14	2.1	0.0	2.1	2.1	2.5	0.7	0.0	6%
15	0.7	1.8	2.1	1.1	1.1	1.1	0.0	5%
16	0.4	1.8	2.1	2.8	2.1	1.8	1.8	8%
17	2.1	1.8	3.5	2.1	1.4	1.8	2.5	9%
18	0.4	2.5	1.4	2.8	2.1	3.5	0.7	8%
19	1.1	1.4	1.8	2.8	1.4	2.5	0.7	7%
20	1.4	0.4	1.4	1.4	1.4	1.4	1.1	5%
21	0.4	0.7	1.1	1.1	1.1	1.8	0.7	4%
22	0.7	0.7	0.4	1.1	1.1	3.5	0.0	4%
23	0.4	0.0	0.4	0.7	1.8	0.4	1.8	3%
	9%	12%	17%	17%	15%	18%	12%	

Seasonal Variation

Understanding which months and seasons experience more crashes sheds light on how environmental elements like weather, temperature, daylight, and road conditions, as well as behavioral factors such as mode choice, influence crashes in Stamford.

Table 4 illustrates the distribution of serious and fatal crashes by time of day in 3-hour buckets and month of the year over five years.

Table 4. Distribution of Serious Injury and Fatal Crashes by Time of Day and Month

Hours	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
12 to 3 AM	0.5	0.5	0.5	0.5	1.1	2.7	1.6	1.1	2.1	1.1	0.5	0.5	12%
3 - 6 AM	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	1.6	0.0	0.0	0.0	2%
6 - 9 AM	1.6	0.5	1.6	0.0	0.0	0.5	0.5	1.1	0.0	1.1	1.1	1.1	8%
9 AM – 12 PM	1.6	1.1	0.0	0.0	1.6	1.6	0.5	0.5	2.1	0.0	1.1	1.1	10%
12 - 3 PM	0.5	2.1	0.5	1.6	1.6	2.1	0.5	1.6	1.1	0.5	0.0	0.5	12%
3 - 6 PM	1.6	0.0	1.6	1.6	2.1	1.6	0.5	2.7	2.7	1.1	1.1	2.7	18%
6 - 9 PM	0.5	1.6	0.0	2.1	2.1	1.6	2.7	0.5	2.1	2.7	2.7	1.1	18%
9 PM 12 AM	0.0	0.5	0.5	2.1	3.2	1.6	1.1	1.1	1.1	5.9	2.1	1.1	19%
	6%	6%	4%	7%	11%	11%	7%	8%	12%	11%	8%	7%	100%

Table 5 illustrates the distribution of bicycle and pedestrian-related serious injuries and fatal crashes by time of day in 3-hour buckets and month of the year over five years.

Table 5. Distribution of Bicycle & Pedestrian Injury and Fatal Crashes by Time of Day and Month

Hours	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
12 to 3 AM	0.2	0.2	0.0	0.2	0.5	0.5	0.7	0.5	0.0	0.2	0.0	0.5	3%
3 - 6 AM	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.5	0.0	0.0	1%
6 - 9 AM	1.8	1.1	1.4	1.1	1.1	1.4	0.9	0.7	2.0	1.8	2.3	0.9	15%
9 AM – 12 PM	0.5	0.9	0.9	1.8	0.9	0.9	0.9	1.4	0.9	1.1	1.1	1.6	12%
12 - 3 PM	1.8	1.6	0.2	1.4	1.8	2.5	1.1	0.7	1.4	2.0	0.7	1.8	16%
3 - 6 PM	2.5	0.7	1.4	1.6	1.6	1.1	1.1	2.0	1.1	3.4	2.9	3.4	21%
6 - 9 PM	2.0	2.0	1.8	1.1	2.0	1.8	0.7	1.6	2.9	2.5	1.4	1.6	20%
9 PM 12 AM	0.5	0.7	0.9	0.5	1.4	0.7	1.6	1.1	1.1	0.9	1.1	2.0	12%
	9%	7%	6%	7%	9%	8%	7%	7%	9%	12%	9%	11%	100%

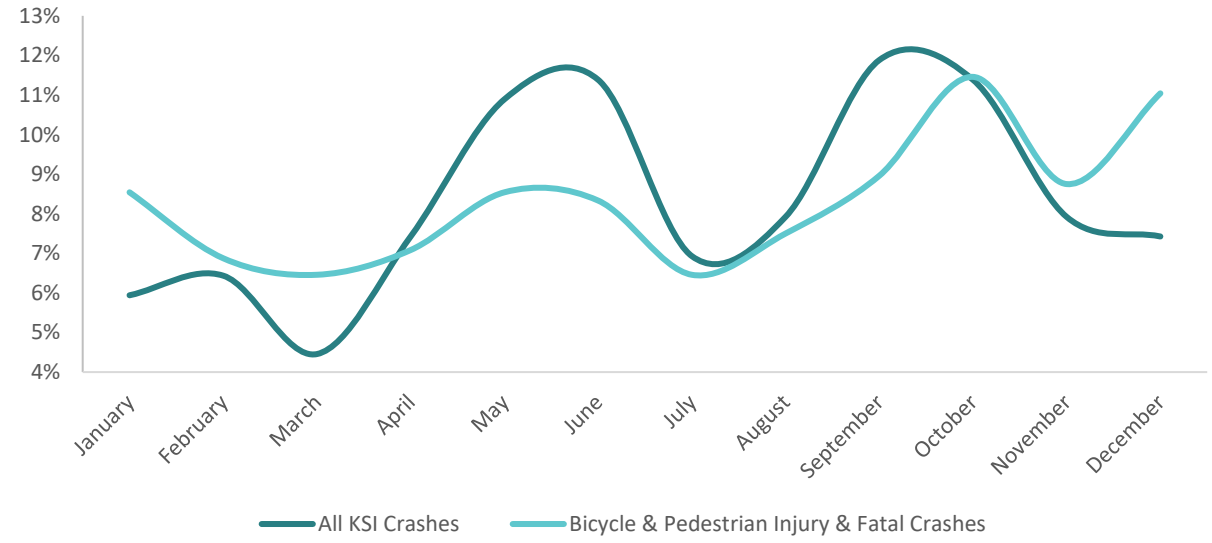
Fatalities and Serious Injuries

KSI crashes fluctuate by month. The crashes experience a spike in May, June, September, and October. During the summer months, an increase in travel may have contributed to a surge in crashes, while in the fall months, the return of schools and higher traffic volumes could have led to a spike in crashes.

Bicycle and Pedestrian Injury and Fatal Crashes

October experiences the highest percentage of crashes by month. Bicycle and pedestrian crashes seem to rise towards the later months of the year. This might be attributed to adverse weather conditions and early sunsets, leading to visibility issues. Figure 4 depicts the 5-year trend of all KSI crashes and all bicycle and pedestrian injury crashes by month.

Figure 4. Crashes by Month (2019-2023)



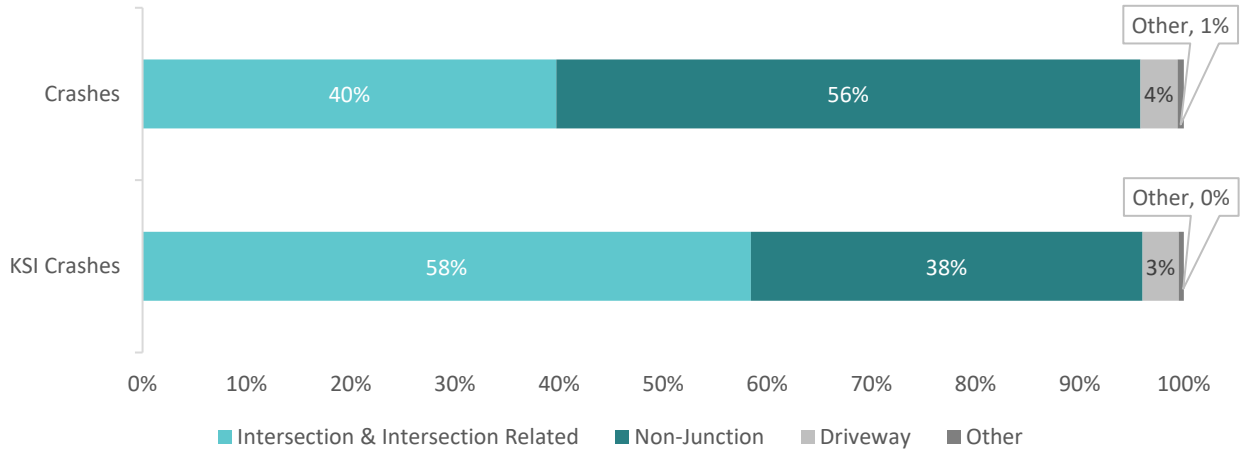
Crash Locations

Crash data was analyzed across various types of sites. Crash sites along roads were examined at intersections, midblock sections, driveways, and other locations. Additionally, crashes were assessed in different land use areas such as parks, schools, and affordable housing zones. Furthermore, crashes were reviewed in proximity to bicycle and pedestrian infrastructure as well as transit stops.

Location Type

Between 2019 and 2023, 40% of all crashes in Stamford occurred at intersections, while 56% occurred at non-junctions (midblock). Among total KSI crashes, 58% occurred at intersections and 38% occurred mid-block. The data indicates even though crashes at intersections are less frequent, they tend to be more severe. Figure 5 shows the breakdown of KSI crashes and all crashes by location type.

Figure 5. Share of Crashes by Location Type

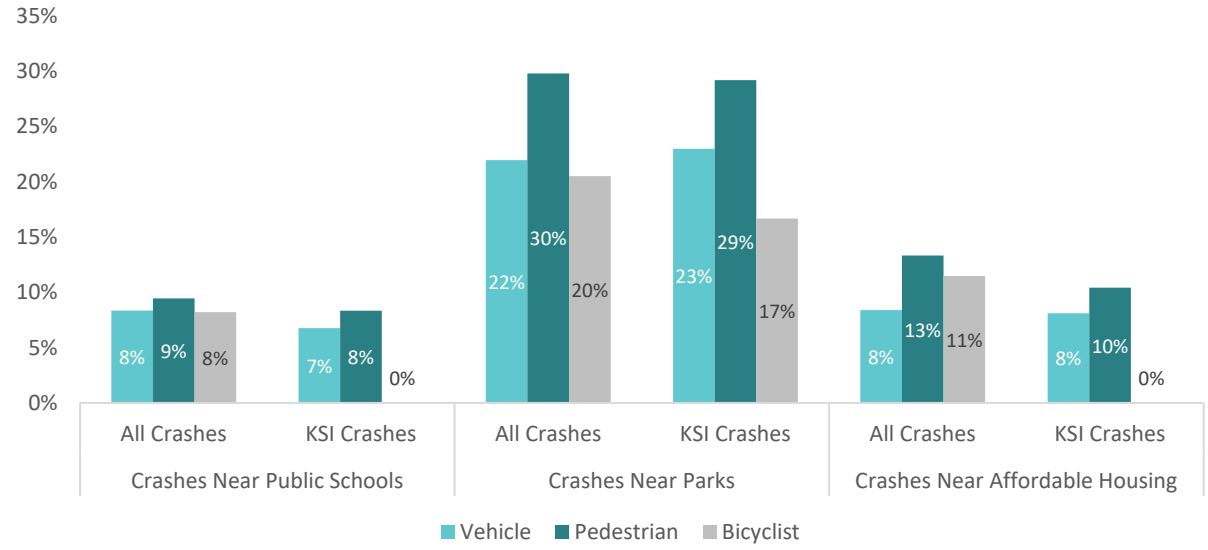


Land Use

Parks, schools, and affordable housing are likely to generate trips by vulnerable road users, such as bicyclists, pedestrians, elderly, and children, understanding traffic safety trends in these areas is critical.

For each land use type, we see a higher portion of pedestrian crashes and KSI crashes than conflicts with motorists or bicyclists. Between 2019 and 2023, 8% of pedestrian-related KSI crashes occurred near a school, 29% near parks, and 10% near affordable housing. The impact to pedestrians near these land uses is most pronounced around parks, where the portion of crashes and KSI for pedestrians is substantially higher than other modes. Figure 6 depicts the types of crashes near activity centers in Stamford.

Figure 6. Share of Crashes Near Key Activity Centers



Transportation

Ninety-six percent of all pedestrian-related crashes occur near sidewalks. Pedestrian-related KSI crashes near sidewalks are about 12%. The severity of these crashes tends to be higher than motor vehicle or bicyclist crashes near sidewalks. A fair portion of pedestrian fatalities in Stamford occur near sidewalks.

Among all bicycle-related crashes, 25% of them occur near bike lanes. Bicycle-related KSI crashes near bike lanes are about 13%. The majority of these crashes tend to be severe.

Of all pedestrian-involved crashes, 86% take place in the vicinity of transit stops. Specifically, pedestrian-related KSI crashes near transit stops constitute approximately 12%. A good portion of pedestrian fatalities in Stamford occur near transit stops.

Systemic Analysis

The systemic analysis assesses the relative severity of different types of crashes and types of crash locations. This is helpful, as location prioritization should not just look at where crashes and KSI have occurred, but the types of places in which crashes and KSI commonly occur. The relative severity is the ratio of the percent of KSI and the percent of crashes; where the relative severity exceeds 1, KSI are overrepresented for that crash type relative to the number of crashes that occur.

Crash Severity by User

Recognizing which types of road users experience the most crashes and which types of road users most disproportionately experience severe crashes is key in identifying safety countermeasures. Table 6 outlines the share of total crashes, KSI crashes and relative severity across different user types between 2019 and 2023.

Table 6. Share of Crashes by User Type

User	% of Crashes	% of KSI	Relative Severity
Pedestrian	2%	24%	10.54
Bicycle	1%	3%	4.46
Motor Vehicle	97%	73%	0.75

These findings can be reduced to two key indicators, frequency, and severity, to help identify how safety countermeasures should be prioritized across user types.

The following key findings can be understood from Table 7:

- Motor vehicle only crashes are very common but tend to be less severe when they occur.
- Pedestrian and cyclist crashes are rare but tend to be very severe when they occur.

Table 7. Frequency and Severity by User Type

User	Frequency	Severity
Pedestrian	Rare	Very Severe
Bicycle	Rare	Very Severe
Motor Vehicle	Very Common	Less Severe

Crash Type Analysis (Motor Vehicle Crashes)

Understanding which crash types occur most often, as well as which crash types most often result in fatalities and serious injuries is critical for developing effective safety countermeasures. Between 2019 and 2023, the most common motor vehicle crash type was rear end, representing 29% of all crashes but only 16% of KSI crashes. During that same period, angle crashes accounted for 24% of all crashes but resulted for 30% of KSI crashes. Table 8 outlines the share of motor vehicle crash types between 2019 and 2023.

Table 8. Share of Motor Vehicle Crashes by Crash Type

Crash Type	% of Vehicle Crashes	% Of KSI	Relative Severity
Rear End	29%	16%	0.56
Angle	24%	30%	1.23
Sideswipe	21%	1%	0.07
Fixed Object	7%	15%	2.06
Head On	5%	20%	4.14
Other	14%	18%	1.26

Analyzing these findings through the lenses of frequency and severity can pinpoint which types of crashes require the most urgent attention for safety interventions. Several key findings can be understood from Table 9:

- Rear End crashes are very common, but tend to be less severe when they occur.
- Head On and Fixed Object crashes are rare, but tend to be more severe when they occur.

Table 9. Frequency and Severity by Crash Type

Crash Type	Frequency	Severity
Rear End	Very Common	Less Severe
Angle	Very Common	Severe
Sideswipe	Very Common	Less Severe
Fixed Object	Very Rare	Very Severe
Head On	Very Rare	Very Severe
Other	Rare	Severe

Angle crashes are both very common and severe. These crashes are generally marginally more likely to occur at intersections than segments (58% vs. 42%), but KSI associated with angle

crashes are substantially likely to occur at intersections than segments (89% vs. 11%). Just looking at intersections, crashes and KSI occur more frequently at signalized intersections than unsignalized intersections (60 and 62%, respectively).

Lighting Analysis

Visibility often plays a role in crashes. This lighting analysis highlights the relative severity of different lighting conditions during crashes. While most crashes (69%) and the highest portion of KSI (45%) occur during daylight, these crashes are less severe than those occurring in dawn, dusk, or dark conditions (Table 10). Crashes in dark conditions without lighting are the most severe (3x as likely to result in a KSI than the average Stamford crash), crashes after dark with lighting present also have a high relative severity.

Crashes after dark by neighborhood is summarized in the neighborhood assessment below.

Table 10. Share of Crashes by Lighting

Lighting	% of Crashes	% of KSI	Relative Severity
Daylight	69%	45%	0.65
Dawn & Dusk	3%	3%	1.03
Dark - Lighting Present	23%	42%	1.80
Dark - No Lighting	3%	9%	3.15
Unknown	1%	0%	0.45

High-Risk Feature Analysis

The following sections summarize the likelihood of different intersection and street types resulting in a crash, serious injury, or fatality. By conducting this systemic analysis, the city can prioritize what types of locations should be prioritized for future investment.

For each of these analyses, “relative likelihood” is measured. This is the ratio of the percent of crashes or KSI to the percent of intersections or roadway mileage. A value of 1 would indicate that crashes are balanced across intersection or street types (e.g., 10% of crashes occur at 10% of intersections). Where the relative likelihood is higher than 1, it indicates that a location type is overrepresented in crashes or KSI.

Control Type

Within Stamford, 11% of intersections are signalized. while this is a small portion of total intersections, 63% of intersection crashes and 58% of intersection serious injuries and fatalities occur at these locations. As a result, signalized intersections should be prioritized for safety improvements. Table 11 summarizes crashes by intersection control type.

Table 11. Share of Crashes by Control Type (All Crashes)

Signalization	% of Ints.	% of Ints. Crashes	Relative Likelihood of Crashes	% of Ints. KSI	Relative Likelihood of KSI
Signalized	11%	63%	5.86	58%	5.43
Unsignalized	89%	37%	0.42	42%	0.47

The most common crash types at intersections are rear end (31%) and angle crashes (26%). The most common crash types for KSI crashes at intersections are angle crashes (31%) and head-on crashes (12%). These trends generally hold across both signalized and unsignalized intersections.

Functional Classification at Intersections

By definition, an intersection is where multiple road segments meet. Sometimes, each of the intersecting roadways are of the same street type (e.g., local, collector, etc.), while sometimes streets of different types come together at the intersection.

Table 12 summarizes crashes and KSI by intersection type. While 52% of intersections are solely comprised of local roads, these locations make up a small portion of crashes and KSI. In contrast, intersections solely comprised of non-local roads make up just 6% of Stamford intersections, but they comprise almost 40% of crashes and KSI. “Mixed” intersections are where a local and non-local street meet. At these locations, crashes and KSI are relatively balanced with the proportion of intersections (41% of intersections relative to 53% of crashes and 58% of KSI).

Table 12. Share of Crashes by Intersection Type (All Crashes)

Intersection Type	% of Int.	% of Ints. Crashes	Relative Likelihood of Crashes	% of Ints. KSI	Relative Likelihood of KSI
Local	52%	8%	0.15	6%	0.11
Mixed	41%	53%	1.29	58%	1.41
Non-Local	6%	39%	6.13	37%	5.76

Functional Classification Along Segments

Functional classification along segments was also reviewed, looking at roadway mileage throughout Stamford and the proportion of crashes and KSI along different types of streets. While local streets are the majority of the city’s mileage (72%), they makeup a lower proportion of crashes (40%) and even fewer KSI (24%). Through this analysis, arterials (both secondary and major arterials) demonstrate a high need for safety improvements, as a substantial portion of crashes happen at these locations despite comprising less than 15% of the roadway network (Table 13).

Table 13. Share of Segment Crashes by Functional Classification (All Crashes)

Functional Classification	% of Miles	% of Seg. Crashes	Relative Likelihood of Crashes	% of Seg. KSI	Relative Likelihood of KSI
Local	72%	40%	0.55	24%	0.33
Collector	14%	12%	0.89	18%	1.27
Secondary Arterial	5%	20%	3.65	20%	3.64
Major Arterial	9%	28%	3.08	39%	4.27

Area Analysis

Historically, underserved communities – communities of color, low-income communities, and communities with the highest poverty rates – have experienced a disproportionate share of fatal crashes.

These communities have received less infrastructure and investment compared to more privileged ones, often suffering from the negative impacts of arterials and highways that divide neighborhoods, create mobility barriers, and increase high-speed traffic. This has resulted in a significant disparity in the quality and layout of streets in underserved areas.

Achieving zero fatalities requires a deliberate effort to recognize and address these disparities at their core. Vision Zero emphasizes the equitable distribution of infrastructure investments, allocating more resources to areas burdened by past decisions' consequences. By investing equitably in safer streets, we can effectively enhance safety, disrupt harmful cycles perpetuated by traffic-related incidents, and foster healthier, fairer, and more prosperous communities. This analysis can help prioritize safety measures in areas with the greatest need.

Equity Assessment

The equity assessment uses an equity measure developed by the City of Stamford as part of their sidewalk selection process. The equity measure is made up of multiple criteria, and it is evaluated at the Census tract level, based on the 2022 5-year American Community Survey. For each criterion, the percent of the Census tract with a given characteristic is represented as a ratio of that Census tract compared to the citywide average (e.g., if 20% of the city is non-white and 40% of the Census tract is non-white, the Census tract would receive a score of 2 for that criteria).

- Racial & Economic Equity (50%)
    - Non-White Residents
    - Cost-Burdened Households
    - Households in Poverty
- Mobility Equity (50%)
    - Zero-Vehicle Households
    - Population under 18 Years Old
    - Population over 65 Years Old

- Population with Reported Disabilities

Based on their equity scores, Census tracts were then categorized as below average, average, or above average. The categories were determined based on the mean score and standard deviation from that score:

- **Below Average** represents Census tracts with scores ½ standard deviation below the mean. These are the most affluent tracts, and they include 54% of the city's roadway miles and 37% of the city's population.
- **Average** includes Census tracts with scores from ½ standard deviation below the mean to ½ standard deviation above the mean. This portion of Stamford includes 33% of the city's roadway miles and 36% of the population.
- **Above Average** represents Census tracts with scores greater than ½ standard deviation above the mean. This area is home to 13% of the city's roadway miles and 27% of its residents.

For all crashes, above average areas show a higher proportion of all crashes and KSI crashes relative to their share of miles and population. This analysis can help prioritize safety measures in areas with the greatest need. For bicycle and pedestrian crashes, this trend is more pronounced, as an even greater share of bicycle and pedestrian crashes and KSI are in the above average areas. Table 14 depicts the equity score for all crashes and bicycle and pedestrian crashes based on the percentage of miles, population, and severity.

Table 14. Equity Assessment – All Crashes

Equity Score	% of Miles	% of Population	% of Crashes	% of KSI*
All Crashes				
Below Average	54%	37%	33%	41%
Average	33%	36%	30%	25%
Above Average	13%	27%	37%	34%
Bicycle & Pedestrian Crashes				
Below Average	54%	37%	32%	31%
Average	33%	36%	26%	26%
Above Average	13%	27%	42%	42%

* All injury crashes are included for bicyclists and pedestrians.

Neighborhood Assessment

Table 15 outlines the distribution of miles, population, all crashes, and KSI crashes across various neighborhoods. Some neighborhoods, like Downtown and Ridgeway-Bullshead, experience higher crash rates and KSI crashes relative to their size and population, indicating potential safety concerns. Conversely, neighborhoods like Shippan have lower crash rates.

Table 15. Neighborhood Assessment – All Crashes

Neighborhood	% of Miles	% of Population	% of Crashes	% of KSI
Cove	7%	11%	10%	10%
Downtown	5%	10%	18%	17%
East Side	4%	6%	7%	8%
Glenbrook-Belltown	5%	9%	7%	5%
North Stamford	28%	11%	3%	10%
Ridgeway-Bullshead	8%	13%	15%	15%
Shippan	2%	2%	0%	1%
South End	3%	5%	5%	2%
Springdale	6%	6%	4%	4%
Turn of river-Newfield	15%	9%	8%	12%
Waterside	4%	4%	5%	2%
West Side	5%	11%	13%	11%
Westover	8%	4%	2%	3%

Table 16 illustrates how miles, population, all crashes, and KSI crashes are spread across different neighborhoods. Downtown and Ridgeway-Bullshead notably experience higher crash rates and injury & fatal incidents relative to their size and population. In contrast, areas like Shippan show no recorded crashes.

Table 16. Neighborhood Assessment – Bicycle & Pedestrian Crashes

Neighborhood	% of Miles	% of Population	% of Crashes	% of KSI
Cove	7%	11%	11%	12%
Downtown	5%	10%	25%	25%
East Side	4%	6%	8%	8%
Glenbrook-Belltown	5%	9%	6%	6%
North Stamford	28%	11%	1%	1%
Ridgeway-Bullshead	8%	13%	17%	16%
Shippan	2%	2%	0%	0%
South End	3%	5%	4%	4%
Springdale	6%	6%	5%	5%
Turn of river-Newfield	15%	9%	5%	5%
Waterside	4%	4%	3%	2%
West Side	5%	11%	14%	15%
Westover	8%	4%	1%	1%

A substantial portion of crashes happen after dark. Conducting a neighborhood assessment by lighting conditions allows the City to better understand where to focus enforcement or lighting

improvements to reduce these types of crashes. Downtown, Ridgeway-Bullshead, and West Side have the highest portions of crashes and KSI after dark (Table 17).

Table 17. Neighborhood Assessment – Crashes in Dark Conditions

Neighborhood	% of Miles	% of Population	% of Dark Crashes	% of Dark KSI
Cove	7%	11%	12%	8%
Downtown	5%	10%	20%	22%
East Side	4%	6%	9%	10%
Glenbrook-Belltown	5%	9%	7%	6%
North Stamford	28%	11%	3%	5%
Ridgeway-Bullshead	8%	13%	13%	16%
Shippan	2%	2%	0%	1%
South End	3%	5%	6%	2%
Springdale	6%	6%	4%	5%
Turn of river-Newfield	15%	9%	6%	10%
Waterside	4%	4%	5%	2%
West Side	5%	11%	15%	11%
Westover	8%	4%	2%	2%

High Injury Network

A high injury network (HIN) provides decision-makers with quantitative information about which streets and intersections see the highest concentrations of severe traffic crashes and can, therefore, benefit most from the implementation of safety countermeasures. HINs, in part, fulfill Question 3 on USDOT's SS4A Self-Certification Eligibility Worksheet: geospatial identification of higher risk locations, which is a requirement for eligibility for SS4A Implementation Grants or to conduct Supplemental Planning and Demonstration activities.

While other tools may complement HINs in developing a data-driven Vision Zero program and action plan, HINs are useful for:

- **Prioritizing Projects**. An HIN indicates the major corridors and intersections with both the greatest demonstrated safety need and the greatest opportunities to make progress towards a Vision Zero goal.
- **Identifying High Impact Grant Applications**. An HIN indicates the corridors and intersections that are most likely to demonstrate safety need and impact on competitive regional, state, and federal grant applications,
- **Developing Critical Partnerships.** An HIN demonstrates where partnerships are most needed, either as part of continuing inter-agency coordination, or as a starting point for collaboration.

Methodology

Because of the distinct types of crashes and related safety countermeasures at intersections and street segments, the methodology to determine the HIN evaluated both intersections and street segments separately. The HIN development process included several steps: 1) defining candidate locations, 2) crash assignment, 3) development of location typologies, and 4) location scoring.

Candidate Locations

The systemic crash analysis revealed that crash severity is correlated with functional classification. Higher-order roads (e.g., secondary and major arterials), have more killed and serious injury crashes (KSI) than local streets on a per-mile basis (see tables on page 21). Based on the very low relative severity of local streets to other street types, local streets and intersections comprised of local street approaches were excluded from the HIN analysis.

As a result, candidate locations for inclusion in the HIN included intersections where at least one approach is a collector or an arterial and included segments categorized as a collector or an arterial. Street segments were consolidated into longer segments than a single block; these segments were first consolidated by street name, and then split where they intersected other collector or arterial streets. This was done to build an HIN that represents a network rather than a set of short, often disconnected segments.

Crash Assignment

KSI crashes were assigned to intersections or segments: intersection crashes were defined to include crashes within 75 feet of the intersection, all other crashes were assigned as segment crashes.

Location Typologies

For both intersections and street segments, typologies were identified through the systemic analysis. These typologies represent feature variations shown to have an impact on expected KSI crashes and are a key piece of the HIN evaluation.

Intersections were grouped into four categories based on intersection traffic control (signal or no signal), and whether the intersection just included a mix of local street and collector or arterial approaches (“mixed”) or was comprised of only collector and arterial approaches (“non-local”).

Segments were grouped based on functional classification and included collector, secondary arterial, and major arterial streets.

Location Scoring

To identify the HIN, all intersections and street segments were evaluated on three equally weighted criteria: KSI Crash History, Typology Risk Assessment, Relative KSI Crash History, and Pedestrian & Bicycle Crash History. Each criteria provides different, but equally important,

information on the risk of severe crashes and potential impact of safety improvements for each intersection and street segment.

- **KSI Crash History** assesses KSI crashes at each intersection and street segment relative to all other intersections and street segments. This metric prioritizes locations with a high history of KSI crashes.
- **Typology Risk Assessment** assesses the risk of each intersection and street segment's typology relative to all other typologies. This metric is a predictive measure, as it prioritizes locations with a high expected number of crashes, based on the street or intersection type. Scores for each type are summarizes in Table 18 and Table 19 below.
- **Relative KSI Crash History** assesses KSI crashes at each intersection and street segment relative to all other intersections and street segments within the same typology. This metric prioritizes locations that performed poorly relative to locations with similar characteristics.
- **Pedestrian & Bicycle Crash History** assesses all bicycle and pedestrian crashes at each intersection and street segment relative to all other intersections and street segments. This metric prioritizes locations with a high history of bicycle and pedestrian crashes.

Scores for each assessment criteria are normalized to vary from 0 to 1, with 0 representing the lowest safety risk and 1 representing the highest safety risk (the formulas used are included in the appendix). Scores for all criteria are then summed for each intersection and street segment to yield a net score between 0 and 4. Intersections and segments with the highest scores are then included in the HIN. Where adjacent segments were both included in the HIN, these segments were combined and rescored.

Table 18. Intersection Typology Score

Intersection Type	% of Intersections	% KSI*	KSI per Intersection	Intersection Type Score (0-1)
Non-Local – Signal	4%	33%	0.59	1.00
Mixed – Signal	7%	25%	0.27	0.47
Non-Local – No Signal	2%	4%	0.21	0.21
Mixed – No Signal	35%	33%	0.12	0.12
Local	52%	6%	0.01	Not included

*Sum of column does not equal 100% due to rounding.

Table 19. Segment Typology Score

Street Type	% of Mileage	% KSI	KSI per Mile	Segment Type Score (0-1)
Major Arterial	9%	40%	0.98	1.00
Secondary Arterial	5%	20%	0.81	0.83
Collector	14%	16%	0.27	0.27
Local	72%	24%	0.07	Not included

Results

Based on the methodology described above, top-ranked intersections and segments were identified for inclusion in the HIN. Three tiers of priority locations are identified, Figure 7 and Figure 8 show the cumulative proportion of KSI and bicycle and pedestrian crashes as each additional intersection and street segment is added to the priority network in rank order. The cutoffs between tiers were identified to provide a substantial portion of KSI within each tier, while not adding an excessive number of intersections or roadway mileage.

The intersections and segments are depicted in the maps below, as well as summarized in the included tables. The HIN captures a substantial portion of KSI within Stamford in just a small portion of roadways and intersections:

- Tier 1 captures 41% of KSI and 45% of bicycle and pedestrian crashes on just 3% of intersections and 4% of roadway miles.
- Tiers 1-3 capture 59% of KSI and 76% of bicycle and pedestrian crashes on just 6% of intersections and 15% of roadway miles.

The Tier 1 intersections are summarized in Table 20, and the Tier 1 segments are summarized in Table 21. The HIN is shown in Figure 9 and Figure 10 below.

Conclusion

As the City of Stamford advances its Vision Zero planning process and works to reduce serious injuries, this crash analysis and the resulting HIN provide a foundation for understanding the city's safety challenges. A few key takeaways were revealed in the data:

- While bicyclists and pedestrians comprise just 3% of crashes during this time period, they represent 27% of serious injuries and fatalities (24% as pedestrians and 3% as bicyclists).
- While rear end, angle, and sideswipe crashes are the most common motor vehicle crash types, the most severe crash types are fixed object crashes and head on collisions.
- Nearly 30% of pedestrian KSI occur near parks, indicating a need for pedestrian safety investments near these community assets.
- While signalized intersections comprise just 11% of total intersections, 58% intersection KSI occur at these locations.
- As roadways have more lanes, higher speeds, and additional daily volumes, the likelihood of crashes and KSI increase on those corridors. While arterials comprise just 14% of roadway mileage in Stamford, 59% of KSI occur on these roadways.
- Based the equity assessment, areas with a high equity need are overrepresented in the city's crashes and KSI.

Figure 7. Cumulative Portion of KSI or Bike/Ped Crashes for Intersection Crashes

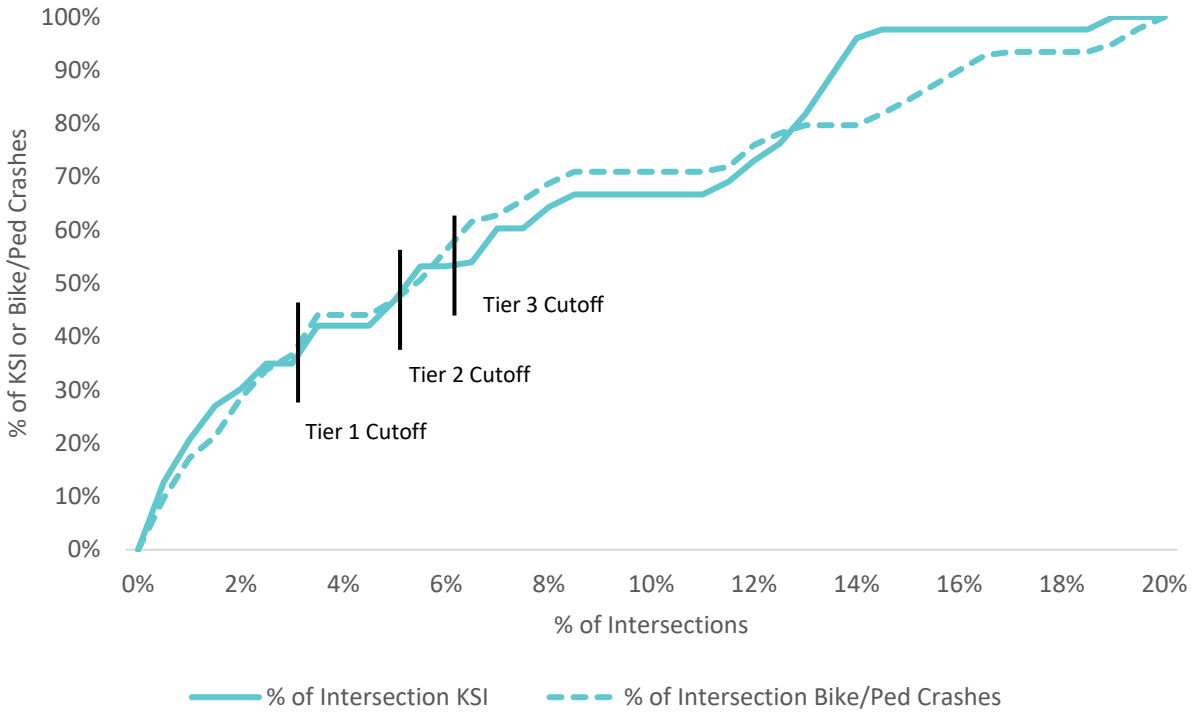


Figure 8. Cumulative Portion of KSI or Bike/Ped Crashes by Roadway Mileage

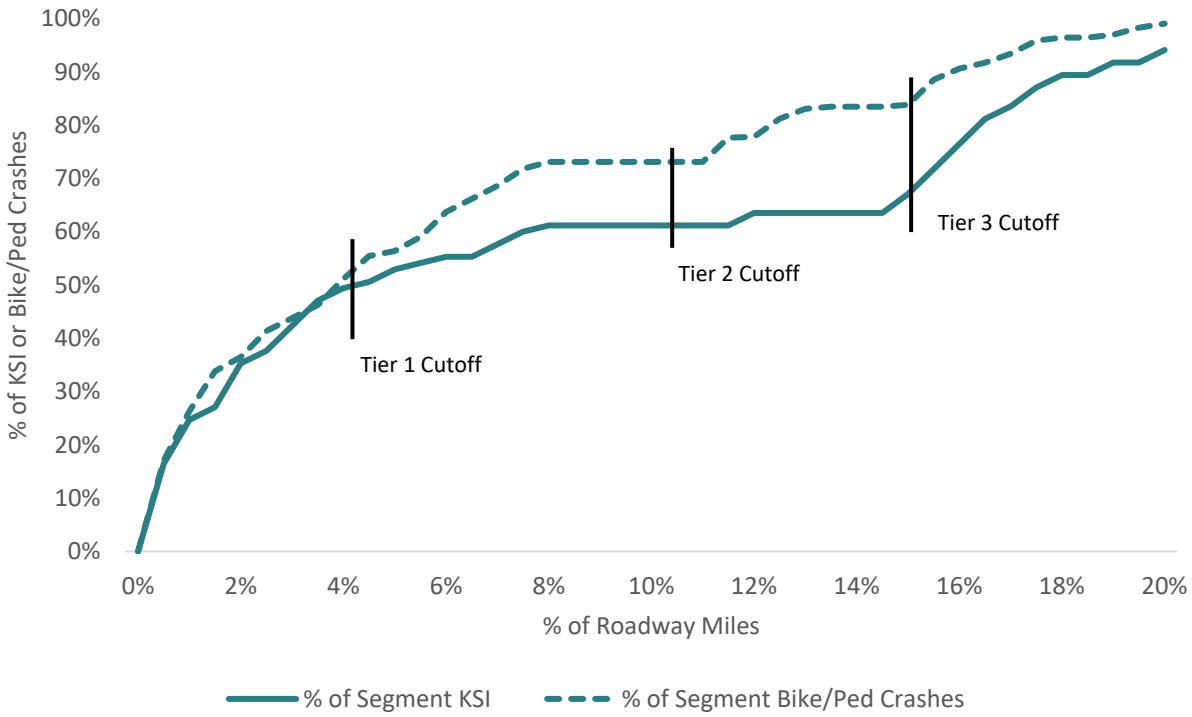


Figure 9. Stamford High Injury Network

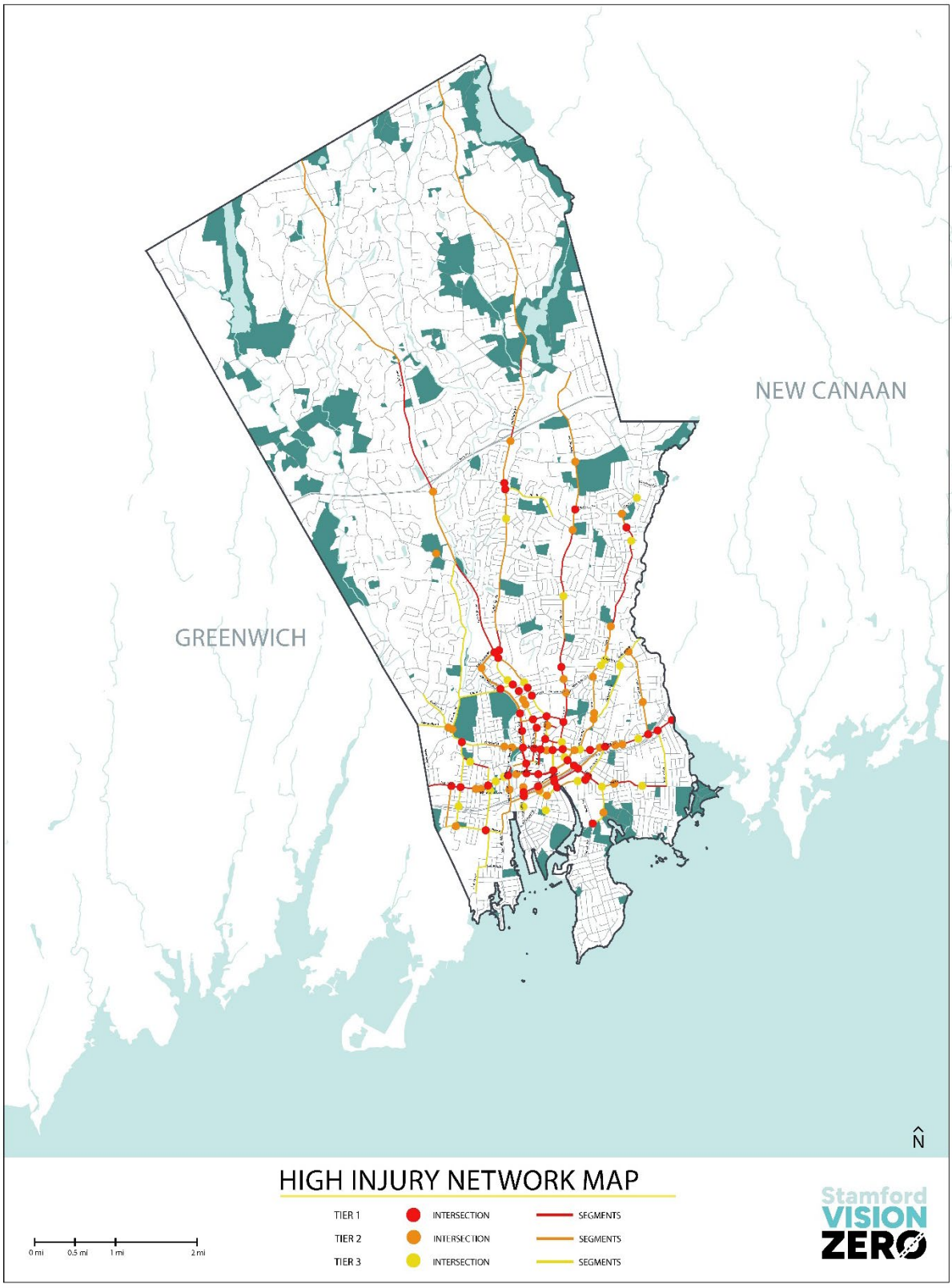


Figure 10. Downtown Stamford High Injury Network

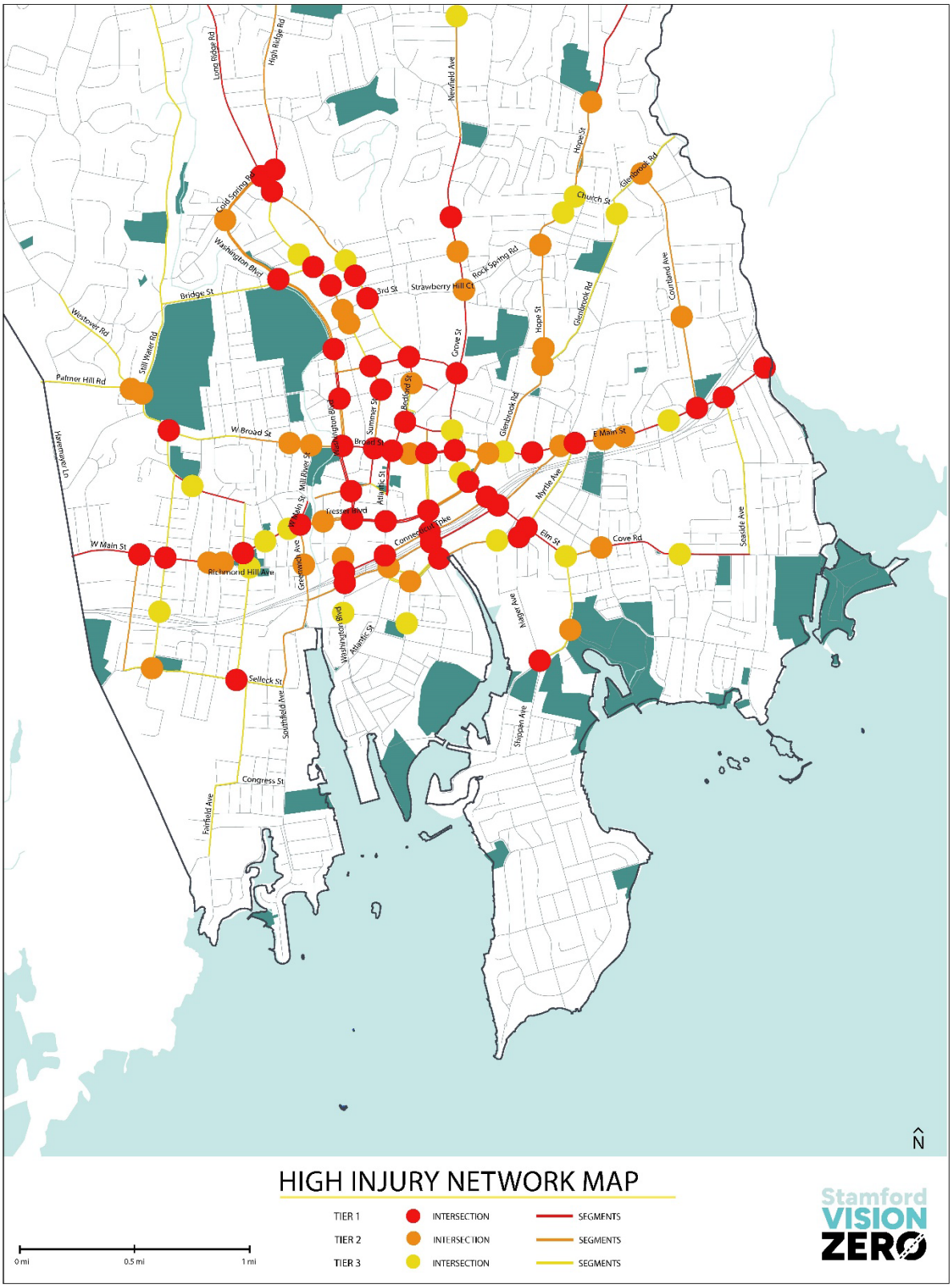


Table 20. HIN Intersections

Location	KSI	Ped & Bike Crashes	Intersection Type	Rank
North State Street & Canal Street	6	1	Non-Local & Signal	1
Broad Street & Grove Street	3	4	Non-Local & Signal	2
Broad Street & Summer Street	1	6	Non-Local & Signal	3
Broad Street & Greyrock Place	3	3	Non-Local & Signal	4
Broad Street & Bedford Street/Atlantic Street	1	5	Non-Local & Signal	4
West Main Street & West Avenue	1	4	Non-Local & Signal	6
Hoyt Street & Bedford Street	0	5	Non-Local & Signal	6
Strawberry Hill Avenue & Colonial Road	1	3	Non-Local & Signal	8
Tresser Boulevard & Atlantic Street	1	3	Non-Local & Signal	8
West Main Street & Harvard Avenue	1	3	Non-Local & Signal	8
North State Street & Washington Boulevard	1	3	Non-Local & Signal	8
East Main Street & Elm Street	2	2	Non-Local & Signal	12
Washington Boulevard & Tresser Boulevard	2	2	Non-Local & Signal	12
Grove Street/Prospect Street & Hoyt Street	0	4	Non-Local & Signal	12
Washington Boulevard & West Broad Street	0	4	Non-Local & Signal	12
East Main Street & Courtland Avenue	2	1	Non-Local & Signal	16
Summer Street & Holy Street	1	2	Non-Local & Signal	16
East Main Street & Seaside Avenue	1	2	Non-Local & Signal	16
East Main Street & Myrtle Avenue	0	3	Non-Local & Signal	16
South State Street & Elm Street	0	3	Non-Local & Signal	16
Bridhe Street & Summer Street	1	1	Non-Local & Signal	21
Washington Boulevard & Bridge Street	1	1	Non-Local & Signal	21
North State Street & Elm Street	1	1	Non-Local & Signal	21
Myrtle Avenue & Elm Street	1	1	Non-Local & Signal	21
South State Street & Canal Street	1	1	Non-Local & Signal	21
Cold Spring Road & Long Ridge Road	2	0	Non-Local & Signal	26
Tresser Boulevard & Canal Street	2	0	Non-Local & Signal	26
Summer Street & 5th Street	0	2	Non-Local & Signal	26
North Street & Summer Street	0	2	Non-Local & Signal	26
Washington Boulevard & North Street	0	2	Non-Local & Signal	26
West Main Street & Fairfield Avenue	0	2	Non-Local & Signal	26
North State Street & Atlantic Street	0	2	Non-Local & Signal	26
East Main Street & Lafayette Street	1	4	Mixed & Signal	33
Washington Boulevard & Main Street	1	4	Mixed & Signal	33
Jefferson Street & Hallowee Boulevard	0	5	Mixed & Signal	33
Forest Street & Bedford Street/Prospect Street	1	15	Mixed & No Signal	36
High Ridge Road & Cedar Heights Road	1	0	Non-Local & Signal	37
Newfield Avenue & Weed Hill Avenue	1	0	Non-Local & Signal	37
Camp Avenue & Hope Street	1	0	Non-Local & Signal	37
West Broad Street & Stillwater Avenue	1	0	Non-Local & Signal	37
West Main Street & Greenwich Avenue	1	0	Non-Local & Signal	37
High Ridge Road & Vine Road	0	1	Non-Local & Signal	37
High Ridge Road & Cold Spring Road	0	1	Non-Local & Signal	37
Bedford Street & High Ridge Road	0	1	Non-Local & Signal	37
Bedford Street & 5th Street	0	1	Non-Local & Signal	37
Bedford Street & 3rd Street	0	1	Non-Local & Signal	37
Washingto Boulevard & 2nd Street	0	1	Non-Local & Signal	37
East Main Street & Weed Avenue	0	1	Non-Local & Signal	37
Jefferson Street/Dock Street & Canal Street	0	1	Non-Local & Signal	37
South State Street & Washington Boulevard	0	1	Non-Local & Signal	37
Shippan Avenue & Magee Avenue	0	1	Non-Local & Signal	37
Selleck Street & Fairfield Avenue	0	1	Non-Local & Signal	37

Table 21. HIN Segments

Location	Segment Start and End Points	Miles	KSI	Bicycle & Pedestrian Crashes	Segment Type	Rank
Stillwater Avenue	West Avenue to Fairfield Avenue	0.33	3	6	Collector	1
Washington Boulevard	Hoyt Street to North Street	0.12	1	2	Major Arterial	2
West Main Street	Mill River Street/Smith Street to Tresser Boulevard	0.11	1	1	Secondary Arterial	3
High Ridge Road	Bedford Street to Oaklawn Avenue	0.35	3	3	Major Arterial	4
North Street	Bedford Street to Prospect Street	0.12	1	1	Collector	5
Summer Street	Main Street to Broad Street	0.15	1	8	Secondary Arterial	6
Broad Street	Washington Boulevard to Grove Street	0.50	2	43	Secondary Arterial	7
Tresser Boulevard	Canal Street to Washington Boulevard	0.33	2	9	Major Arterial	8
East Main Street	City Border to Myrtle Avenue	0.94	5	23	Major Arterial	9
Bedford Street	Broad Street to Walton Place	0.19	0	25	Secondary Arterial	10
High Ridge Road	Scofield Town Road to Interlaken Road	0.18	1	0	Major Arterial	11
High Ridge Road	Merrit Parkway NB Off-Ramp to Wire Mill Road	0.19	1	0	Major Arterial	12
Cove Road	Lockwood Avenue to Seaside Avenue	0.67	3	9	Secondary Arterial	13
Grove Street	East Main Street to Hoyt Street	0.44	1	16	Major Arterial	14
Long Ridge Road	Cold Spring Road to Stillwater Road	1.22	4	2	Major Arterial	15
South State Street	Canal Street to Elm Street	0.33	1	1	Major Arterial	16
Elm Street	Tresser Boulevard to North State Street	0.54	1	11	Major Arterial	17
Newfield Avenue	Turner Road to Vine Road	0.84	2	3	Major Arterial	18
Hope Street	Toms Road to Camp Avenue	1.31	3	5	Major Arterial	19
West Main Street	City Border to Greenwich Avenue	1.05	1	28	Major Arterial	20
Long Ridge Road	Merritt Parkway NB Off-Ramp to Chestnut Hill Road	1.68	4	0	Major Arterial	21
Forest Street	Bedford Street to Grove Street	0.22	0	14	Secondary Arterial	22
Hoyt Street	Summer Street to Strawberry Hill Avenue	0.40	0	16	Major Arterial	23
East Main Street	Glenbrook Road to North State Street	0.26	0	9	Major Arterial	24
Strawberry Hill Avenue	Hoyt Street to Upland Road	1.05	1	10	Major Arterial	25
Washington Boulevard	Tresser Boulevard to Broad Street	0.36	0	9	Major Arterial	26
Bedford Street	Hoyt Street to North Street	0.11	0	5	Secondary Arterial	27
North State Street	Atlantic Street to Washington Boulevard	0.19	0	4	Major Arterial	28

Appendix

Equations for Calculating HIN Metrics

Metric	Equation for Intersections	Equation for Segments
KSI Crash History	$\frac{\text{KSI Crash Count}_{\text{Intersection}}}{\text{MAX(KSI Crash Count)}_{\text{All Intersections}}}$	$\frac{\text{KSI Crash Count per Mile}_{\text{Street Segment}}}{\text{MAX(KSI Crash Count per Mile)}_{\text{All Street Segments}}}$
Typology Risk Assessment	$\frac{\text{KSI Crash Count per Intersection}_{\text{Intersection Typology}}}{\text{MAX(KSI Crash Count per Intersection)}_{\text{All Intersection Typologies}}}$	$\frac{\text{KSI Crash Count per Mile}_{\text{Street Segment Typology}}}{\text{MAX(KSI Crash Count per Mile)}_{\text{All Street Segment Typologies}}}$
Relative KSI Crash History	$\frac{\left(\frac{\text{KSI Crash Count}_{\text{Intersection}}}{\text{KSI Crash Count per Intersection}_{\text{Intersection Typology}}}\right)}{\text{MAX}\left(\frac{\text{KSI Crash Count}_{\text{Intersection}}}{\text{KSI Crash Count per Intersection}_{\text{Intersection Typology}}}\right)}$	$\frac{\left(\frac{\text{KSI Crash Count per Mile}_{\text{Street Segment}}}{\text{KSI Crash Count per Mile}_{\text{Street Segment Typology}}}\right)}{\text{MAX}\left(\frac{\text{KSI Crash Count per Mile}_{\text{Street Segment}}}{\text{KSI Crash Count per Mile}_{\text{Street Segment Typology}}}\right)}$
Bicycle & Pedestrian Crash History	$\frac{\text{Bicycle \& Pedestrian Crash Count}_{\text{Intersection}}}{\text{MAX(Bicycle \& Pedestrian Crash Count)}_{\text{All Intersections}}}$	$\frac{\text{Bicycle \& Pedestrian Crash Count per Mile}_{\text{Street Segment}}}{\text{MAX(Bicycle \& Pedestrian Crash Count per Mile)}_{\text{All Street Segments}}}$