

# Baltimore City Strategic Highway Safety Plan

---

## 2022 - 2026



BALTIMORE CITY DEPARTMENT OF TRANSPORTATION | MAYOR BRANDON SCOTT

## Contents

<b>Acknowledgments .....</b>	<b>3</b>
<b>Introduction.....</b>	<b>4</b>
<b>Mission, Vision, and Goals .....</b>	<b>5</b>
<b>Key Partners.....</b>	<b>6</b>
<b>Steering Committees.....</b>	<b>7</b>
<b>Problem Identification.....</b>	<b>9</b>
<b>Data Trends.....</b>	<b>9</b>
<i>Overall Trends .....</i>	<i>9</i>
<i>Serious Injury and Non-Motorist Trends .....</i>	<i>13</i>
<b>Outside Research .....</b>	<b>21</b>
<b>Baltimore City Crash Reduction Plan .....</b>	<b>21</b>
<b>Serious Injury and Fatality Reduction Targets .....</b>	<b>30</b>
<b>Emphasis Areas and Strategies.....</b>	<b>31</b>
<b>Key Strategies.....</b>	<b>31</b>
<b>Emphasis Areas.....</b>	<b>32</b>
<i>Right-Sizing Driving Space.....</i>	<i>32</i>
<i>Traffic Signals and Stop Control .....</i>	<i>34</i>
<i>Speeding.....</i>	<i>37</i>
<i>High Crash Intersections and Corridors .....</i>	<i>41</i>
<i>Separating Non-Motorists from Motorists .....</i>	<i>42</i>
<i>Adopting a Safety Culture at Baltimore City Government.....</i>	<i>44</i>
<i>Reporting and Benchmarking .....</i>	<i>46</i>
<i>Community Empowerment .....</i>	<i>49</i>
<b>Conclusion and Outlook.....</b>	<b>52</b>

## Tables

Table 1: Total Crashes 2016 - 2020 .....	9
Table 2: Total Pedestrian Crashes 2016 - 2020 .....	11
Table 3: Total Bicycle Crashes 2016 – 2020 .....	11
Table 4: Intersection-related crashes 2016 - 2020 .....	13
Table 5: Severe crashes by road type 2016 - 2020 .....	14
Table 6: Severe crashes by vehicle movement type 2016 - 2020 .....	16
Table 7: Incapacitating and fatal vehicle movements involving a pedestrian, cyclist, or scooter rider 2016 - 2020 .....	17
Table 8: Crash Severity by Vehicle Type 2016 - 2020.....	18
Table 9: Crash severity by crashes involving drugs and alcohol 2016 - 2020.....	19
Table 10: Intersection Crash Hot Spots 2017 - 2019 .....	23
Table 11: Road Segment Crash Hot Spots 2017 - 2019.....	24
Table 12: Pedestrian and Bicycle Intersection Crash Hot Spots 2017 - 2019.....	26
Table 13: Pedestrian and Bicycle Segment Crash Hot Spots 2017 - 2019 .....	27
Table 14: Five-Year Serious Injury and Fatality Reduction Targets .....	30
Table 15: Strategies to Embed Complete Streets into City Culture .....	31
Table 16: Strategies to Right-Size Driving Space .....	33
Table 17: Strategies for Signal Timing .....	36
Table 18: Strategies for Speeding Reduction.....	39
Table 19: Strategies to reduce High Crash Intersections and Corridors .....	41
Table 20: Strategies to Separate Non-Motorists from Motorists .....	43
Table 21: Strategies to advance a safety culture in Baltimore City Government .....	44
Table 22: Strategies to improve Data Reporting and Benchmarking.....	46
Table 23: Strategies for Community Empowerment .....	49

## Figures

Figure 1: Injury and fatal crashes heat map 2018 - 2020.....	10
Figure 2: Pedestrian and Bicycle crashes heat map 2018 - 2020 .....	12
Figure 3: Crash Severity by Speed Limit 2016 - 2020.....	15
Figure 4: Pedestrian and Bicycle Crashes by Speed Limit 2016 - 2020 .....	15
Figure 5: Injury and fatal crashes by time of day 2016 - 2020 .....	20
Figure 6: Baltimore City Crash Reduction Plan High Crash Corridors and Intersections 2017 - 2019 with Transit Equity Score .....	22
Figure 7: Baltimore City Crash Reduction Plan High Crash Pedestrian and Bicycle Intersections and Corridors with Transit Equity Score .....	25

## Acknowledgments

Project Manager: Shayna Rose, City Planner II, DOT

with special thanks to:

- Clea Baumhofer, Engineer Supervisor, DOT
- Cindy Burch, Transportation Safety Planner, Baltimore Metropolitan Council
- Luciano Diaz, Community Aid, DOT
- William Haynes, Traffic Chief, DOT
- Corren Johnson, Complete Streets Deputy Director, DOT
- Allysha Lorber, Capital Planning Chief, DOT
- John Malinowski, Engineer II, DOT
- Brian Seel, Data Analyst, DOT
- Adrea Turner, Chief of Staff, DOT
- Graham Young, Complete Streets Manager, DOT
- Meg Young, Shared Mobility Coordinator, DOT
- Mikah Zaslow, City Planner II, BCDOP

## Introduction

Federal transportation bills have required Strategic Highway Safety Plans (SHSP) within each state for over a decade; State leadership in Maryland further acknowledged the need for strategic planning at the local level and began to encourage the development and implementation of local SHSPs in 2017. This coincided with the development of the Toward Zero Baltimore (TZB) strategic plan.

Toward Zero Baltimore is a long-term approach that aims to achieve zero traffic fatalities and serious injuries. The core goals of Toward Zero Baltimore are:

- Prevent dangerous roadway behaviors
- Prioritize safety as the primary determinant of city-wide decision-making
- Improve all City streets to be safer for all, with emphasis on the most vulnerable users (pedestrians and cyclists)
- Reduce and ultimately eliminate fatalities and injuries caused by traffic-related crashes on City streets
- Prevent dangerous roadway user behaviors, encouraging respect for other users and safe use of the City's shared streets

Building upon the work that Toward Zero Baltimore began, the Baltimore City SHSP strives to prevent crashes that result in severe injury or death occurring on the roadway every year, siting Zero Deaths and Serious Injuries by 2030 as its guiding vision. The SHSP will use the Safe System Approach, which emphasizes using engineering as the primary mechanism to solve systemic roadway safety problems. In 2018, Baltimore City adopted a Complete Streets Ordinance and a subsequent Complete Streets Manual. The Complete Streets approach, which elevates the priority of pedestrians, bicyclists, transit users, and other vulnerable roadway users, will be used as the lens through which all safety countermeasures will be designed and implemented. The implementation of a Safe System Approach of complete streets is essential to the vision of this plan.

This effort is being led by the Baltimore City Department of Transportation (DOT) and utilizes crash data collected by the Baltimore City BPD Department (BPD). These agencies will be the primary data resources for this plan and effort, while also building partnerships with the Departments of Health, Fire and Emergency Medical Services (EMS), Planning, Public Works, and Baltimore City Public Schools. This plan is a means to bring together several agencies and departments to coordinate safety planning into one City-wide strategic plan.

In addition to TZB, relevant prior plans include the Baltimore City Crash Reduction Plan (2021) and the Baltimore City Bicycle Master Plan (2015, 2017 Separated Bike Lane Network addendum), and multiple small area plans throughout the city. DOT also has ongoing efforts to improve safety with traffic calming, ADA accessibility, and roadway improvement programs. These plans and programs guide the SHSP in identifying high-impact projects that address known safety issues and protect vulnerable roadway users. Projects will target noted crash hot spots as well as system-wide safety issues, incorporating strategies such as implementing the Separated Bike Network, reconfiguring traffic signals to reduce motorist speeds, reducing the lanes of oversized roads, and tackling traffic safety in neighborhoods holistically. DOT currently

has several programs that specifically target traffic safety; the SHSP will reinforce the importance of those efforts and recommend to expand them.

The efforts identified in this plan will be evaluated annually as well as at the end of this plan's life cycle. The action plan is a living document; during the life cycle of the SHSP, adjustments may be made based on acute changes or unforeseen occurrences, such as the effects of the COVID-19 pandemic. Iterative evaluation will empower this team to modify strategies as needed to continue the effort of reaching and maintaining zero fatalities and serious injuries.

## Mission, Vision, and Goals

**Mission:** To reduce traffic-related fatalities and serious injuries to zero on the Baltimore City transportation network by 2030.

**Vision:** To implement a location-based program for improving safety at intersections and along corridors in Baltimore City under the guidance of Complete Streets, utilizing evidence-based, proven effective countermeasures.

The core tenants of the Baltimore City Strategic Highway Safety Plan Vision are:

- Reduce and ultimately eliminate all fatalities and serious injuries caused by traffic crashes on city streets;
- Using data, reinforce and prioritize safety as the primary determinant of decision-making within the city;
- Improve city streets to be safer for all, with emphasis on the most vulnerable users, such as pedestrians and bicyclists;
- Identify specific locations where risky motorist behavior is likely to interact with vulnerable users and implement countermeasures;
- Implement the Es of Safety: Engineering, Enforcement, Evaluation, Equity, Empowerment, and Enactment.

The Baltimore City SHSP is based on the “Safe System” approach. A Safe System recognizes that humans are subject to errors in judgment, distraction, and cultural pressures. Rather than placing the onus on individuals to safely negotiate with a system, the focus of Safe Systems is to design roadways such that severe crashes do not occur. Roads in a Safe System are retrofitted to keep travelers alert, reduce the design speeds of motorists, and prevent interaction between motorists and non-motorists. In the event of a crash, a Safe System ensures that impact forces are within the boundary of human tolerance. Policies in a Safe System are developed to complement road design in encouraging safe travel. When infrastructure and policymakers bear the brunt of the burden in engineering a Safe System, individuals can be better partners in upholding safe conditions on the road. This Action Plan will build on information gathered from interagency workgroups, prior safety reports and plans, existing transportation programs in the City of Baltimore, and DOT Transportation goals.



Source: UC Berkeley Safety Transportation Research and Education Center

## Key Partners

Multiple agencies and partners play important roles in the selection and funding of projects related to transportation safety, enforcement and data collection, and grassroots community action. While DOT is the agency lead, the following partners are identified as having unique perspectives in multi-modal safety issues and equity. These partners will have a chance to provide comments on plans developed by DOT and will be invited to sit on subject-specific working groups and committees. The following lists are preliminary and not meant to preclude any additional groups that may have valuable insight.

### Lead Agency - Baltimore City Department of Transportation (DOT)

- Director's Office
- Planning Division
- Traffic Division
- Traffic Safety Division
- Transportation Engineering and Construction Division
- Communications
- Data Team
- GIS Team
- Automated Traffic Violation Enforcement System (ATVES)

### **Identified Baltimore City and Quasi-City Government Partners**

- Baltimore City BPD Department (BPD)
- Baltimore City Sheriff's Office
- Maryland Department of Transportation State Highway Administration (MDOT SHA)
- Maryland Department of Transportation Maryland Transit Administration (MDOT MTA)
- Baltimore City Health Department
- Baltimore City Public Schools
- Baltimore City Department of Public Works
- Baltimore City Department of Planning
- Baltimore City Department of Finance
- Baltimore City Department of Human Resources
- Baltimore City Housing and Community Development
- Baltimore City Fire and Emergency Management Department
- Baltimore Development Corporation
- Baltimore City Recreation and Parks
- Baltimore City Mayor's Office

### **Identified Community Partners**

- Bikemore
- Black People Ride Bikes
- Maryland Institute College of Art (MICA) School for Social Design
- ReBUILD Metro
- The Neighborhood Design Center
- Baltimore City Community Development Corporations
- Baltimore City Waterfront Partnership
- Baltimore City Downtown Partnership
- Johns Hopkins University
- Morgan State University
- Rails to Trails

### **Steering Committees**

The Steering Committees are the means to accomplishing the goals set forth in this document. Each has a role in evaluating plans and progress towards safety goals, as well as tracking crashes, selecting and evaluating interventions, and pursuing partnerships and funding. Partners are invited to sit on one or multiple steering committees, all of which are mutually influential.

Existing:

- Zero Stat Meeting (Monthly, hosted by DOT)
- Pedestrian and Bicycle Fatality Review (Quarterly, hosted by DOT)
- Sustainable Transportation Subcabinet (Monthly, hosted by Department of Planning)
- Neighborhood Traffic Calming Review (Monthly, hosted by DOT)



- Impact Investment Area Subcabinets (Quarterly, hosted by DOT)
- Mayor's Advisory Committee on Complete Streets (Quarterly, hosted by DOT)
- Mayor's Bicycle Advisory Committee (Monthly, hosted by DOT)
- Traffic Stat (Monthly, hosted by DOT)
- Traffic Impact Study Panel (Hosted by Department of Planning)
- INSPIRE meeting (Monthly, hosted by Baltimore City Public Schools)

Recommended New Committees:

- *CIP Project Review (Annual)* – to ensure projects put forward by DOT to the CIP reflect commitment to safety goals and Complete Streets
- *Mayor's Advisory Commission on Traffic Safety (Quarterly)* – to review projects and policies and hold the City accountable to the public on safety goals
- *Safe Routes to School Working Group (Quarterly)* – to plan infrastructure and educational projects that specifically target the most vulnerable users; pedestrians and bicyclists under the age of 12
- *Resurfacing Project Review (Monthly)* – to ensure all annual resurfacing projects are incorporating safety and Complete Streets
- *Communications and Programs Working Group (Quarterly)* – to develop safety messaging and Complete Streets safety training. Also, build out programs and corresponding messaging that empower community action around road safety

## Problem Identification

### Data Trends

Crash data can help identify some of the root causes of crashes, and this data is collected by the Baltimore BPD Department (BPD). BPD analysts use information ascertained by BPD reports to geocode crashes with their respective details. The following sections use this data to identify patterns and trends. It should be noted that not all crashes receive BPD reports; BPD reports are typically filed if a vehicle is towed or an ambulance is called. The following tables and figures are therefore likely incomplete. Sometimes BPD reports can be unreliable because they may be missing important factors or incorporate some subjectivity into the narrative of a crash. Speed is an example of this; crashes are only recorded as speeding-related if an officer or witness observes speeding. The following sections will take this into account and attempt to only report the metrics that are most likely to be objective. This report will also call out the sections in which metrics may fall subject to inconsistent or incomplete reporting. The Baltimore Crash Reduction Report has more details on the specific issues with crash data reporting.

### Overall Trends

Over the last five years for which crash data is available (2016-2020), Baltimore City has experienced a significant number of crash-related fatalities and injuries. While crashes have steadily decreased, fatalities have not decreased and injury crashes continue to make up about 30% of all crashes.

**Table 1: Total Crashes 2016 - 2020**

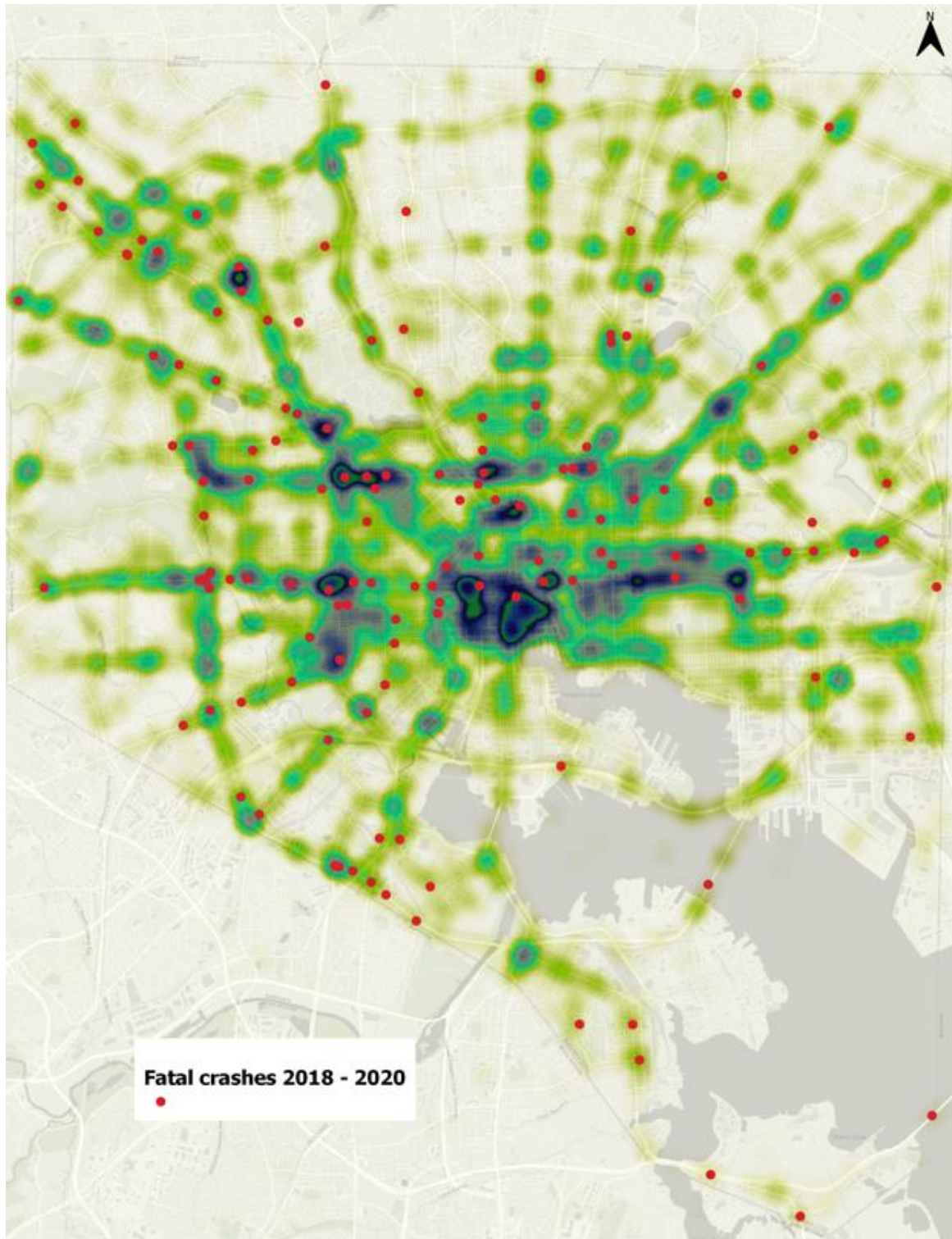
Year	2016	2017	2018	2019	2020	5-YR AVG.
<b>Fatal Crashes</b>	52	41	37	48	70	50
<b>Total Injury Crashes</b>	5,993	6,063	5,808	5,710	4,865	5,688
<b>Serious Injury Crashes</b>	1,323	1,007	1,030	1,081	1,044	1,097
<b>Property Damage Crashes</b>	20,487	13,808	12,563	12,230	11,063	14,030
<b>Total Crashes</b>	26,526	19,914	18,404	17,985	15,991	19,764
<b>Total of All Fatalities</b>	53	44	36	49	68	50
<b>Total Number Injured</b>	9,664	10,062	9,544	9,550	8,057	9,375
<b>Total Serious Injuries</b>	4,816	3,031	2,896	3,120	2,748	3,322

In 2020, which saw the beginning of COVID-19 pandemic, fewer people commuted to their jobs and traveled to other destinations causing fewer cars on the road. While this may have contributed to fewer crashes overall, fatalities saw an uncharacteristic rise. According to the National Highway Traffic Safety Administration, this trend was observed nationally and may be attributed to people driving at higher speeds when traffic congestion was reduced.

This report is primarily concerned with crashes that result in severe outcomes. As such, DOT mapped injury crashes and fatalities for the years 2018 – 2020 to represent the most up-to-date context for location-based crashes. Crashes were primarily concentrated in and around Downtown. Of particular concern are the entirety of the North Ave corridor, Edmondson Ave

around Monroe St and Fulton St, Edmondson at Hilton, and the eastern portions of Fayette Street and Orleans Street. Most fatalities occurred outside of the main Downtown area.

**Figure 1: Injury and fatal crashes heat map 2018 - 2020**



### Pedestrian Crashes

While the number of total pedestrian crashes has declined by about 40% between 2016 and 2020, the number of pedestrian fatalities has remained close to 20 each year. While pedestrians only make up about 4% of all crashes, they make up anywhere from 30% – 47% of all fatal crashes, making protecting pedestrians a crucial element of this action plan. All pedestrian crashes are injury crashes. The number of injury crashes that involved pedestrians declined from 20% in 2016 to 14% in 2020, but continue to represent an outsized proportion of injury crashes. Note that crashes involving pedestrians are often unreported, making this data likely an underestimation of crashes involving pedestrians.

**Table 2: Total Pedestrian Crashes 2016 - 2020**

Year	2016	2017	2018	2019	2020	5-YR AVG.
<b>Total Crashes</b>	1,228	1,190	1,019	916	682	1,007
<i>% of total crashes</i>	5%	6%	6%	5%	4%	5%
<b>Total of All Fatalities</b>	18	20	10	19	19	17
<i>% of total fatalities</i>	34%	45%	28%	39%	28%	35%
<b>Total Number Injured</b>	1,254	1,276	1,134	959	759	1,076
<i>% of total injuries</i>	13%	13%	12%	10%	9%	11%

### Bicycle Crashes

Between 2016 and 2019, bicycle crashes showed little sign of decline but starkly dropped in 2020. Fatalities have hovered at approximately one per year for the past five years. Similar to pedestrians, bicyclists make up an outsized proportion of injuries and fatalities. Though bicyclists are involved in under 1% of all crashes, they represent 2% of all injuries and fatalities. Note that crashes involving bicyclists are often unreported, making this data likely an underestimation of crashes involving bicyclists.

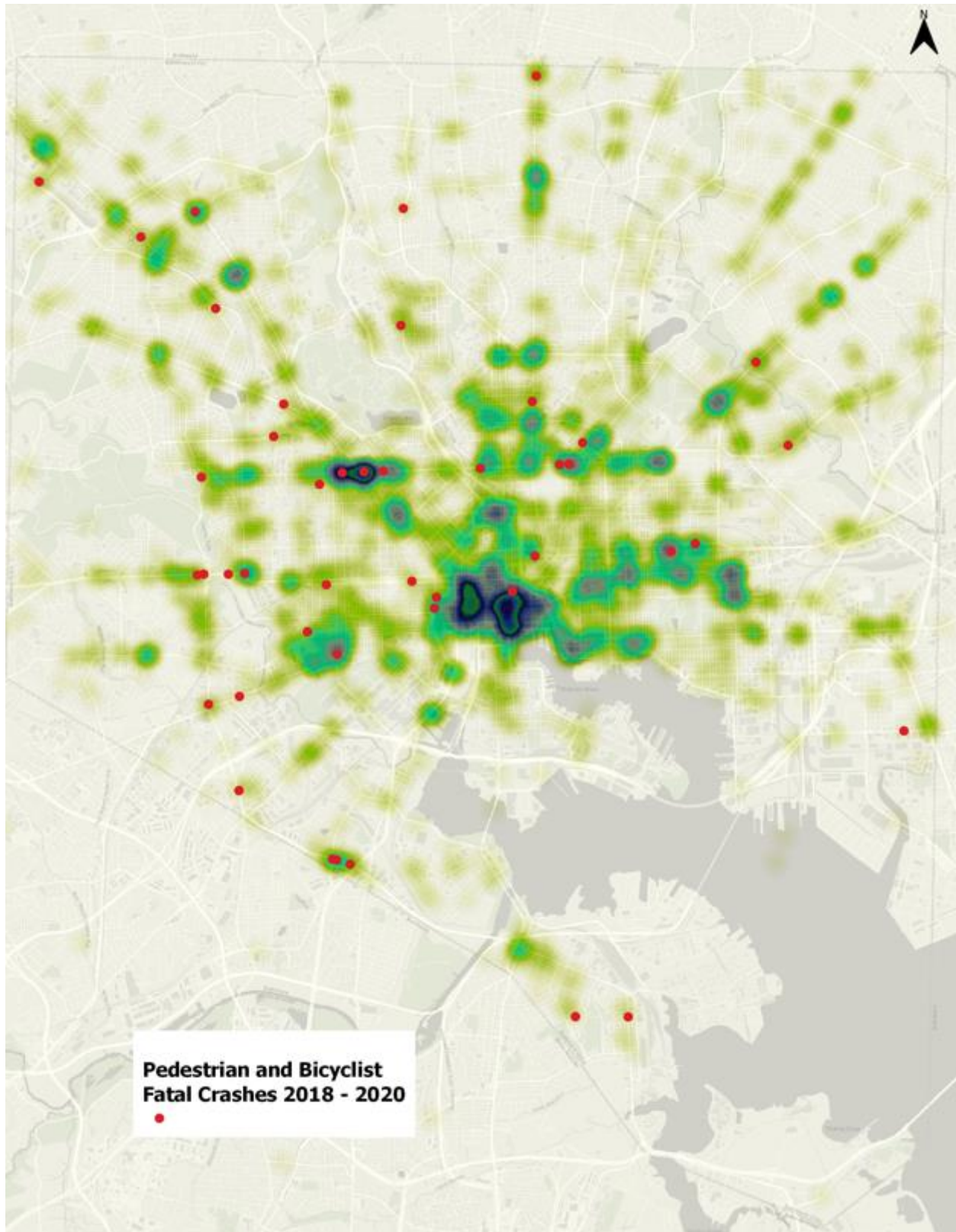
**Table 3: Total Bicycle Crashes 2016 – 2020**

	2016	2017	2018	2019	2020	5-YR AVG.
<b>Total Crashes</b>	238	209	199	217	156	204
<b>Total of All Fatalities</b>	1	1	0	2	1	1
<b>Total Number Injured</b>	200	179	172	198	155	181

DOT also mapped pedestrian and bicycle crashes for 2018 – 2020, as seen in the figure below. Crashes are predominantly concentrated in the Downtown core. There is also a high concentration of crashes along the entire North Ave corridor, along the eastern segments of Fayette and Orleans, and in and around the intersection of Wilkens and Monroe. Fatalities mostly occurred outside of Downtown, particularly on North Ave, MLK Blvd, and Edmondson Ave and Wilkens Ave to the west, the McElderry Park neighborhood to the east, and Patapsco Ave to the south.



**Figure 2: Pedestrian and Bicycle crashes heat map 2018 - 2020**



### Intersection-related Crashes

Between 2016 and 2020, the number of intersection-related crashes declined by 31% and intersection-related injuries declined by 22%. Prior to 2020, fatalities at intersections seemed to be on the decline, but they rose sharply in 2020. In 2020, 46% of all fatal crashes occurred at intersections. While intersections make up about 40% of total crashes that occurred in 2020, intersections account for over 50% of all injuries.

**Table 4: Intersection-related crashes 2016 - 2020**

	2016	2017	2018	2019	2020	5-YR AVG.
<b>Total Crashes</b>	9,433	8,205	7,461	7,328	6,469	7,779
<b>Total of All Fatalities</b>	24	28	12	22	31	23
<i>% of total fatalities</i>	45%	64%	33%	45%	46%	47%
<b>Total Number Injured</b>	5,442	5,595	5,205	5,268	4,272	5,156
<i>% of total injuries</i>	56%	56%	55%	55%	53%	55%

### Serious Injury and Non-Motorist Trends

This action plan is focused on crashes that are likely to cause serious injuries and fatalities. The following sections investigate severe injury crashes, fatal crashes, and non-motorist crashes under a variety of circumstances and contexts, including road type, speed limit, vehicle movement type, vehicle type, drugs or alcohol involved, and time of day. These factors were chosen to be further analyzed for their relevance and reporting reliability.

### Road Type

Crash reports include a designation of the kind of road where the crash occurred. The types are:

- Not applicable: includes non-road crashes such as parking lots or parking garages
- Two-way, not divided: traditional two-way road with a painted line down the middle
- One-way: one-way road
- Two-way (divided, unprotected): two-way road with a painted buffer in the middle of at least 4 feet)
- Two way (divided with positive median barrier): road that has a divider that is more than paint, such as a built median or a barrier
- Two way, undivided with left turn lane
- Other
- Unknown, which are typically sidewalks, parking lots, or other areas not within a roadway

The following table breaks down all crashes into four categories over each road type:

- Severe injuries: crashes where the most severe injury was marked as either ‘possible incapacitating injury’ or ‘incapacitating injury’
- Fatal injuries: crashes where at least one person was fatally injured

- Pedestrian involved crashes
- Bike/Scooter involved crashes

The following table shows the break-down of crash types that occur on each road by percentage. The rows do not add up to 100% because this table does not include all crash types, and has overlapping types.

**Table 5: Severe crashes by road type 2016 - 2020**

	Severe Injury	Fatal	All Ped	All Bike/Scooter
Not Applicable	15.06%	0.00%	5.70%	0.78%
Two-Way, Not Divided	29.44%	0.37%	6.93%	1.34%
One-Way	24.77%	0.21%	6.42%	1.29%
Two-Way, Divided, Unprotected	34.91%	0.55%	6.90%	1.21%
Two-Way, Divided, Positive Median Barrier	37.89%	1.03%	4.52%	0.68%
Two-Way, Not Divided W/Left Turn	42.72%	3.54%	7.65%	0.75%
Other	27.38%	0.13%	4.88%	1.22%
Unknown	17.57%	0.43%	10.71%	1.86%

Two-way, undivided roads with left turn lanes have the highest severe injury rate, the highest fatality rate, and the highest pedestrian crash rate (apart from the ‘unknown’ category). However, without the number of lanes, speed limit, and land use contexts, this data is incomplete. The table might lead one to believe that two-way roads with left-turn lanes are more dangerous than two-way roads without left-turn lanes. The reality is that roads in Baltimore with left-turn lanes are more likely to be major arterials with multiple travel lanes, higher speed limits, signals spaced far apart allowing for free-flow movement, and high conflict points. For pedestrians, the most common category was ‘unknown’, which generally is attributed to crashes that happened on sidewalks, crosswalks, or parking lots, according to BPD report narratives. Beyond the ‘unknown’ category, pedestrian crashes most commonly occur on roads without a median. In future analysis, road type categories should be broken down by lane numbers, speed limits, and analyzed in terms of their proximity to pedestrian generators in order to better understand trends.

### Speed Limit

Speed plays a major role in the outcome of a crash, with higher speed crashes resulting in worse outcomes. While speed limits are set based on the design of the road, Baltimore City is an urban environment meaning that roads with high speed limits can be close to pedestrian generators and other conflict points. Showing the catastrophic outcomes of higher speed roads in Baltimore demonstrates a need for higher protection for vulnerable users on those roads and for road retrofitting. Baltimore City does not have jurisdiction over setting its own speed limits, but it can also retime traffic signals to promote slower speeds.

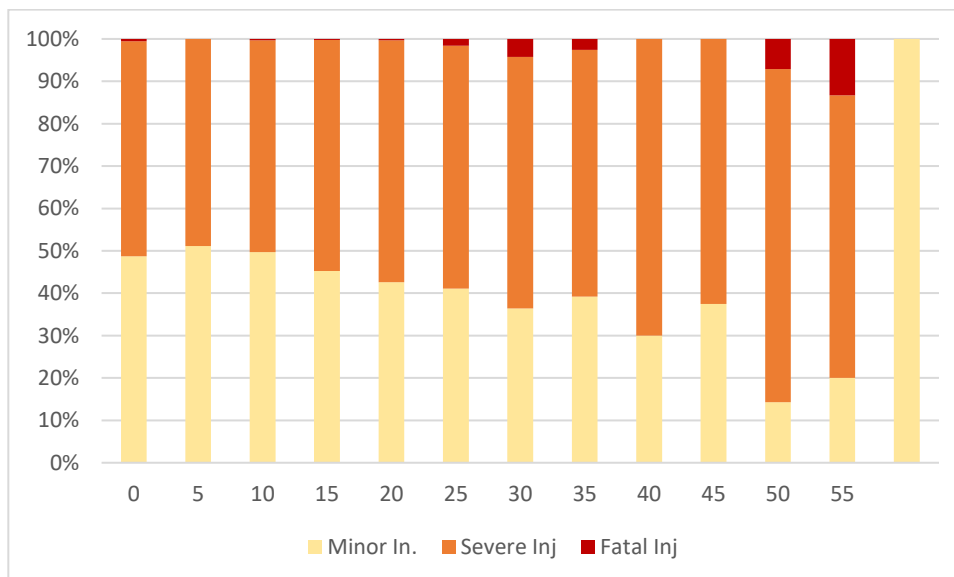
The following graph looks at the breakdown of crash severity by the road speed limit for crashes that resulted in injury (although, this does not mean that this was the speed that the vehicles were traveling).

**Figure 3: Crash Severity by Speed Limit 2016 - 2020**



When looking only at crashes that involve a vulnerable road user, the outcomes are more severe. In crashes that do not involve vulnerable road users, about 50% of crashes result in injury, with a slight correlation when speed limit increases. Between 75 – 80% of all crashes involving a vulnerable road user result in injury. The likelihood of severe injury increases significantly by speed limit, beginning at 10 mph. Vulnerable road user fatalities increase at speed limits of 25 mph and greater. Pedestrians who were hit on roads with speeds of 50 mph or higher tend to be construction workers or people with broken-down vehicles.

**Figure 4: Pedestrian and Bicycle Crashes by Speed Limit 2016 - 2020**





### Vehicle Movement Type

Crash records typically contain information around the context of a crash. Cross referencing vehicle movement type by the crash severities of interest (severe injury, fatal injury, pedestrian crash, and bike/scooter crash) allows us to predict the relationship between vehicle behaviors and severe crashes, and ultimately control for them with infrastructure countermeasures and policies.

**Table 6: Severe crashes by vehicle movement type 2016 - 2020**

	Severe Inj.	Fatal	All Ped	All Bike/Scooter
Not Applicable	6.32%	0.02%	2.19%	0.45%
Moving Constant Speed	12.82%	0.18%	2.49%	0.46%
Accelerating	13.51%	0.14%	3.25%	0.55%
Slowing or Stopping	11.03%	0.36%	2.15%	0.44%
Starting from Lane	12.87%	0.03%	3.40%	0.93%
Starting from Parked	7.93%	0.10%	5.28%	0.29%
Stopped in Traffic Lane	10.32%	0.07%	0.46%	0.15%
Changing Lanes	7.94%	0.10%	0.71%	0.31%
Passing	7.01%	0.15%	1.71%	0.33%
Parking	3.59%	0.00%	3.06%	0.26%
Parked	5.78%	0.13%	0.75%	0.12%
Backing	4.16%	0.00%	5.70%	0.17%
Making Left Turn	15.74%	0.24%	5.17%	0.79%
Making Right Turn	9.76%	0.07%	4.92%	1.38%
Right Turn On Red	15.43%	0.00%	11.43%	0.57%
Making U Turn	14.17%	0.06%	1.22%	0.17%
Skidding	12.38%	0.76%	1.19%	0.33%
Driverless Moving Vehicle	6.94%	0.46%	4.17%	0.00%
Leaving Traffic Lane	17.70%	0.82%	1.65%	0.00%
Entering Traffic Lane	14.49%	0.00%	0.93%	0.52%
Negotiating a Curve	16.40%	0.53%	1.32%	0.26%
Other	8.74%	0.51%	2.10%	0.62%
Unknown	7.42%	0.14%	2.29%	0.32%

When looking at injury crashes, a few trends stand out:

- Fatal crashes tend to involve vehicles that are out of control, such as ‘leaving traffic lane’, ‘skidding’, ‘negotiating a turn’, or vehicles without a driver at the wheel.
- Unsurprisingly, incapacitating injury crashes have some of the same trends as fatal crashes. ‘Making a left turn’ crashes are over represented in injury crashes, which can happen either when someone gets hit in the process of turning on a permissive green, or when a pedestrian/cyclist is hit by a driver that does not look for them in the process of a turn. We see similar issues on ‘right turn on red’.

- Pedestrian involved crashes by volume are usually low speed crashes, such as ‘backing’, ‘starting from parked’, and ‘parking’. However, that does not represent the most severe crashes. Pedestrians have an outsized representation in crashes involving a right turn on red.
- The most common crash for bike and scooters is a vehicle making a right turn. Bicycles and scooters also commonly get hit as cars turn left or by cars ‘starting from lane’, which means while accelerating after being stopped at a traffic signal or stop sign.

Looking at the movements vehicles made in severe and fatal crashes that involved a pedestrian/cyclist/scooter helps to identify more common causes of crashes. However, the challenge is that single events can have a much greater impact on the data because these collisions have fewer data points. The following shows the number of serious/fatal crashes that involved a pedestrian where a driver made one of the following movements.

**Table 7: Incapacitating and fatal vehicle movements involving a pedestrian, cyclist, or scooter rider 2016 - 2020**

	Severe/Fatal
Not Applicable	36.73%
Moving Constant Speed	47.75%
Accelerating	48.15%
Slowing or Stopping	40.21%
Starting from Lane	36.88%
Starting from Parked	39.13%
Stopped in Traffic Lane	26.72%
Changing Lanes	34.69%
Passing	45.45%
Parking	39.68%
Parked	39.34%
Backing	39.58%
Making Left Turn	44.10%
Making Right Turn	43.46%
Unknown	49.86%

Particularly in the case of pedestrian and cyclist crashes, reported movement may be hard to capture in the BPD report. Regardless, some trends emerge from the data captured. Crashes that result in serious injury or fatality typically involve a moving vehicle and often one that is negotiating a turning or passing movement.

### Vehicle Type

This chart looks at the breakdown of injury severity and vulnerable user-involved crash by type of vehicle involved. This is data from 2016-2020 for vehicles types that were involved in a minimum of 20 crashes. Note that these crashes do not indicate that they were caused by these types of vehicles, but rather the associated injury rate with vehicles involved in crashes. For instance, a moped operator is not protected by the encasing of a vehicle meaning that injury severity would be higher for mopeds involved in crashes. Dirt bikes are commonly used in

Baltimore and fall into the category of Moped. Low-speed vehicles are typically street-legal golf carts.

**Table 8: Crash Severity by Vehicle Type 2016 - 2020**

	Severe Inj.	Fatal	Ped	Bike/Scooter
Not Applicable	7.61%	0.06%	2.40%	0.54%
Motorcycle	38.11%	2.56%	1.86%	0.88%
Passenger Car	11.04%	0.14%	2.06%	0.39%
Station Wagon	11.92%	0.00%	2.49%	0.09%
Cargo Van/Light Truck 2 Axles (10,000lbs (4,536 Kg) Or Less)	10.04%	0.46%	1.47%	0.58%
Medium/Heavy Trucks 3 Axles (More Than 10,000lbs (4,536kg))	9.09%	0.40%	1.19%	0.27%
Truck Tractor	10.21%	1.60%	1.32%	0.00%
Recreational Vehicle	8.70%	0.00%	2.82%	0.31%
Transit Bus	20.79%	0.30%	3.10%	0.51%
School Bus	2.34%	0.11%	0.22%	0.33%
Ambulance/Emergency	5.00%	0.00%	0.69%	0.43%
Ambulance/Non Emergency	2.36%	0.00%	0.47%	0.47%
Fire Vehicle/Emergency	2.68%	0.13%	1.34%	0.00%
Fire Vehicle/Non Emergency	1.91%	0.00%	1.44%	0.48%
BPD Vehicle/Emergency	10.74%	0.07%	1.52%	0.42%
BPD Vehicle/Non Emergency	5.50%	0.03%	1.74%	0.71%
Moped (including "Dirt Bikes")	41.74%	1.56%	2.01%	2.23%
Pickup Truck	10.94%	0.19%	2.42%	0.47%
Van	11.68%	0.19%	2.65%	0.33%
Other Light Trucks (10,000lbs (4,536kg))	7.62%	0.08%	1.60%	0.42%
(Sport) Utility Vehicle	11.90%	0.21%	2.60%	0.41%
Low Speed Vehicle	7.24%	0.00%	3.82%	0.53%
Other Bus	15.38%	0.12%	2.93%	0.12%
All-Terrain Vehicle (ATV)	13.53%	0.00%	2.35%	0.00%
Other	9.61%	0.17%	1.75%	0.44%
Unknown	3.56%	0.03%	2.32%	0.36%

Crashes involving motorcycles and mopeds/dirt bikes tend to result in the most serious injuries and fatalities. This is consistent with national trends; motorcycles and mopeds/dirt bikes are more likely to be in crashes, due to a variety of factors including operator behavior, lack of helmet, and vehicular blind spots. They are also more likely to be injured or killed; motorcyclists and moped/dirt bike drivers travel at the same speeds as motor vehicles but without the protection of a metal encasing or may be driving recklessly.

The vehicles with the worst outcomes in crashes involving pedestrians are larger vehicles including medium/heavy trucks, tractor trailers, buses, pickup trucks, and sport utility vehicles (SUV). Cyclists and scooter riders have a disproportionately high crash rate with motorcycles and mopeds, possibly due to these vehicle operators often improperly use bike lanes.

### Drugs or Alcohol Involved

Drugs and alcohol also have a significant impact on the severity of injuries from crashes. The following data looks only at the maximum injury from crashes in which a driver has a ‘substance use code’ of one of the following. The first two lines of the table are crashes for which the officer either did not test the driver, or where there was a drug/alcohol test that came back negative. These two categories will serve as the baseline from which to compare the alcohol and drug categories. Officers select “Alcohol Present” (or drugs, medication) when they believe there is no indication that the presence of alcohol, drugs, or medication contributed to the crash. There is likely subjectivity in the distinction between “present” and “contributed”, which may lead to inconsistency in trends.

**Table 9: Crash severity by crashes involving drugs and alcohol 2016 - 2020**

	Severe Inj.	Fatal	Ped	Bike/Scooter
Not Applicable	16.42%	0.20%	3.80%	0.68%
None Detected	18.21%	0.38%	5.84%	1.04%
Alcohol Present	21.92%	4.59%	14.30%	0.43%
Illegal Drug Present	19.02%	6.83%	10.73%	0.98%
Medication Present	14.41%	4.24%	11.02%	0.85%
Combined Substance Present	12.90%	14.52%	17.74%	0.00%
Alcohol Contributed	21.00%	0.58%	10.60%	0.19%
Illegal Drug Contributed	30.00%	1.43%	11.43%	0.95%
Medication Contributed	23.75%	0.00%	11.25%	0.00%
Combination Contributed	18.92%	13.51%	13.51%	0.00%
Other	15.33%	6.57%	13.87%	0.73%
Unknown	9.68%	0.33%	5.70%	0.82%

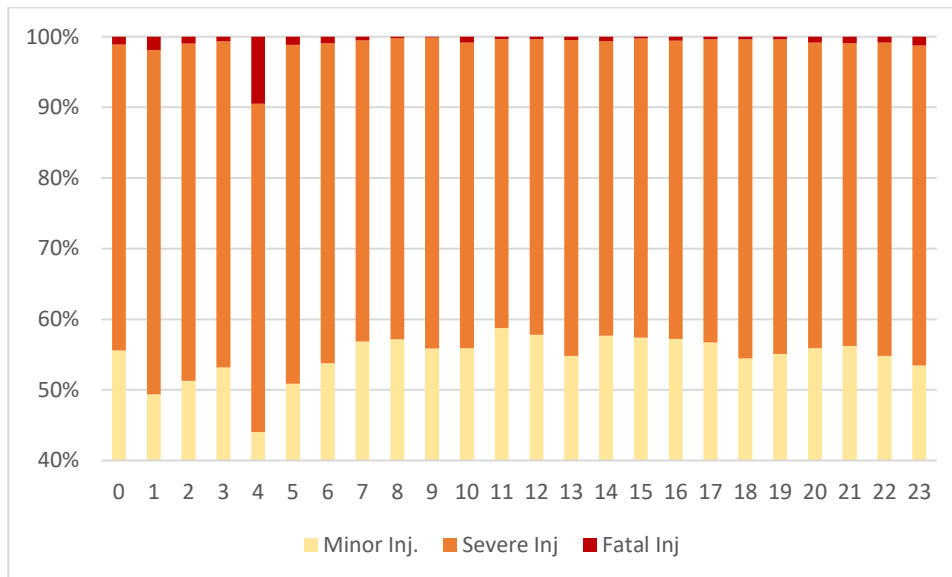
The following trends can be discerned from this data:

- Generally, a higher percentage of crashes that involved a driver under the influence of a substance resulted in fatalities and pedestrians being hit compared with crashes involving drivers who were not under the influence.
- Crashes involving alcohol (whether “present” or contributed”) were more likely to result in severe injuries, fatalities, and pedestrians being hit.
- Crashes in which officers determined that illegal drugs or medications contributed were more likely to result in severe injury.
- Drivers in which multiple substances were detected had the highest rates of fatal and pedestrian crashes, though seemingly no impact on crashes involving severe injuries.
- There are no discernable patterns with crashes involving bicyclists; this however may be due to a lack of data.

### Time of Day

The time of day can have an impact on the crash severity. High severity and fatal crashes have an uptick at night, particularly between 10pm and 6am. This may be attributed to reduced night-time visibility or drivers being more distracted at night.

**Figure 5: Injury and fatal crashes by time of day 2016 - 2020**



While the data represented on the above graph may not seem particularly stark, the trends become more prominent when considering the amount of vehicles on the road throughout the day. Generally, more vehicles are on the road during the day than at night, making the seemingly slight uptick at night represented above more pronounced in reality. Additionally, during the day, more vehicles are on the road during peak hours (7 – 9am, 4 – 7pm) than during off-peak hours. Further investigation into road volumes and the role of street lighting may be necessary to glean insight into time of day crashes.

Additionally, the following facts are important to consider when accounting for Baltimore’s challenges:

- Commercial trucks and transit buses account for about 4% of crashes. Standard automobiles are the most frequently involved vehicles.
- Nearly 40% of crashes occur in or near an intersection.

A 2021 study by Basil Labs tracked crash-related 911 calls compared to crash reports in Washington, DC.<sup>1</sup> The study found that about 10% of vehicle-only crashes and 30% of crashes that involved a person outside of a vehicle did not end up in official crash reports. This pattern was especially pronounced in majority-Black communities. A similar evaluation can be done in Baltimore to determine if there are similar issues. Having complete crash data is vitally important in order to identify issues; crash reports may need to be supplemented with 911 data and hospital case data. Data gathering will be further explored in the strategies section.

<sup>1</sup> <https://www.bloomberg.com/news/articles/2021-07-15/how-many-traffic-crashes-are-going-unreported>

## Outside Research

Outside of DOT, several academic institutions have conducted their own traffic safety studies in Baltimore. In 2017, an “Analysis of Intersection Related Pedestrian Crashes in the City of Baltimore” was completed by students of University of California, Los Angeles<sup>2</sup>. Major takeaways from this research project included:

- Intersections that have a higher number of crashes or higher severity of crashes are highly concentrated in the downtown area, or along major arterials characterized by commercial and mixed-use land uses.
- There is a statistically significant difference in the average number of lanes at high crash intersections versus low crash intersections. The average number of lanes at high crash intersections is 7, versus 5 lanes at lower crash intersections.

Additionally, “Moving Toward Zero in the City of Baltimore” research was conducted by students from Duke University’s Sanford School of Public Policy in 2017. The research recommended implementing a “20 is Plenty” campaign, which would establish a default speed of 20 MPH in the downtown area, supplemented by expanded enforcement and education.

## Baltimore City Crash Reduction Plan

In 2021, the Baltimore City Department of Transportation entered into an agreement with Mead & Hunt, Inc. to conduct an analysis of traffic crash patterns in Baltimore City and identify locations for improvement. Three years of crash data were utilized (2017-2019) to identify hot spots at the intersection and segment levels. Interstates were excluded from the study and crash rates were not used due to lack of data availability.

Once the hot spots were identified, a weighting system that incorporated crash frequency, severity, and crash rate was applied. Frequency is the total count of crashes at that location, the higher the number the higher the rank. Severity rank was calculated by applying weights according to the level of injury experienced in the crash, the more injurious the crash the higher the rank. Crash rate was calculated using vehicular exposure metrics: vehicle miles traveled (MVMT) on roadway segments and million entering vehicles (MVE) for intersections. A composite crash index (CCI) rank was calculated as 25% frequency rank, 25% crash rate rank, and 50% severity rank. Ranks are highest at the lowest score (e.g. 1 is the highest rank). Equity ranks were applied to hot spots as well, using DOT’s Transit Equity Score (Wallace Montgomery, 2021). Baltimore City’s “Transit Equity Score” highlights census blocks with poor transportation access as relates to age, poverty, race, no-car households, income, education, Hispanic/Latinx, public transit commuters, and disability status.

The study also incorporated the Safe System Approach by noting common denominators in roadway characteristics data at identified road segments and intersections. This information can be used to identify countermeasures and as a predictive model for other potential high crash locations.

The study resulted in four lists of high crash hot spots, including High Crash Intersections, High Crash Road Segments, High Pedestrian and Bicycle Crash Intersections, and High Pedestrian and

---

<sup>2</sup> [https://www.researchgate.net/publication/277152058\\_An\\_Analysis\\_of\\_Pedestrian-Vehicular\\_Crashes\\_Near\\_Public\\_Schools\\_in\\_the\\_City\\_of\\_Baltimore\\_Maryland](https://www.researchgate.net/publication/277152058_An_Analysis_of_Pedestrian-Vehicular_Crashes_Near_Public_Schools_in_the_City_of_Baltimore_Maryland)



Bicycle Crash Segments. Tables 10, 11, 12, and 13 show each list in order of their overall composite score ranking with associated discrete subject scores. As this Action Plan is primarily concerned with severe and fatal crashes, Figures 6 and 7 map overall crash hot spots and ped/bike hot spots, respectively, in order of their Severity Rank.

### Overall High Crash Intersections and Road Segments

**Figure 6: Baltimore City Crash Reduction Plan High Crash Corridors and Intersections 2017 - 2019 with Transit Equity Score**

#### High Severity Crash Segments

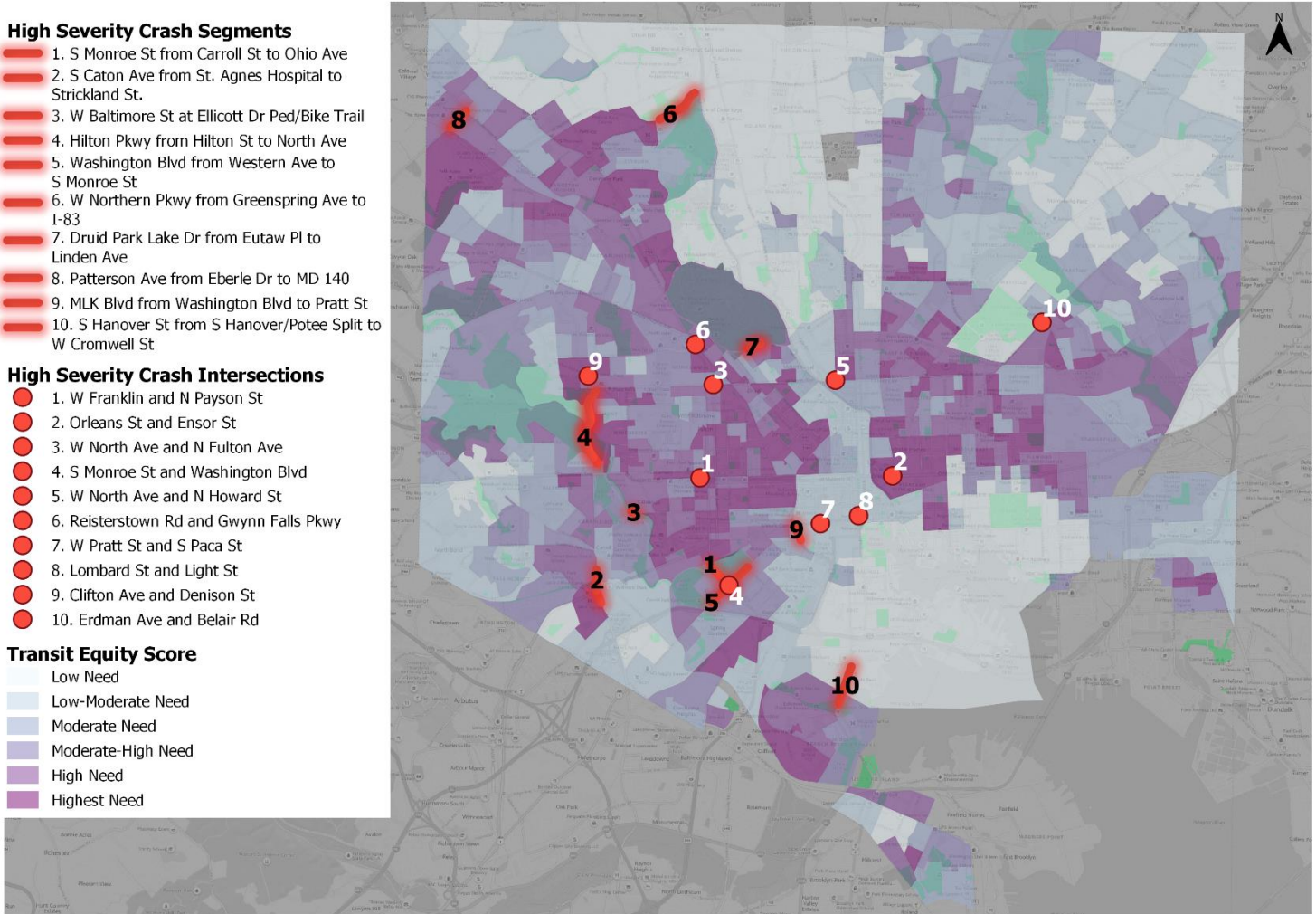
1. S Monroe St from Carroll St to Ohio Ave
2. S Caton Ave from St. Agnes Hospital to Strickland St.
3. W Baltimore St at Ellicott Dr Ped/Bike Trail
4. Hilton Pkwy from Hilton St to North Ave
5. Washington Blvd from Western Ave to S Monroe St
6. W Northern Pkwy from Greenspring Ave to I-83
7. Druid Park Lake Dr from Eutaw Pl to Linden Ave
8. Patterson Ave from Eberle Dr to MD 140
9. MLK Blvd from Washington Blvd to Pratt St
10. S Hanover St from S Hanover/Pottee Split to W Cromwell St

#### High Severity Crash Intersections

1. W Franklin and N Payson St
2. Orleans St and Ensor St
3. W North Ave and N Fulton Ave
4. S Monroe St and Washington Blvd
5. W North Ave and N Howard St
6. Reisterstown Rd and Gwynn Falls Pkwy
7. W Pratt St and S Paca St
8. Lombard St and Light St
9. Clifton Ave and Denison St
10. Erdman Ave and Belair Rd

#### Transit Equity Score

- Low Need
- Low-Moderate Need
- Moderate Need
- Moderate-High Need
- High Need
- Highest Need



**Table 10: Intersection Crash Hot Spots 2017 - 2019**

Intersection	Frequency Rank	Rate Rank	Severity Rank	Equity Rank
1. W Franklin St and N Payson St	2	2	1	3
2. Orleans St and Ensor St	1	3	2	2
3. W North Ave and N Fulton Ave	4	5	3	6
4. S Monroe St and Washington Blvd	3	4	4	7
5. W North Ave and N Howard St	5	7	5	1
6. Clifton Ave and Denison St	8	1	9	5
7. Lombard St and Light St	6	6	8	T9
8. Reisterstown Rd and Gwynns Falls Pkwy	9	8	6	8
9. W Pratt St and S Paca St	7	9	7	T9
10. Erdman Ave and Belair Rd	10	10	10	4

The following key points can be discerned from this data:

- 70% of intersections had at least 4 lanes on both the major and minor road
- 60% of intersections had a left turn lane from at least one approach, four of which had a protected left turn phase
- The posted speed was 30 MPH on 90% of the intersecting roads
- Right turns on red were allowed at 50% of the intersections
- All major roads have an AADT greater than 10,000, and 90% have an AADT greater than 20,000
- 60% of intersections were of principal arterials on both the major and minor road
- Roadway functional classes breakdown as:
  - Principal arterial: 75%
  - Minor arterial: 15%
  - Local: 10%
- One intersection (S Monroe St at Washington Blvd) had a cycle length of 150s, all other signalized intersections had a cycle length between 110-120s
- 70% of intersections had crosswalks across all four legs, 20% had crosswalks across three legs, and 10% did not have any crosswalks
- Most intersections were near major pedestrian generators, including: West Baltimore MARC Station, bus stops, grocery/drug stores, convenience stores, Mondawmin Mall



**Table 11: Road Segment Crash Hot Spots 2017 - 2019**

Segment	Frequency Rank	Rate Rank	Severity Rank	Equity Rank
1. S MONROE ST	2	5	1	T4
2. W BALTIMORE ST	4	1	3	6
3. S CATON AVE	3	6	2	7
4. WASHINGTON BLVD	5	2	5	T4
5. HILTON PKWY	1	10	4	3
6. DRUID PARK LAKE DR	9	3	7	1
7. W NORTHERN PKWY	6	8	6	8
8. PATTERSON AVE	7	4	8	2
9. S MARTIN LUTHER KING JR BLVD	8	7	9	9
10. S HANOVER ST	10	9	10	10

The following key points can be discerned from this data:

- 90% of segments were 4 or greater lane roadways
- The posted speeds break down as:
  - 20 MPH: 10% (Advisory speed, typical speed is 30 MPH)
  - 25 MPH: 10%
  - 30 MPH: 40%
  - 35 MPH: 40%
- 40% of segments had an AADT greater than 32,000
- One segment had an AADT less than 10,000 (W Baltimore St, 8,900)
- All segments were two-way roads
- 50% of segments had median, either concrete or concrete and grass, one of which had a partial two way left turn lane
- All segments were classified as arterials
- Lane widths break down as:
  - 9.5 ft: 10%
  - 10 ft: 40%
  - 11 ft: 40%
  - 12 ft: 10%
- Curb-to-curb road width break down as:
  - 40-45 ft: 2
  - 46-50 ft: 1
  - 51-55 ft: 0
  - 56-60 ft: 5
  - 61-65 ft: 0
  - 66-70 ft: 1
  - >70 ft: 1

- Two segments had no sidewalks or pedestrian trails present
- 8 segments had no cycling facilities present
- 70% had no pedestrian crossings within the segment (excluding crossings at segment limits)
- 80% of segments had a distance greater than 2 blocks between pedestrian crossings

### Pedestrian and Bicycle High Crash Intersections and Road Segments

**Figure 7: Baltimore City Crash Reduction Plan High Crash Pedestrian and Bicycle Intersections and Corridors with Transit Equity Score**

#### High Severity Ped/Bike Crash Segments

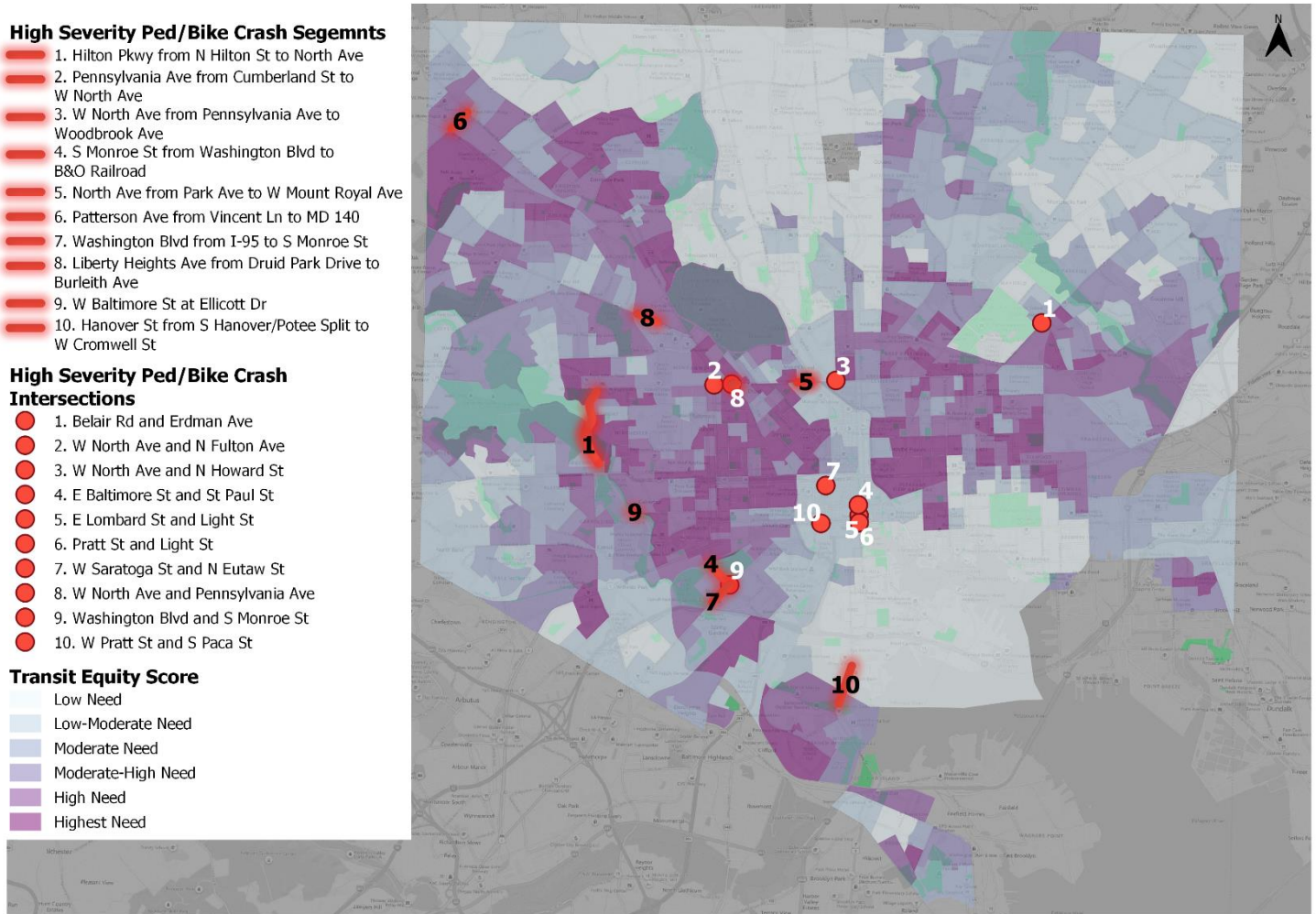
1. Hilton Pkwy from N Hilton St to North Ave
2. Pennsylvania Ave from Cumberland St to W North Ave
3. W North Ave from Pennsylvania Ave to Woodbrook Ave
4. S Monroe St from Washington Blvd to B&O Railroad
5. North Ave from Park Ave to W Mount Royal Ave
6. Patterson Ave from Vincent Ln to MD 140
7. Washington Blvd from I-95 to S Monroe St
8. Liberty Heights Ave from Druid Park Drive to Burleigh Ave
9. W Baltimore St at Ellicott Dr
10. Hanover St from S Hanover/Potee Split to W Cromwell St

#### High Severity Ped/Bike Crash Intersections

1. Belair Rd and Erdman Ave
2. W North Ave and N Fulton Ave
3. W North Ave and N Howard St
4. E Baltimore St and St Paul St
5. E Lombard St and Light St
6. Pratt St and Light St
7. W Saratoga St and N Eutaw St
8. W North Ave and Pennsylvania Ave
9. Washington Blvd and S Monroe St
10. W Pratt St and S Paca St

#### Transit Equity Score

- Low Need
- Low-Moderate Need
- Moderate Need
- Moderate-High Need
- High Need
- Highest Need



**Table 12: Pedestrian and Bicycle Intersection Crash Hot Spots 2017 - 2019**

Intersection	Frequency Rank	Rate Rank	Severity Rank	Equity Rank
1. Belair Rd and Erdman Ave	1	3	T1	3
2. W North Ave and N Fulton Ave	2	4	T1	4
3. E Baltimore St and St Paul St	4	2	4	T7
4. E Lombard St and Light St	3	5	T5	T7
5. W North Ave and N Howard St	6	8	3	1
6. Pratt St and Light St	5	9	T5	T7
7. W Saratoga St and N Eutaw St	9	1	7	6
8. W North Ave and Pennsylvania Ave	7	7	8	2
9. Washington Blvd and S Monroe St	8	6	T9	5
10. W Pratt and S Paca St	10	10	T9	T7

The following key points can be discerned from this data:

- 70% of intersections had a left turn lane from at least one approach, only 1 had a protected left turn phase
- All intersections had crosswalks across all legs
- Intersection lighting was good at all intersections
- Right turns on red were prohibited at 90% of intersections
- The posted speed was 30 MPH on 90% of the intersecting roads
- 90% of intersections had at least 4 lanes on both the major and minor road
- 90% of major roads had an AADT greater than 10,000, 70% of major roads had an AADT greater than 20,000
- 60% of intersections were of principal arterials on both the major and minor road
- Roadway functional classes breakdown as:
  - Principal arterial: 75%
  - Minor arterial: 25%
- 60% had right turn lanes, all of which had permissive phases and prohibited right on red
- One intersection (S Monroe St at Washington Blvd) had a cycle length of 150s, all other intersections had a cycle length between 110-120s
- Most intersections were near major pedestrian generators, including: grocery/drug stores, the Inner Harbor, Camden Yards, the Lexington Market, Penn-North Metro Station, bus stops, office buildings

**Table 13: Pedestrian and Bicycle Segment Crash Hot Spots 2017 - 2019**

Segment	Frequency Rank	Rate Rank	Severity Rank	Equity Rank
1. PENNSYLVANIA AVE	4	1	2	1
2. W NORTH AVE (Pennsylvania Ave)	2	3	3	2
3. HILTON PKWY	1	9	1	5
4. S MONROE ST	3	6	4	T6
5. W NORTH AVE (Park Ave)	5	7	5	9
6. PATTERSON AVE	6	5	6	3
7. WASHINGTON BLVD	7	4	7	T6
8. W BALTIMORE AVE	8	2	9	8
9. LIBERTY HEIGHTS AVE	9	8	8	4
10. S HANOVER ST	10	10	10	10

The following key points can be discerned from this data:

- 90% of segments were 4 or greater lane roadways
- The posted speeds break down as:
  - 20 MPH: 10% (Advisory speed, typical speed is 30 MPH)
  - 25 MPH: 40%
  - 30 MPH: 30%
  - 35 MPH: 20%
- Sidewalks were present at all segments
- Only one segment had cycling facilities on the segment
- Pedestrian generators in the vicinity of the segments include schools (e.g., MICA, BCCC, The Mount Royal School), parks, grocery stores/shopping centers, Penn-North Metro Station, bus stops
- Some segments were inter-neighborhood connectors or bypasses which were one of if not the only road to other areas, thus channeling pedestrians (e.g., Hanover St Bridge, Hilton Pkwy, Patterson Ave to Reisterstown Plaza Metro under the RR crossing)
- 60% of segments had an AADT greater than 20,000
- All segments were two-way roads
- 40% of segments had median, either concrete or concrete and grass, one of which had a partial two way left turn lane
- All segments were classified as arterials
- Lane widths break down as:
  - 9.5 ft: 20%
  - 10 ft: 20%
  - 11 ft: 50%
  - 18 ft: 10%
- Curb-to-curb road width break down as:

- 39-45 ft: 3
- 46-50 ft: 1
- 51-55 ft: 0
- 56-60 ft: 3
- 61-65 ft: 0
- 66-70 ft: 0
- >70 ft: 3
- 60% had no crosswalk within the segment
- 60% of segments had a distance greater than 0.25 mi between pedestrian crossings

### **Overarching Findings**

- Findings highlighted unsurprising characteristics of hot spot roadways and intersections, such as high AADT and more lanes at hot spot locations.
- For pedestrian and bicycle intersection crashes, all hot spots had crosswalks at all intersection legs. Additionally, right turns were prohibited at 90% of these intersections. This suggests that presence of pedestrian amenities is not the primary safety factor for bicyclist and pedestrians at intersections, but rather, other operational characteristics of the roadway / intersection (e.g., phasing, speeds,) factor in the safety of bicyclists and pedestrians.
- Conversely, bike facilities were found along only 1 of the top 10 bicycle/pedestrian hot spot road segments, suggesting that bike facilities may help reduce bike crashes along road segments.

### **Other Identified Issues**

The Baltimore City Crash Reduction Plan notes several issues with crash data and reporting:

- The crash location XY coordinates are not validated by the MSP before being incorporated into SHA's crash database (TANG).
- MDOT SHA is moving towards a new database structure that is based on the ACRS data structure. This is called MSCAN
- Washington College processes the final crash data product (Sanitized Shapefiles) annually for DOT. This data is derived from MDOT SHA's TANG database. They use the ACRS manual to resolve data conflicts. However, because there are parallel crash data QC efforts among different contractors, it is unclear whether all the QC is captured in the final, sanitized shapefile provided to DOT by Washington College.
- Near misses are a critical factor in road safety, however this data is difficult to capture
- Many crashes go unreported, either because they are minor, or due to other interests of the parties involved. This is particularly the case for crashes involving a pedestrian or bicyclist, which can underrepresent actual pedestrian and bicycle crash statistics.
- Although there are standard reporting forms for crash incidents, consistent documentation and interpretation among dozens of municipal, county, and state law enforcement agencies is challenging, which can result in skewed data.
- Not all crashes are reportable to the ACRS system, including incidents involving public transit vehicles and minor speeding and traffic violations.

- Often, the responding officer is able to determine causation based on prevailing site and driver conditions. Other times, however, critical causation data is not offered by the driver (e.g. distracted, texting), which can underrepresent actual risky behaviors.

### **Data Recommendations**

The following is a list of data recommendations to improve crash data accuracy. The recommendations are categorized by whether the solution is on the scene at the crash location (source) or during post processing (PP). Additionally, location accuracy improvements (Location) are distinguished from (Attribute) accuracy improvements.

#### Source, Location Recommendation

- Require responding officer to collect the coordinates of the crash location with a GPS-enabled application and provide training.

#### PP, Location Recommendations

- Compare GIS points to the Road name and Reference Road name attributes. The Road name is the crash on street and the Reference Road name is the nearest intersection to the crash. Using a centerline GIS file, an analyst can check the location for the proper on street and nearest cross street.
- Compare the GIS point location to the information provided in the Narrative data attribute. The Narrative data attribute is often the most valuable piece of information in the attribute table because it provides the officer the opportunity to list details of the crash such as the distance that it occurred from the intersection or the lane in which the crash occurred.

#### Source, Attribute Recommendations

- Investigate the ACRS system and see where improvements can be made for standardization of data attribute entry. This could include the following:
  - Refining the domains (possible input values) that are given as options in ACRS
  - ACRS not accepting blank or null values
  - Ensuring all officer's vehicles are equipped with standardized ACRS systems.
- Officer training on data input.

#### PP, Attribute Recommendations

- Cross reference data attributes, checking for consistency. For example, if the Weather attribute is rainy, the Surface Condition Attribute should be wet or slippery. The following data attributes are easy to cross reference:
  - Accident Time / Light Code
  - Weather / Surface Condition
  - Junction / Intersection Type
- When there are blank or null values for Weather or Surface Condition, historical weather reports can be researched.
- Compare the Narrative attribute to other data attributes.



## Serious Injury and Fatality Reduction Targets

The performance targets are set using a linear trend line to reach zero fatalities and serious injuries in 2030. The previous five-year average and the current five-year average were used to determine these targets. Rolling five-year averages are used to calculate the targets for each individual year. Although the 2028 – 2032 five-year average targets are not zero, zero fatalities and injuries can be extrapolated from the midpoint year of 2030, assuming annual reductions each year.

Five data points were graphed, beginning with the 2012-2016 average, and the endpoint was set as zero - the 2028-2032 midpoint. A linear trend line was fit and the resulting equation was used to calculate interim data points. Those targets are guiding points for Baltimore City to reach zero fatalities and serious injuries by 2030.

Statistically, although the endpoint is set at zero, the trend line equation calculates the rate at which a decline should occur even if the project endpoint is close to zero but not exactly that (the next data point would be at or below zero using the equation).

**Table 14: Five-Year Serious Injury and Fatality Reduction Targets**

	Baseline	Current	Targets		
	2012-2016	2016-2020	2020-2024	2024-2028	2028-2032
Fatalities	37	50	26	15	4
Serious Injuries	248	466	228	142	55

\*Serious injuries are defined as those reported as incapacitating on the crash report.

Fatalities and serious injuries have been in an increasing trend in Baltimore City. These targets are aggressive to reach a goal of zero fatalities and serious injuries and will require a substantial paradigm shift.

## Emphasis Areas and Strategies

### Key Strategies

Strategies that promote these aggressive safety goals cannot be adequately addressed without first creating a fundamental shift in the ethos of Baltimore City towards its road infrastructure and transportation culture. Baltimore City passed a Complete Streets ordinance in 2018 and a Complete Streets Manual in 2020. Operationalizing Complete Streets through an equity lens into planning, engineering, and funding is essential to the majority of the transportation safety strategies outlined in the following sections. The below table recommends overarching strategies to engrain Complete Streets into the culture of DOT and the City as a whole:

**Table 15: Strategies to Embed Complete Streets into City Culture**

Type	Strategy	Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Policy	Develop targeted Complete Streets training for each DOT division. Administer trainings annually.	DOT Traffic	Mayor's Advisory Committee on Complete Streets	Short/Ongoing	\$\$	Operating, External Funding
Policy/Process	Create checklist for proposed CIP projects that reflect Baltimore's modal hierarchy, safety, and equity goals. Create prioritization factors and weights.	DOT Planning	CIP Project Review	Short/Ongoing	\$	Operating
Policy	Create annual Complete Streets Goals and tie to CIP projects	DOT Planning	Sustainable Transportation Subcabinet, Mayor's Advisory Committee on Complete Streets	Short/Ongoing	\$	Operating
Plan	Create City-wide Complete Streets typology map	DOT Planning	Mayor's Advisory Committee on Complete Streets	Medium	\$\$	External Funding



Type	Strategy	Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Policy	Create Complete-Streets-oriented Maintenance of Traffic (MOT) requirements and guidelines for in-house work, utilities, and private developers	DOT Traffic	Mayor's Advisory Committee on Complete Streets	Short	\$	Operating
Policy	Promote transportation mode shift among Baltimore City government employees. Strategies involve changes to the City fleet composition, annual employee travel surveys, employee incentives for sustainable transportation, and accessible information around sustainable transportation	DOT Planning, DGS, DHR	Sustainable Transportation Subcabinet	Long/Ongoing	\$ - \$\$	Operating, State and Federal grants

## Emphasis Areas

The following emphasis areas and corresponding strategies represent an “infrastructure first” approach to transportation safety engineering. All location-based projects outlined are to be prioritized in order of highest need through a data-driven selection process. Locations of interest will be selected by evaluating severe crash frequency and likelihood, pedestrian and bicycle crash frequency and likelihood, and equity need. This represents adherence to the legislated Complete Streets hierarchy of transportation modes through an equity lens. All existing and future DOT projects, including active projects and annual resurfacing projects, should be designed to prioritize the measures in the following sections.

### Right-Sizing Driving Space

In the 1950s, Baltimore City had a population of one million people and was a leader in the industrial economy. Over the next 50 years, the proliferation of highway infrastructure made it possible for industries to relocate to more expansive and cheaper land and for City residents to relocate to suburbs. As a result, Baltimore City has oversized infrastructure for its needs today; this is particularly evident outside of peak commuting hours. Roads that have excess capacity are conducive to speeding. The Baltimore High Crash Reduction Plan identified a correlation between severe crashes and number of lanes. Right-sizing the road encourages lower speeds and creates more room in the public right-of-way for safer bike, pedestrian, and transit travel. There

are several ways to reduce the amount of road space for vehicles, including lane reduction, width reduction, and intersection turning space reduction.

**Table 16: Strategies to Right-Size Driving Space**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Plan	Identify oversized roads through a survey of AADT/AAWDT, lane widths, and number of lanes. Create a plan that recommends the replacement of excess roadway with a toolbox of bike facilities, pedestrian facilities, transit facilities, traffic calming infrastructure, and green space.	DOT Planning	Mayor's Advisory Committee on Complete Streets	Long	\$\$	External Funding
Process	Analyze existing and future resurfacing projects and other construction projects for lane narrowing and lane reduction.	DOT Planning and Traffic	Traffic Stat	Short/ Ongoing	\$	Operating
Plan	Identify roads that changed from industrial use to residential use and prioritize for retrofit as a more Complete Street.	DOT Planning	Mayor's Advisory Committee on Complete Streets	Medium	\$	Operating

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Process + Infrastructure	Ensure lane reduction projects are in the Construction Program each year. Create annual goals around this metric.	DOT Planning	CIP Project Review*	Short/ Ongoing	\$\$\$	Operating + CIP Funding
Process	Couple lane width and lane reduction projects with goals pertaining to impervious surface removal and bike facilities.	DOT Planning and Traffic	Sustainable Transportation Subcabinet	Short	\$	Shared DPW and DOT CIP funding
Plan	Determine corridors with peak-hour parking restrictions that experience speeding and frequent crashes. Remove peak hour restrictions appropriately.	DOT Planning	Traffic Stat	Long	\$\$	External Funding

\*Working Group does not exist yet

### Traffic Signals and Stop Control

Free flow roadway conditions that encourage speeding can result from traffic signal timing and phasing that promote the flow of vehicles over the safety of all roadway users. An important aspect of transportation safety engineering is timing and coordinating traffic signals for slow speeds and to help more vulnerable users to cross roadways. Traffic signals can also be phased to protect higher-risk movements, such as left turns, bicycle/scooter crossings, and pedestrian crossings.

Baltimore City's Complete Streets Manual recognizes the role that traffic signals can play in calming the City's streets. To create a walkable, safe, and comfortable environment, it recommends the following measures to promote the safety of natural pedestrian movements:

- Reduce the number of signal phases
- Shorten Cycle Lengths
- Fixed time operation

Table 8 in the Complete Streets Manual<sup>3</sup> (p. 95 – 96) details recommendations on cycle lengths, clearance intervals, pedestrian phases, coordination, and green time allocation for all Complete Street typologies shown in the following table:

Street Type	Timing Method	Peak Hours Cycle Length (sec.) (3)	Non-Peak Hours Cycle Length (sec.) (3)	Clearance Intervals	Pedestrian Phases	Coordination	Green Time Allocation
Downtown Commercial	(1)	60-90	60	(4)	(5)	(7)	(8)
Downtown Mixed-Use	(1)	60	40-60	(4)	(5)	(7)	(8)
Urban Village Main	(1)	60	40-60	(4)	(5)	(7)	(8)
Urban Village Neighborhood	(1)	60	40-60	(4)	(5)	(7)	(8)
Urban Village Shared Street	(1)	60	40-60	(4)	(5)	(7)	(8)
Urban Center Connector	(1), (2)	90-120	60-90	(4)	(6)		(9)
Neighborhood Corridor	(1)	60	40-60	(4)	(5)	(7)	(8)
Industrial Access	(1), (2)	90-120	60-90	(4)	(6)		(9)
Parkway	(1), (2)	90-120	60	(4)	(6)		(9)
Boulevard	(1)	60-90	60	(4)	(5)	(7)	(8)

<sup>3</sup> <https://transportation.baltimorecity.gov/completestreets>

- (1) Pretimed (Coordinated where feasible).
- (2) Actuated.
- (3) Peak hours assumed to be 7AM-9AM and 4PM-6PM. Unique circumstances require exceptions.
- (4) Yellow clearance intervals shall be calculated based on the target and posted speed and be kept as short as permitted by law. Red clearance intervals should be based on ITE clearance interval calculation formulas but consider engineering judgment. The goal should be to keep the red clearance interval as short as possible but minimize conflicts resultant from vehicles not clearing the intersection prior to a conflicting phase.
- (5) Pedestrian Phase—Urban
  - Pedestrian phases shall be recalled every cycle regardless of pedestrian presence.
  - Pedestrian walk interval time can be decreased to 4 seconds to allow for a shorter desired cycle length, if this is determined to be adequate based on the characteristics of the crossing and pedestrians utilizing the intersection.
  - Minimum pedestrian clearance time calculations shall include the yellow change/buffer interval. The pedestrian change interval may:
    - Include or exceed all of the minimum pedestrian clearance time or
    - Be equal to the minimum pedestrian clearance time minus the buffer interval.
  - To obtain the goal of a short cycle length while providing adequate time for crossing, the pedestrian clearance times shall be set on the assumption that the minor approach can receive up to the same amount of green time as the major approach.
  - Leading pedestrian intervals should be provided at locations with high turning volumes.
  - At actuated signals, rest in Walk operation should be in effect, holding the walk or flashing don't walk for the entire corresponding green signal.
- (6) Pedestrian Phase—Suburban/Industrial
  - Pedestrian phases should be set to recall during times when pedestrians are expected to be present. Engineering judgment can be used for actuated operation.
  - Pedestrian walk interval can be decreased to 4 seconds to allow for a shorter desired cycle length.
  - Minimum pedestrian clearance time calculations shall include the yellow change interval.
  - To obtain the goal of a short cycle length while providing adequate time for crossing, the pedestrian change interval shall be set on the assumption that the minor approach can receive up to the same amount of green time as the major approach.
- (7) Coordination:
  - When progression is desired, offsets/coordination parameters should be set based on the target speed. For the majority of urban roadways, this should be 20 mph.
  - Offsets may need to be set differently to consider complex queue interaction.
- (8) Green-Time Allocation—Urban
  - To obtain the goal of a short cycle length while providing adequate time for crossing, the pedestrian change interval shall be set on the assumption that the minor approach can receive up to the same amount of green time as the major approach.
  - The minor approach should receive no less than a 2/3 ratio of the green-time that the major approach receives.
- (9) Green-Time Allocation—Suburban/Industrial
  - The minor approach should receive no less than a 1/2 ratio of the green-time that the major approach receives.

Baltimore City must retrofit its traffic signals to comply with Complete Streets standards.  
 Strategies:

**Table 17: Strategies for Signal Timing**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Process	Leveraging the City-wide Signal contract, retime traffic signals City-wide to comply with Complete Streets manual. Enact proactive reviews of existing traffic signals with the safety and movements of pedestrians, bicyclists, and transit in mind.	DOT Traffic	Traffic Stat	Long/Ongoing	\$\$	Operating + External
Policy	Provide training on Complete Streets traffic signals	DOT Traffic	Traffic Stat	Short/Ongoing	\$\$	Operating + External
Plan	Leveraging the City-wide Signal contract, conduct City-wide review for new traffic signals and all-way stop need, evaluating appropriate signal distance length in the urban core for pedestrian crossing and slow vehicle speed, using best practices from other cities. Schools should be prioritized.	DOT Traffic	Traffic Stat	Long/Ongoing	\$\$\$	Operating + External

### Speeding

Speeding can be influenced by safer infrastructure, enforcement, and policy. Community input is vital to successfully addressing this topic, as crash data does not necessarily reflect the full picture of speeding.

Current efforts to curtail speeding in Baltimore include the Neighborhood Traffic Calming program and 311 requests. The Neighborhood Traffic Calming program is an annual dedicated funding source that allows DOT to evaluate selected neighborhoods holistically and implement comprehensive traffic calming on local streets. Neighborhoods are selected through a combination of high overall crash rate and equity need. In FY22, DOT also received funds for similar traffic calming work in the Impact Investment Neighborhoods, as designated by DHCD. Community members may also submit 311 requests for traffic calming. In the past, DOT addressed these requests in order of receipt, generally through speed humps exclusively. DOT

has revised its 311 program to prioritize requests coming from high crash and high equity need areas, and has revised the toolkit of strategies to include quick-build measures, such as striping and flex posts. Additionally, efforts previously described that result in a narrower roadway with fewer driving lanes and more street “infill” as well as Complete Streets traffic signal timing inherently are anti-speeding strategies.

**Table 18: Strategies for Speeding Reduction**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Legislation + Policy	Continue to advocate for City's ability to link speed limits to roadway typology as defined in the Complete Streets manual. Using data-driven and best-practices approach, reduce default and maximum speed limits Citywide. Explore the possibility of enacting a "20 is Plenty" policy in the Downtown area.	DOT Director's Office	Mayor's Advisory Committee on Traffic Safety*	Short - Long	\$	Operating
Policy	Create Neighborhood Slow Zones as part of the traffic calming toolbox**	DOT Traffic	Neighborhood Traffic Calming Review	Long	\$\$	Operating
Policy + Process + Infrastructure	Continue to build the Neighborhood Traffic Calming program***	DOT Planning + Traffic	Neighborhood Traffic Calming Review + Impact Investment Area Subcabinets	Short/ Ongoing	\$	Operating



Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Plan + Infrastructure	Finalize the SMAP and implement traffic calming measures, including the aforementioned road diets and signal retiming, on identified high-speed corridors	DOT Planning + Traffic	Zero Stat	Long/Ongoing	\$\$	External + CIP
Infrastructure + Policy	Implement additional speed cameras and targeted enforcement on noted high-speed corridors. Investigate the practicality of a fee structure that respects income.	Traffic + ATVES	Traffic Stat, Mayor's Advisory Committee on Traffic Safety*	Long/Ongoing	\$\$	External + CIP
Technology	Investigate ways of capturing speeding and near misses through low-labor technologic solutions.	DOT Data Team	Zero Stat	Medium	\$	Operating

\*Committee does not currently exist

\*\* Similar to School Zones, Neighborhood Slow Zones require drivers to operate at slower speeds within a given area. The typical speed of a Neighborhood Slow Zone is 20 mph. Determine the appropriate mechanism of enacting Neighborhood Slow Zones (proactively or by request/application process)

\*\*\* To build upon the Neighborhood Traffic Calming program, DOT Traffic and Planning should undertake the following:

- Develop traffic calming toolbox for engineers and planners to use, both within DOT and at other agencies.
- Identify top 10 neighborhoods for cut-throughs annually, analyzing local streets only. Select at least six neighborhoods each year for comprehensive traffic calming of local streets. Neighborhoods are to be identified at the beginning of each fiscal year.
  - Neighborhoods identified for FY22 were:

- Oliver
- Broadway East
- East Baltimore Midway
- Druid Heights
- Sandtown-Winchester
- Upton
- A DOT engineer and a planner will be assigned to each identified neighborhood. The team will meet with the neighborhood in the early fall to get community input around neighborhood issues, then design alternatives to present to the neighborhood by the winter. Alternatives should address speeding, injury and fatal crashes in the neighborhood, as well as other neighborhood safety concerns. Final projects will be selected collaboratively between DOT and the neighborhood and implemented in the following paving season.

### High Crash Intersections and Corridors

In addition to the City-wide strategies noted in the above sections, hot spots of consistent severe injuries and fatalities should be addressed. Any fatality or serious injury should automatically trigger a design review of the location. Severe crashes are to be reviewed on an annual basis to not only update lists of targeted areas, but also to track improvements through the metrics that matter most – severe injury and death.

**Table 19: Strategies to reduce High Crash Intersections and Corridors**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Infrastructure	Use annual dedicated safety funds to implement comprehensive safety improvements at high severity intersections and corridors, identified annually. Safety improvements should prioritize separating dangerous movements, lane/width reduction, improving sight lines, discouraging turning acceleration, and vulnerable user protection.	DOT Planning + Traffic + TEC	Zero Stat, Pedestrian and Bicycle Fatality Review, CIP Project Review	Long/ Ongoing	\$\$\$	External + CIP

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Infrastructure	Improve pedestrian and bicycle crossings of major intersections. Strategies should enhance the visibility of pedestrians and bicyclists through larger crossing areas, brightly colored reflective paint, and placement in the line of vehicle sight. Enhancements may also reduce the crossing distance spent in vehicle lanes. Lead pedestrian and bicycle intervals may be implemented, or a Barnes Dance street crossing system.	DOT Planning + Traffic + TEC	Zero Stat, Pedestrian and Bicycle Fatality Review, CIP Project Review	Long/ Ongoing	\$\$\$	External + CIP

### Separating Non-Motorists from Motorists

More often than not, when a motorist collides with a non-motorist, severe injuries result. The best way of preventing those injuries and deaths is to ensure vulnerable road users do not interact with motorists. This means protective infrastructure, separate signal phasing, enhancing visibility, enforcement of dedicated lanes, and policies and incentives that reduce the number of motor vehicles on the road to begin with.

**Table 20: Strategies to Separate Non-Motorists from Motorists**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Infrastructure	Build the Separated Bike Network. The Separated Bike Network identifies where bicyclists need the most protection from vehicles due to road characteristics and multi-modal transportation need. Create a dedicated annual funding source that is specifically used to implement this plan.	DOT Planning + Traffic	Mayor's Bicycle Advisory Committee	Long/Ongoing	\$\$	CIP + External
Infrastructure	Further protect bus/bike-only lanes with rumble strips, flex posts, or other barriers to deter motorists from using the lanes.	DOT Planning + Traffic	Mayor's Bicycle Advisory Committee, Pedestrian and Bicycle Fatality Review	Medium/Ongoing	\$	CIP + External
Technology	Implement automated enforcement of bus-only lanes	DOT Planning + ATVES	Mayor's Complete Streets Advisory Committee	Long	\$\$	CIP + External

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Infrastructure	Improve pedestrian and bicyclist visibility with appropriately scaled lighting, high-output street lighting, daylighting, and high visibility paint.	DOT Planning + Traffic	Pedestrian and Bicycle Fatality Review	Short/ Ongoing	\$	CIP
Policy	Investigate policies and incentives that encourage mode shift. Apply for grants.	DOT Planning + DGS + DHR	Sustainable Transportation Subcabinet	Long/ Ongoing	\$\$	External

### Adopting a Safety Culture at Baltimore City Government

Baltimore City Government must lead in adopting the culture it seeks to see throughout the City. This can come from the projects it selects and prioritizes, the policies it has for its employees, the methods of design and analysis it uses, and the messaging it puts out internally and to the public.

**Table 21: Strategies to advance a safety culture in Baltimore City Government**

Type	Strategy	Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Policy	Incorporate Vision Zero philosophy within City employee driver training courses. Implement incentive programs for good driving and strict punitive measures for any City vehicle incidents with pedestrians or bicyclists.	DOT Traffic Safety + DHR	Comms and Programs Working Group*	Medium/ Ongoing	\$\$	Operating + External

Education + Policy	Provide Traffic Enforcement Officers with training on safety measures for pedestrians, bicyclists, and scooter-riders. Encourage and support use of bicycles, transit, and walking among Traffic Enforcement Officers.	DOT Traffic Safety	Comms and Programs Working Group*	Medium/Ongoing	\$\$	Operating + External
Comms	Develop safety messaging to be included in all DOT mailings/notices.	DOT Communications	Comms and Programs Working Group*	Short	\$	Operating
Education	Build upon Safety City** program with a focus on protecting pedestrians, bicyclists, scooter-riders, and people with disabilities.	DOT Traffic Safety	Comms and Programs Working Group*	Short	\$	Operating + External
Education + Programs + Infrastructure	Partner with BCPS, the INSPIRE program, and Safe Routes to Schools to create social media messaging, programming, and infrastructure improvements for schools	DOT Planning + DOP + BCPS	INSPIRE monthly meeting, Safe Routes to School Working Group*	Medium/Ongoing	\$\$	External + INSPIRE funding
Policy + Infrastructure	Use safe systems engineering in all active design and construction projects, including resurfacing and bridge replacement/maintenance, noting opportunities for lane reduction, lane width reduction, bicyclist separation, traffic calming measures, pedestrian crossing visibility, and intersection safety improvements. Build a toolbox with a prioritization mechanism.	DOT TEC + Traffic	Traffic Stat, Resurfacing Project Review*	Short/Ongoing	\$\$	Operating + CIP



Process	Adopt a project prioritization matrix for proposed CIP projects, weighting safety engineering, road diets, and multi-modal capacity expansion highly. Projects must also be prioritized weighing equity heavily.	DOT Planning	CIP Project Review*	Short	\$	Operating
---------	--	--------------	---------------------	-------	----	-----------

\*Working Group does not currently exist

\*\* Safety City is an interactive transportation safety learning space for children in grades K-5 in Druid Hill Park. Children can learn how to be safe pedestrians by walking in a miniaturized model of Downtown Baltimore. Safety education programs are operated by DOT Staff. DOT hosts an annual event at Safety City that involves giveaways, food, and fun activities for kids.

### Reporting and Benchmarking

Safety analysis is highly dependent on the availability and accuracy of the information used. Crash data notoriously has reporting consistency issues, as identified in the Baltimore Crash Reduction Plan. DOT should invest resources in improving crash reporting. It should also ensure that it has accurate geocoded infrastructure in order to link crashes to additional relevant infrastructure information, such as lane numbers and pedestrian generators. All safety improvements should also be geocoded in order to track safety improvements over time. Finally, publicly sharing key information and analysis is not only important in keeping DOT accountable to its goals but can also further empower communities to implement their own countermeasures.

**Table 22: Strategies to improve Data Reporting and Benchmarking**

Type	Strategy	Lead Agency(s)	Steering Committee	Time-frame	Cost	Funding Source(s)
Process	Update high severity and high ped/bike crash intersections and segments annually.	DOT Planning + Data Team + GIS Team	Zero Stat	Short/Ongoing	\$	Operating
Plan	Identify high severity and high ped/bike crash intersections and segments near public schools.	DOT Planning + Data Team + GIS Team	Zero Stat	Short/Ongoing	\$	Operating
Process	Improve turnaround of crash data and/or BPD reports to ensure data is received in a timely manner.	DOT Data Team	Zero Stat	Long	\$	Operating

Type	Strategy	Lead Agency(s)	Steering Committee	Time-frame	Cost	Funding Source(s)
Policy	Receive all BPD reports involving a fatal crash within 24 hours of the incident.	DOT Data Team	Zero Stat	Medium	\$	Operating
Process	Improve internal access for crash data. House data in a centralized web-based portal for planning analysis.	DOT Data Team	Zero Stat	Short	\$	Operating
Process	Work with the City's 311 system to improve ways for citizens to report traffic safety issues.	DOT Planning	Zero Stat	Short	\$	Operating
Process	Analyze 911 data for injury, pedestrian, and bicycle crashes that are not captured by official crash reports.	DOT Data Team	Zero Stat	Medium/Ongoing	\$	Operating
Process	Work with BPD to ensure that information collected is complete on crash reports, with particular emphasis on correct location.	DOT Data Team + BPD	Zero Stat	Long	\$	Operating
Process	Obtain follow-up medical/trauma data for victims from hospitals, particularly relating to deaths, complications, and handicaps associated with long-term injuries.	DOT Data Team + Department of Health	Zero Stat	Long	\$	Operating

Type	Strategy	Lead Agency(s)	Steering Committee	Time-frame	Cost	Funding Source(s)
Technology	Develop and launch public web-based portal and mapping tool for collecting data and public input related to safety issues.	DOT Planning + DOT Data Team + GIS Team + Comms	Zero Stat	Medium	\$	Operating, External
Policy	Develop post-construction evaluation methods to be included in all DOT construction projects.	DOT Planning + Traffic	Zero Stat	Short	\$	Operating
Policy	Adopt traffic safety statistics to be tracked as performance measures.	DOT Planning + Traffic + Data Team	Zero Stat	Short	\$	Operating
Plan	Engage institutional partners for traffic safety research and program evaluations.	DOT Planning + Data Team	Zero Stat	Long/Ongoing	\$	Operating
Technology, Policy	Develop public safety dashboard that tracks annual severe injuries, fatalities, pedestrian crashes, bicycle crashes, and scooter crashes. Dashboard should also include new safety projects installed that calendar year.	DOT Planning + Data Team	Zero Stat	Medium	\$\$	Operating

Type	Strategy	Lead Agency(s)	Steering Committee	Time-frame	Cost	Funding Source(s)
Policy	Release annual report to the public that summarizes crash metrics, progress towards safety goals, new safety projects and initiatives implemented, equity impacts, and recommendations for the following year	DOT Planning + Data Team	Zero Stat, Mayor's Advisory Committee on Traffic Safety*	Medium/Ongoing	\$	Operating

\*Committee does not currently exist

### Community Empowerment

Education around traffic safety does not need to be limited to driver training courses. With the right tools and resources, communities and researchers can be valuable partners in increasing safe infrastructure within Baltimore.

For example, in 2018 a team of students and graduates at the Maryland Institute College of Art (MICA) School for Social Design were awarded a grant by the Maryland Department of Transportation Motor Vehicle Administration's Highway Safety Office (MHSO) for roadway safety education. The resultant "Made You Look" campaign promotes pedestrian and bicyclist safety through brightly colored clothes and roadway art. The team worked with DOT to create a toolkit for communities to use in implementing their own "Art in the ROW" designs for traffic calming. In collaboration with DOT and ReBUILD Johnston Square, the Made You Look team is currently guiding the Johnston Square neighborhood through the Right of Way (ROW) art design process and will study the effects of the resultant design on driver speed and behavior. The project design process, funded through grants from Bloomberg Asphalt Art and AARP Livable Communities, is being shadowed by the Neighborhood Design Center (NDC), which plans to offer pro-bono Art in the ROW design assistance for communities in the future.

**Table 23: Strategies for Community Empowerment**

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Program	Expand the Slow Streets program to encourage pop-up traffic calming in neighborhoods.	DOT Planning + Traffic	Slow Streets Meeting	Medium	\$\$	CIP + External

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Program	Sponsor traffic calming and tactical urbanism workshops for communities.	DOT Planning	Comms and Programs Working Group*	Medium/Ongoing	\$\$	External
Program	Create design competitions to beautify traffic calming and bike infrastructure projects.	DOT Planning + BOPA + DOP	Comms and Programs Working Group*	Medium/Ongoing	\$\$	External
Partnerships	Build on partnerships with organizations such as Neighborhood Design Center (NDC), MICA School of Social Design, Bikemore, Black People Ride Bikes, Baltimore Office of Promotion and the Arts (BOPA), and community development corporations to further support the above strategies and apply for grants.	DOT Planning + Director's Office	NDC/DOT/MICA Quarterly Meeting	Medium/Ongoing	\$	Operating

Type	Strategy	Lead Agency(s)	Steering Committee(s)	Time-frame	Cost	Funding Source(s)
Partnerships	Form new partnerships with additional organizations for programs, funding, and joint grant applications.	DOT Planning + Director's Office	Comms and Programs Working Group*	Long/Ongoing	\$	Operating
Comms	Consolidate the traffic calming, Slow Streets, and community programs web pages to be an all-in-one resource for community-based traffic calming. The web page should include links to funding opportunities, transportation planning toolkits, and the Remix platform so that communities may analyze spatial data in order to plan projects.	DOT Planning + Comms	Comms and Programs Working Group*	Short	\$	Operating

\*Working Group does not currently exist



## Conclusion and Outlook

While there are plenty of actions outlined in this Action Plan that can be done under current operating conditions, many of the strategies need additional funding or staff. DOT will need to work creatively with other agencies to share the cost and staffing burden of integrating the Complete Streets and equity-first mindset into roadway safety efforts. This is already being done through the Sustainability Subcabinet Transportation Working Group, in which DOT, DPW, and DGS are putting funds and bandwidth together in pursuit of transportation, resiliency, and sustainability goals. Understanding that road safety is a shared responsibility, similar cross-agency working groups can be formed, or reformed under current DOT working groups.

DOT must also be aggressive in its pursuit of external funding. Grants are available at the State and Federal levels for transformative road safety projects. This Action Plan will make Baltimore City eligible for new funding and will help the City determine projects to put forward in annual applications. Finally, Baltimore is home to several philanthropies, institutions, and universities that have expressed a desire to make their community safer, more livable, and more equitable. DOT should work with these organizations to push forward infrastructure project and, forming public-private partnerships that can expedite Complete Streets and safety goals through an equity lens.

Given current trends, achieving zero deaths and serious injuries by 2030 is an ambitious goal for Baltimore City. To meet this goal, DOT must respond with an equally aggressive strategy, prioritizing multi-modal and equitable safety in all decision-making. It must leverage all resources possible, including those that are currently untapped, and involve all relevant agencies, local institutions, and legislators. Finally, DOT cannot achieve this ambitious goal without the community as a strong partner. DOT will work to empower residents and businesses to make responsible roadway decisions and transform their own neighborhoods into beacons of safety and vitality.