Connecticut Avenue (MD 185) Pedestrian Road Safety Audit

Montgomery County, Maryland

Prepared For:
Department of Transportation
Montgomery County, Maryland

In partnership with the Maryland State Highway Administration

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1. Introduction

1.1 Objective

The objective of this study was to complete a pedestrian road safety audit (PRSA) for Connecticut Avenue (MD Route 185) between Independence Street and Georgia Avenue (MD Route 97) in Aspen Hill, Maryland (Figure 1). As a result of the audit, the PRSA team has identified a variety of issues related to pedestrian and bicycle safety and developed a number of suggestions to improve overall safety in the study area.

1.2 Background

The study area is an approximately 0.5-mile segment of Connecticut Avenue (MD 185) located in a predominantly commercial corridor, supporting retail and service land uses, that is surrounded by residential uses of moderate density. The study area includes three signalized intersections at Independence Street, Aspen Hill Road, and Georgia Avenue (MD 97). Connecticut Avenue (MD 185) and Georgia Avenue (MD 97) are both relatively high-volume divided major arterial roadways. Aspen Hill Road is a four-lane arterial roadway that provides connections between Georgia Avenue to the east of the study area and Veirs Mill Road to the southwest of the study area. Independence Street is a residential street that provides local access to residential neighborhoods to the west of the study area.

Connecticut Avenue (MD 185) and Georgia Avenue (MD 97) both serve as major commuter routes between and within Montgomery County, Maryland, and Washington, D.C. The study area also experiences significant pedestrian activity, generated by the adjacent commercial and residential land use and several transit bus stops.

The Connecticut Avenue (MD 185) study area was identified as one of Montgomery County's High Incidence Areas (HIA) for pedestrian-related collisions, as part of the Montgomery County Executive's Pedestrian Safety Initiative. Based on collision data provided by Montgomery County and the Maryland State Highway Administration, 21 pedestrian collisions and two bicyclist collisions occurred in the study area from January 2005 through December 2009. The purpose of this PRSA was to identify safety issues that may be contributing to the observed pedestrian and bicyclist collisions in the study area.

The PRSA was performed on May 18 and May 19, 2011, during daytime and nighttime conditions, including weekday morning and evening peak hours. The PRSA team consisted of six members, representing:

- Montgomery County Department of Transportation (MCDOT),
- Maryland State Highway Administration (MDSHA),
- District of Columbia Department of Transportation (DDOT), and
- Vanasse Hangen Brustlin, Inc. (VHB), the PRSA consultant.

1.3 Organization of the Report

This report first presents a description of the existing geometric, operational, and safety conditions for the study area based on field reviews and available data. Next, the report identifies the existing

conditions and general issues identified within the corridor by the PRSA team. Finally, the report presents suggestions to enhance pedestrian safety throughout the study area. For each location, the assessment identifies issues, possible contributing factors, and suggestions for improvement.

This report will be a resource to MDSHA and MCDOT, as well as other stakeholders, for implementing pedestrian safety improvements within the audit area. There will be an ongoing vetting of the suggestions and recommendations in this report with collaboration among agencies and stakeholders to implement short and intermediate-term recommendations and assess the feasibility and constructability of long-term projects. Ultimately, this process will assess the merits of these recommendations and establish a process whereby a range of pedestrian safety recommendations are implemented.

1.4 Existing Conditions

1.4.1 Site Characteristics

In the study area, Connecticut Avenue (MD 185) is a divided six-lane major highway that runs in the north-south direction (though it curves to an east-west orientation at the intersection at Georgia Avenue). Figure 1 shows the study area for this PRSA. North of the study area, Connecticut Avenue becomes a divided, four-lane roadway. The posted speed limit on Connecticut Avenue is 45 miles per hour in the study area. The study area includes three signalized intersections along Connecticut Avenue:

- Georgia Avenue (MD 97) at Connecticut Avenue (MD 185)
- Connecticut Avenue (MD 185) at Aspen Hill Road
- Connecticut Avenue (MD 185) at Independence Street

In proximity to the study area, Georgia Avenue (MD 97) is a divided six-lane major highway that runs in the north-south direction. For the purposes of this PRSA, at the intersection of Georgia Avenue and Connecticut Avenue (MD 185), Georgia Avenue is considered the north-south roadway, and Connecticut Avenue is considered the east-west roadway. The southbound approach of the Georgia Avenue and Connecticut Avenue intersection includes one exclusive left-turn lane, three through lanes, and two uncontrolled, channelized right-turn lanes. The northbound approach contains one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane. The eastbound approach contains three exclusive left-turn lanes, one through lane and a shared through-right lane. The westbound approach includes one exclusive left-turn lane, one shared through-left lane, one through lane, and one shared through-right lane.

In proximity to the study area, Aspen Hill Road is an arterial roadway that runs in an east-west direction. To the east of the study area, Aspen Hill Road is a four-lane roadway with a two-way center turn lane. To the west of the study area, Aspen Hill Road is a two-lane roadway with on-street parking along some sections. The southbound approach of the Connecticut Avenue (MD 185) and Aspen Hill Road intersection includes one exclusive left-turn lane, two through lanes, and one shared through-right lane. The northbound approach includes two exclusive left-turn lanes, three through lanes, and one exclusive right-turn lane. The westbound and eastbound approaches each contain one exclusive left-turn lane, one through lane, and a shared through-right lane. Figure 2 summarizes the roadway lane geometry throughout the corridor.

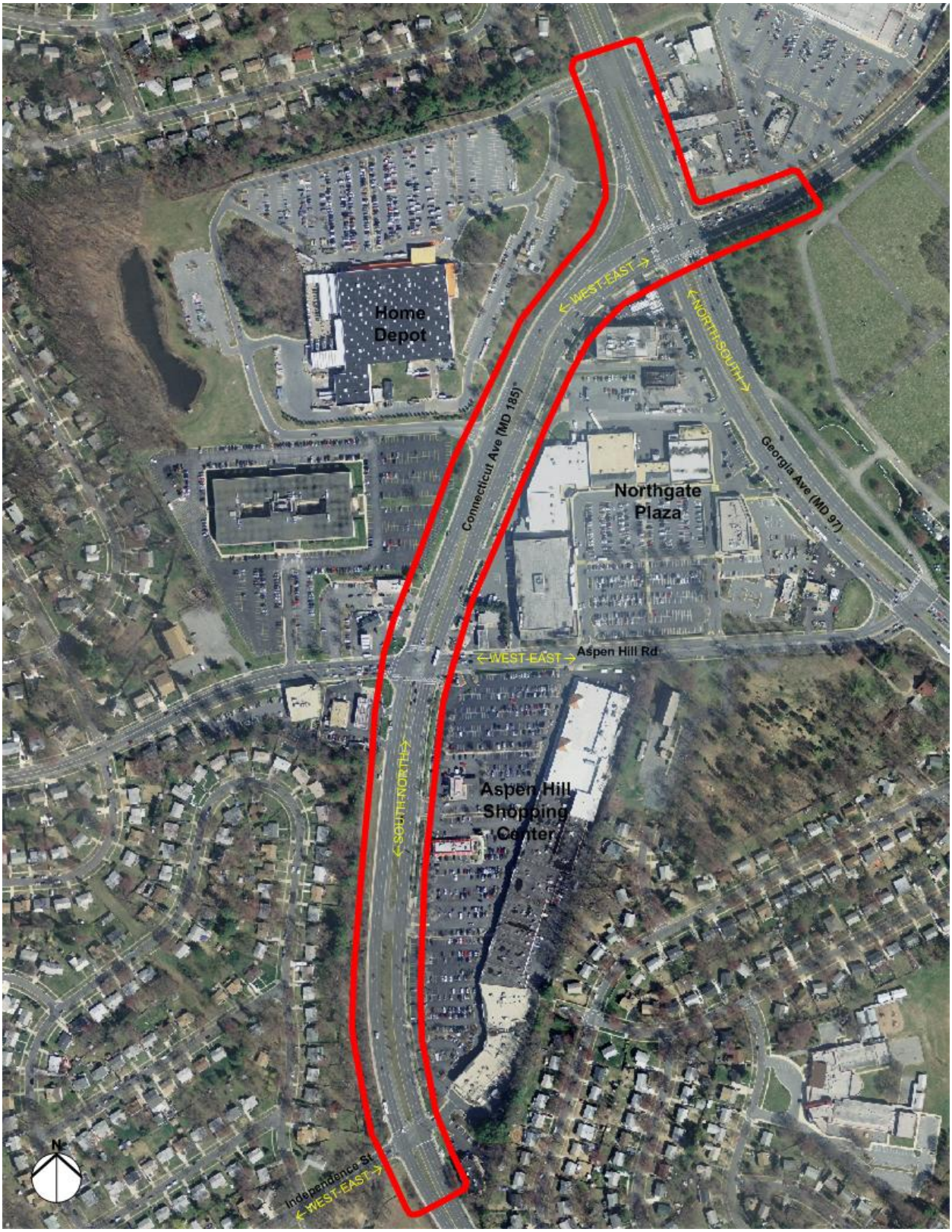


Figure 1: Study Area

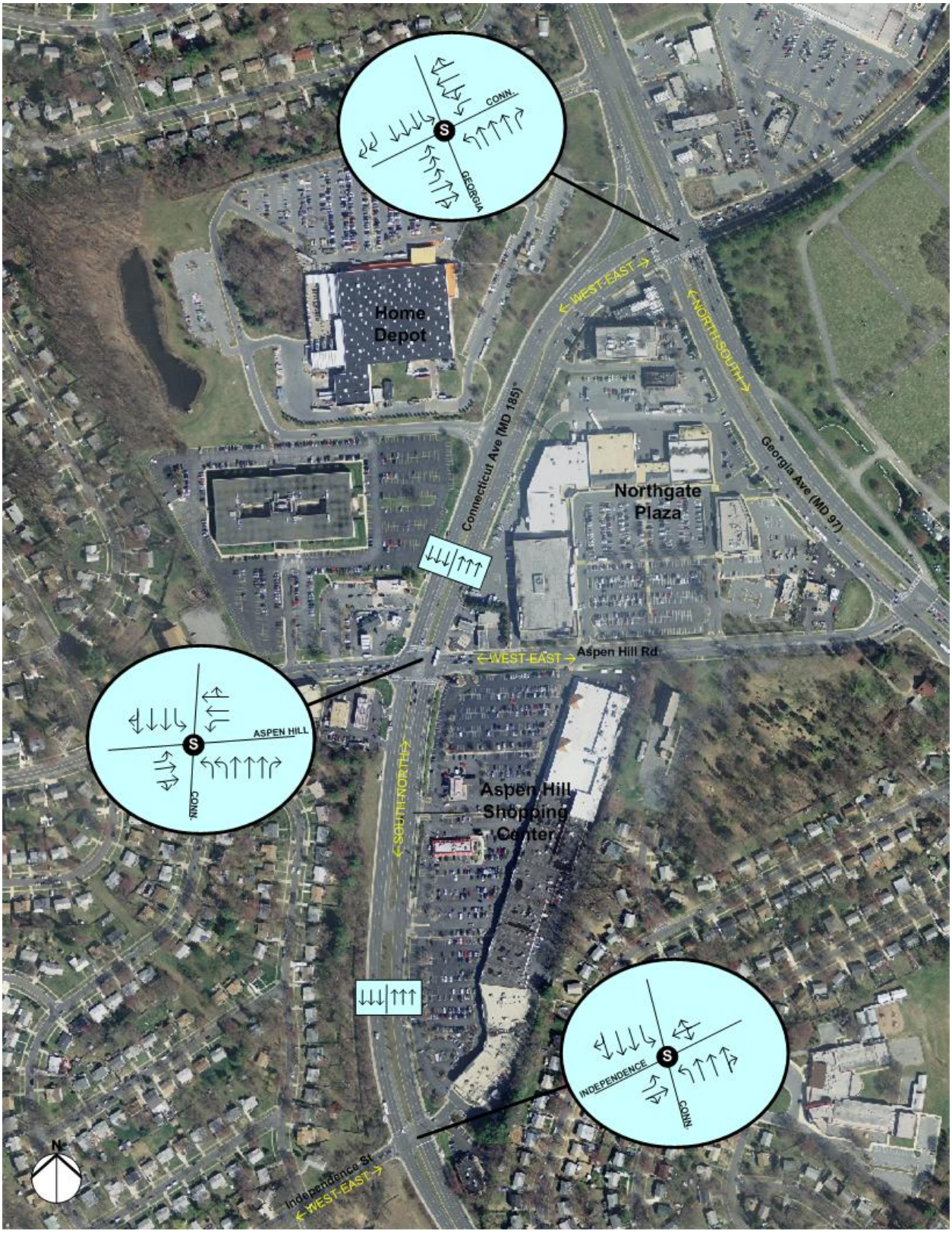


Figure 2: Study Area Corridor and Intersection Lane Geometry

Independence Street is a two-lane residential street with on-street parking that runs in an east-west direction. Independence Street terminates at Connecticut Avenue (MD 185), and constitutes the eastbound approach to the Connecticut Avenue and Independence Street intersection. The westbound approach to the intersection is a driveway that provides access to the Aspen Hill Shopping Center. The northbound and southbound approaches each contain an exclusive left-turn lane, two through lanes, and a shared through-right lane. The westbound approach is a single lane. The eastbound approach includes two lanes that are not clearly defined, but generally operate as one left-turn lane and one shared through-right lane.

Sidewalks are present along both sides of Connecticut Avenue (MD 185) within the study area. Marked crosswalks are provided at all of the signalized intersections within the study area; however, only the north and west legs of the Connecticut Avenue/Independence Avenue intersection are marked with crosswalks. Medians on Connecticut Avenue and Georgia Avenue are not designed for pedestrian use, but are used by some pedestrians as a limited refuge during street crossings.

1.4.2 Traffic Data

Average annual daily traffic (AADT) volumes in vehicles per day for Georgia Avenue (MD 97) and Connecticut Avenue (MD 185) were obtained from MDSHA traffic count records. All traffic volume data and estimates are provided in Table 1.

Table 1: 2010 AADT

Road	Location	AADT
Georgia Avenue (MD 97)	0.2 miles north of MD 185	45,461 vpd
Georgia Avenue (MD 97)	0.1 miles south of MD 185	34,011 vpd
Connecticut Avenue (MD 185)	0.1 miles south of MD 97	37,530 vpd

Vehicle speed data was collected at two locations on Connecticut Avenue (MD 185) in October 2011. Table 2 summarizes the 85th percentile vehicle speed data. The 85th percentile speed is the speed at or below which 85 percent of vehicles travel at a particular location, and is used extensively in the field of traffic engineering and safety.

Table 2: 2011 85th Percentile Vehicle Speed Data

Road	Location	Direction	Speed
Connecticut Avenue (MD 185)	Between Georgia Avenue and Aspen Hill Road	SB	46 mph
Connecticut Avenue (MD 185)	Between Independence Street and Littleton Street	NB	52 mph

Public transportation is heavily utilized in the study area through the 13 bus stops located on Connecticut Avenue (MD 185), Georgia Avenue (MD 97), and Aspen Hill Road. WMATA bus routes L8, Y5, Y7, Y8, and Y9 and Montgomery County Ride On routes 26, 34, 41, and 53 have stops within the study area (see Figure 3). A summary of bus stop locations and ridership is shown in Figure 4.

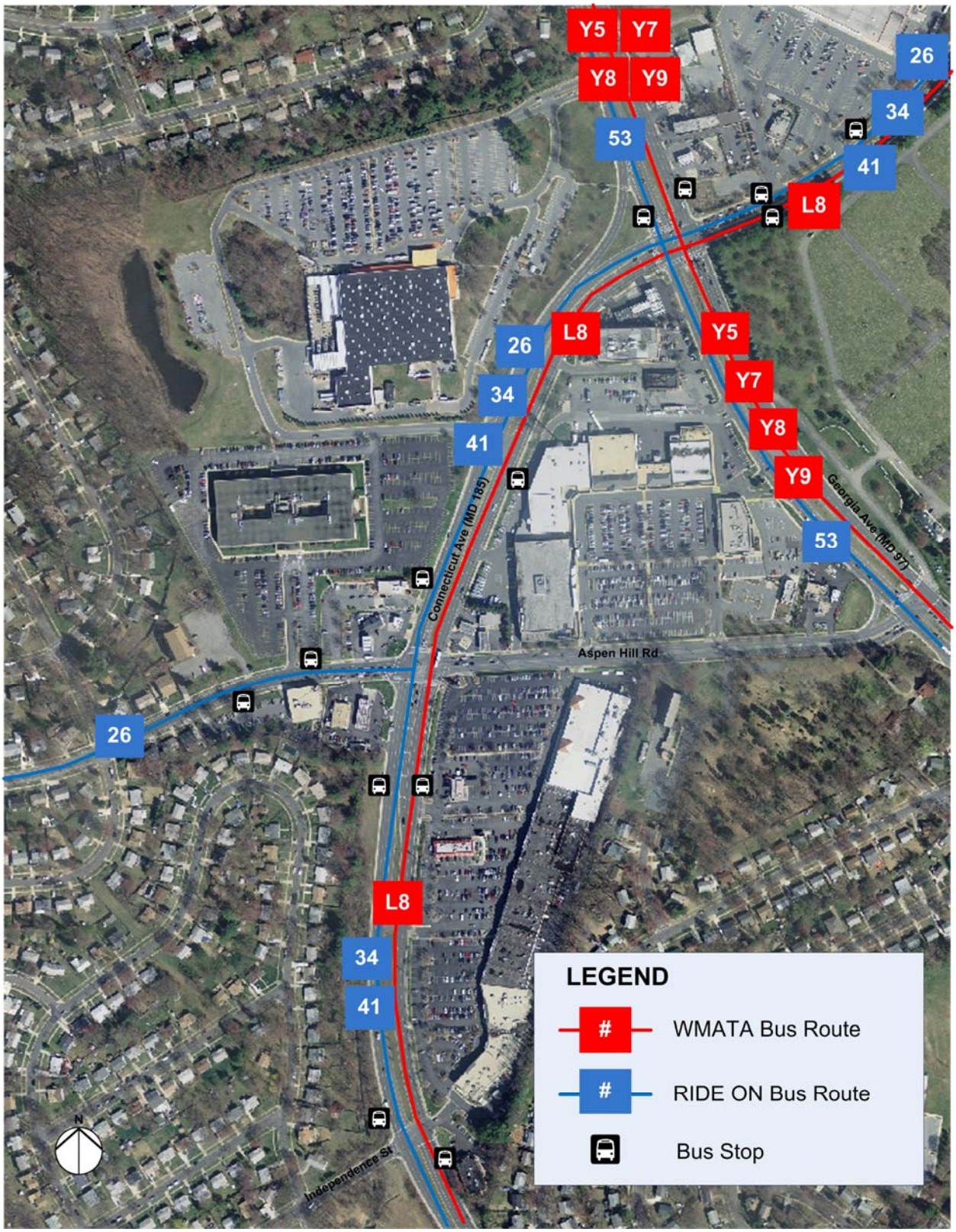


Figure 3: Connecticut Avenue Study Area Bus Routes

Figure 4: Connecticut Avenue Study Area Daily Bus Stop Ridership

Peak hour vehicular and pedestrian volumes entering the intersection from the most recent MDSHA traffic volume counts for the Connecticut Avenue (MD 185) and Georgia Avenue (MD 97) intersection are shown in Table 3. This data is provided in vehicles per hour (vph) and pedestrians per day (ppd).

Table 3: Traffic Count Data (Entering Volumes)

Year	Location	AM Peak Hour	AM Peak Volume	PM Peak Hour	PM Peak Volume	Daily Ped Volume
2010	Connecticut Avenue at MD 97	7:00 - 8:00 AM	5,493 vph	5:00 - 6:00 PM	5,501 vph	950 ppd
2011	Connecticut Ave at Aspen Hill Rd	7:30 - 8:30 AM	4,627 vph	5:15 - 6:15 PM	4,589 vph	259 ppd
2011	Connecticut Ave at Independence St	7:30 - 8:30 AM	3,609 vph	5:15 - 6:15 PM	3,650 vph	220 ppd

1.4.3 Crash Data

A review of all collision records collected by Montgomery County Police in the study area during the five-year period from 2005 through 2009 was conducted and crash data identifying the location, date, time, severity, type, and ambient conditions of all reported pedestrian and bicyclist crashes within the corridor was provided to the PRSA team(Figure 5). From 2005 through 2009, a total of 262 vehicular crashes, 21 pedestrian, and two bicyclist crashes were reported in the study area (Figure 6).

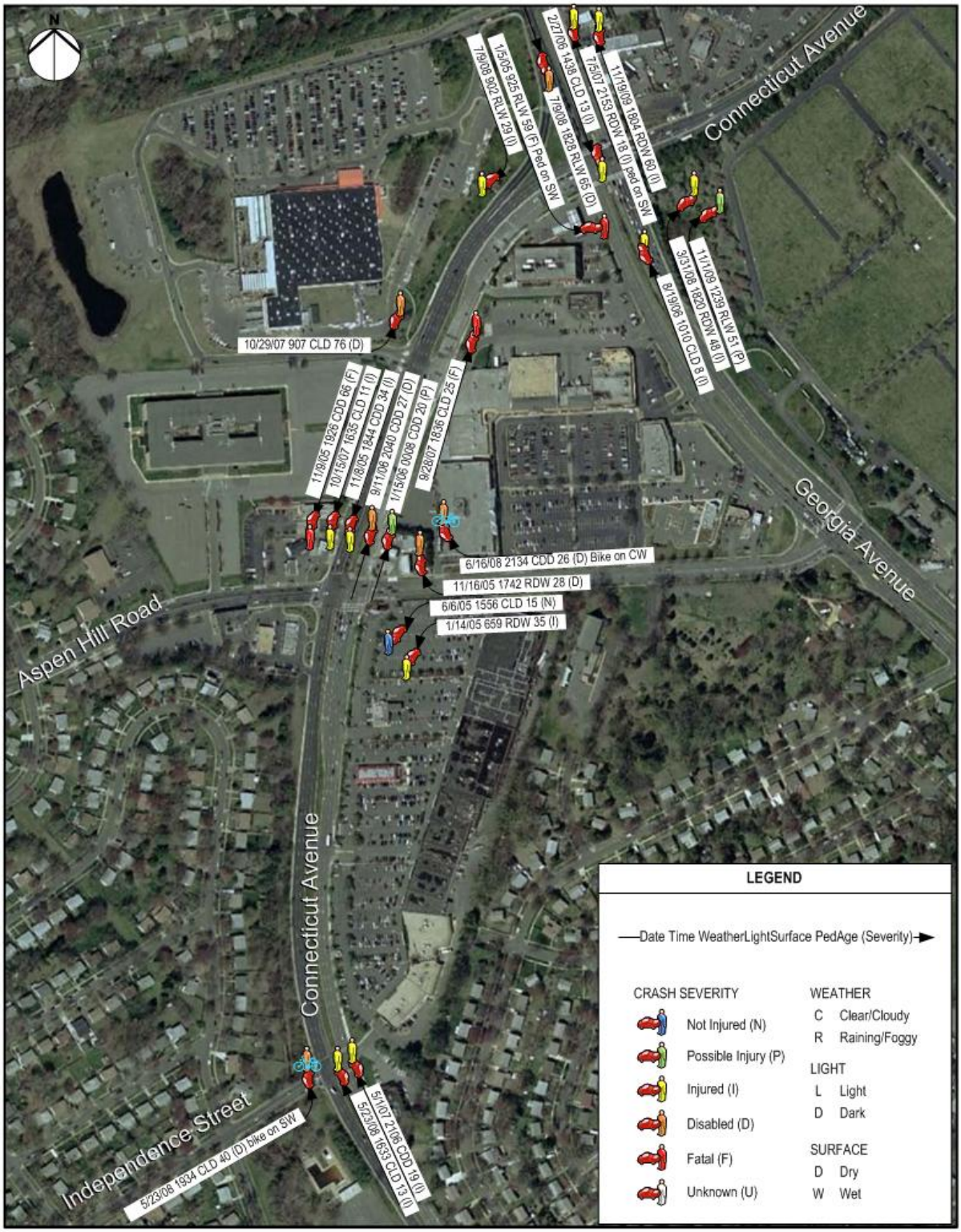


Figure 5: Pedestrian and Bicyclist Crashes – Connecticut Avenue (Independence Street to MD 97), 2005-2009

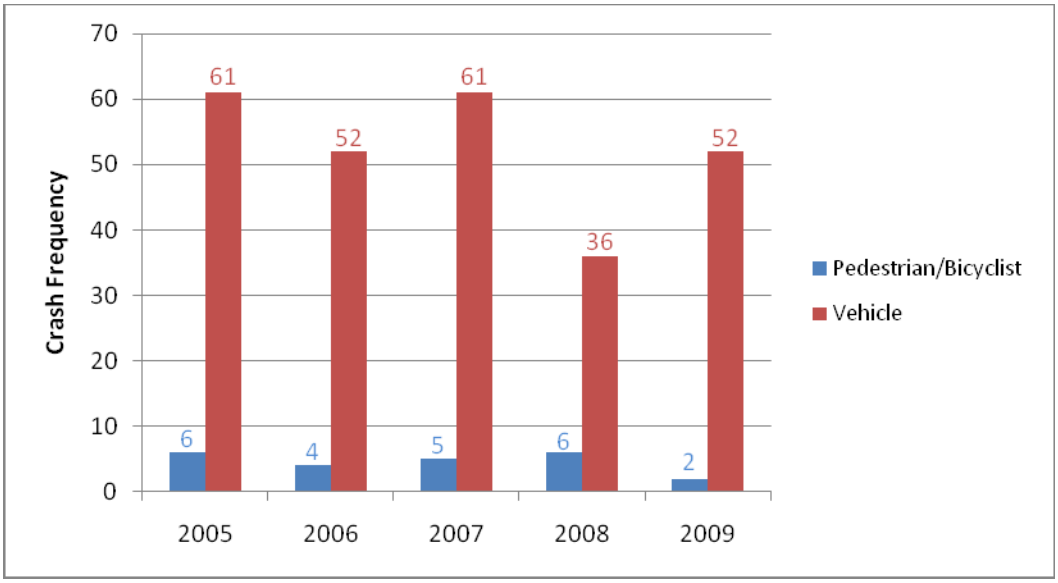


Figure 6: Study Area Crash Frequency, 2005 – 2009

Crash data indicate that 22 of the 23 pedestrian and bicyclist crashes resulted in injuries or possible injuries (Figure 7). Three crashes resulted in pedestrian fatalities due to injuries, six crashes resulted in disabling injuries, 11 crashes resulted in non-incapacitating injuries, and two crashes resulted in possible injuries. In comparison to the previous seven High Incidence Area corridors evaluated under the Pedestrian Safety Initiative, the proportion of severe crashes (defined as injury, disabling, or fatal for this analysis) on Connecticut Avenue (MD 185) corridor exceeds all but one of the other corridors. In addition to the total number of pedestrian collisions, the occurrence of multiple fatalities and the large proportion of moderate to severe injury crashes support the need for additional pedestrian safety measures in the corridor.

Connecticut Avenue (MD 185) and Georgia Avenue (MD 97) are arterial roadways designed primarily to provide vehicle mobility, using design characteristics like multiple wide lanes, minimized centerline curvature, significant distances between signalized intersections, and auxiliary turn lane treatments. The roadway design features likely contribute to elevated vehicle speeds on both roadways (posted speed limits of 45 mph or higher), which subsequently may contribute to elevated crash severity for pedestrians and bicyclists. Analysis of national crash trends by Transportation For America indicates that nearly 60 percent of pedestrian fatalities in urban areas occur on arterial roadways. As shown in Figure 8, vehicle speed directly correlates to pedestrian crash severity, with low probabilities for avoiding severe or fatal injuries at speeds of 40 mph or greater. Vehicle speed data collected on Connecticut Avenue in October 2011 indicates northbound and southbound 85th percentile speeds of 52 and 46 miles per hour, respectively.

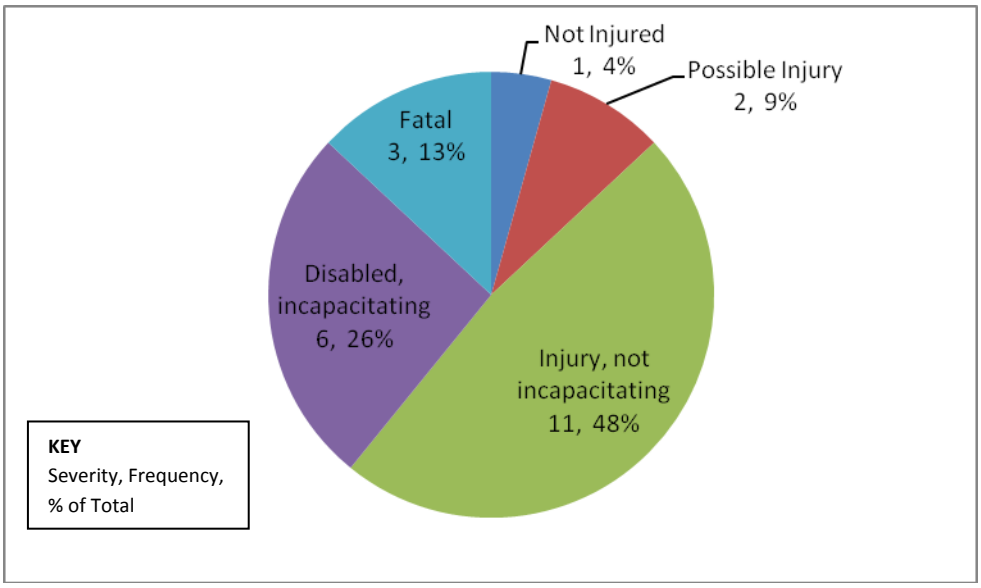


Figure 7: Pedestrian/Bicyclist Crashes by Crash Severity, 2005 – 2009

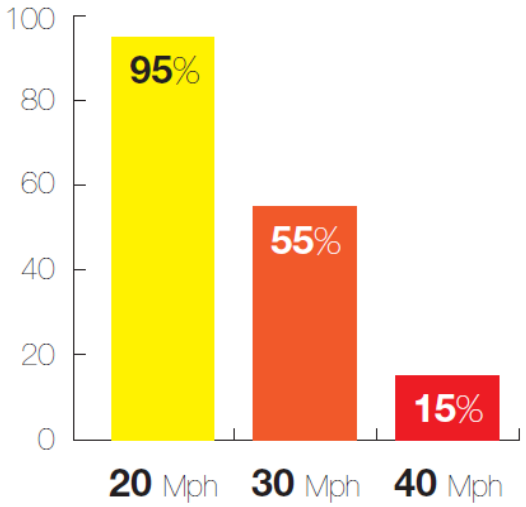


Figure 8: Pedestrian Survival Probability vs. Vehicle Speed

Source: Transportation For America, *Dangerous by Design*

The chart in Figure 9 shows vehicle movements prior to the pedestrian crashes at all study locations. Nearly half of the 23 crashes involved vehicles moving at constant speed. This finding suggests that drivers typically may not see pedestrians in the roadway or may not expect pedestrian activity at the location of the crash. These circumstances may indicate that low light (a factor in nearly half of all pedestrian crashes) or uncontrolled and unexpected midblock crossing activity (a factor in nine of the pedestrian crashes) may have contributed to many of the crashes. Other vehicle movements prior to the crashes involved making a left turn, making a right turn, and accelerating.

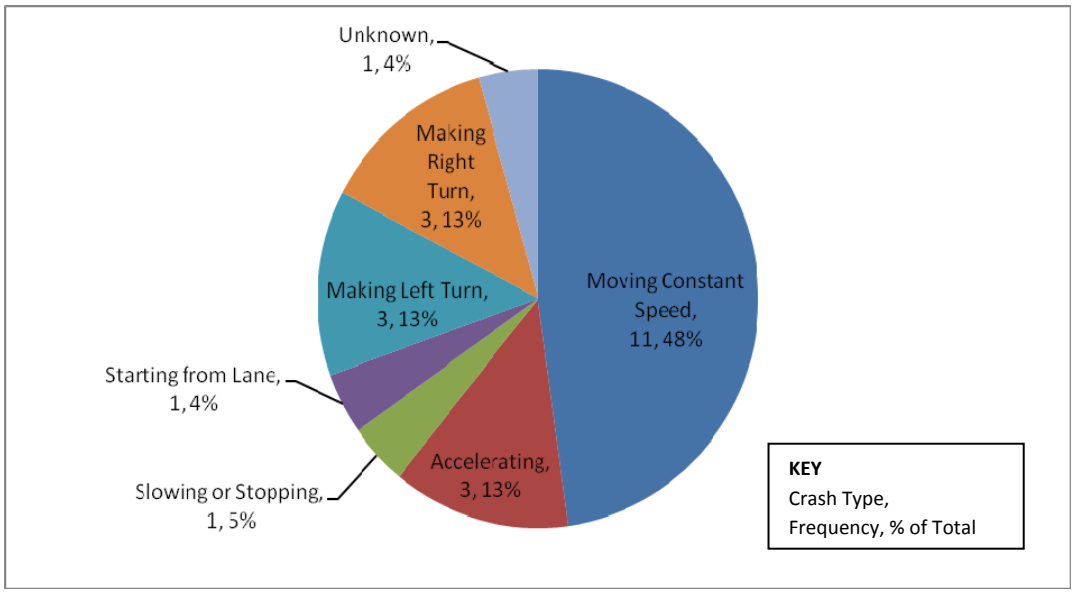


Figure 9: Vehicle Movement Prior to Pedestrian Crash, 2005 - 2009

Figure 10 shows the age distribution of pedestrians and bicyclists involved in crashes. Pedestrians and bicyclists under the age of 20 were involved in highest proportion of crashes in the study area (7 out of 23 crashes), followed by the age group comprised of individuals who were 20-30 years old. Additioanlly, five pedestrians/bicyclists involved in crashes were aged 60 or above. The age distribution of the crashes may simply reflect the prevaling demographics of the pedestrian population in the study area and perhaps the County in general. However, the age groups disproportionally affected in this area are also among the most vulnerable pedestrian populations: (1) children and teenagers who may be unaware of the risks and consequences of pedestrian crashes and (2) elderly pedestrians who are typically the least mobile and most impacted by limited accessibility and limited pedestrian faciilties.

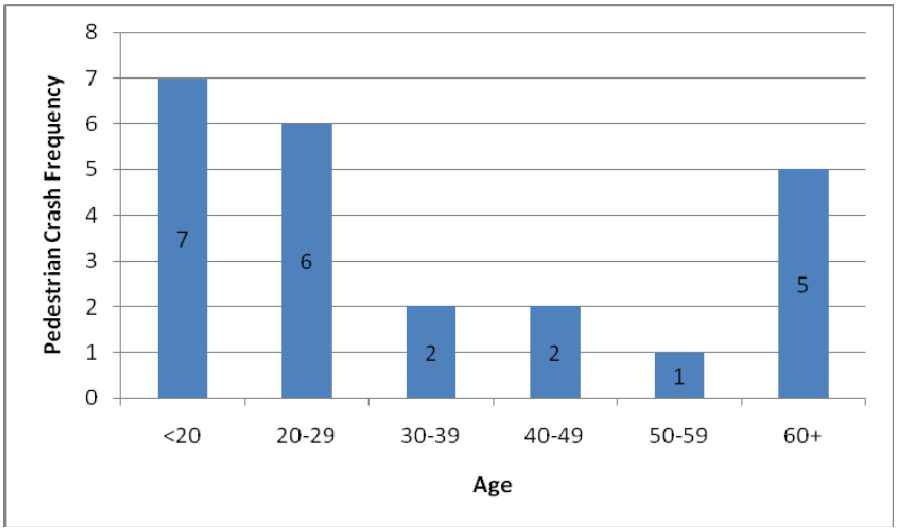


Figure 10: Pedestrian and Bicyclist Crashes by Age, 2005 - 2009

More than 60 percent (14 crashes) of pedestrian and bicyclist crashes occurred under dry conditions, and more than half (12 crashes) occurred during daylight hours (Figure 11). Eleven of the 23 crashes occurred under dark or dawn/dusk lighting conditions, suggesting that low lighting levels may be a contributing factor to pedestrian and bicyclist crashes in the study area. It is also important to understand that low lighting conditions may exacerbate other contributing factors, such as sight distance limitations.

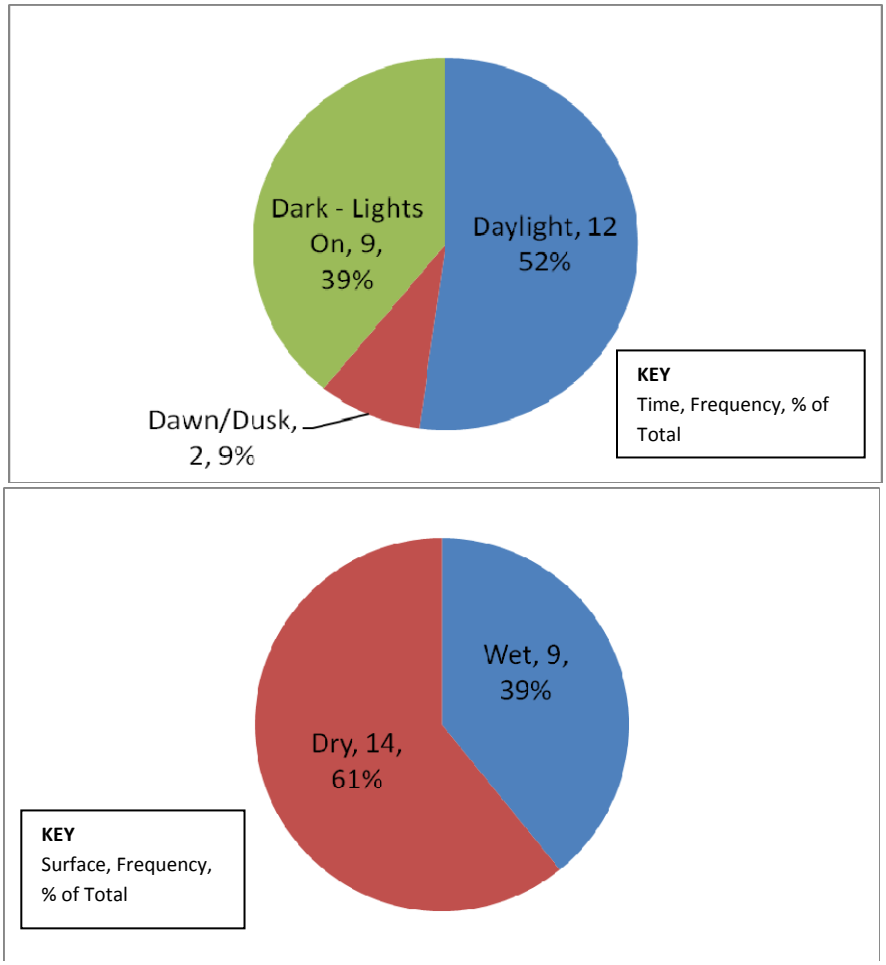


Figure 11: Pedestrian and Bicyclist Crashes by Time of Day and Road Surface Conditions, 2005 - 2009

2. Road Safety Audit Findings

2.1 Safety Benefits of Existing Roadway Features

Notable existing roadway features that enhance pedestrian safety in the study area include but are not limited to:

- *Continuous sidewalks*: Sidewalks along Connecticut Avenue within the study area are continuous and provide a designated space for pedestrians in the corridor. Sidewalks on the east side of Connecticut Avenue generally are of sufficient width, and there is a buffer between the sidewalk and roadway in places. However, large portions of the sidewalk along the west side of Connecticut Avenue, between Independence Street and Aspen Hill Road, are limited to an effective width of less than the preferred five feet, due to encroachment of grass on the sidewalk and a lack of buffer between the sidewalk and roadway.
- *Countdown pedestrian signals*: Pedestrian countdown signals are provided at the intersection of Connecticut Avenue at Georgia Avenue. Countdown pedestrian signal research has shown that pedestrians easily understand how the signal works, that more pedestrians start during the clearance phase, and that fewer people initiate walking late in the clearance phase. Studies have also shown that fewer pedestrians remain in crosswalks during the steady "Don't Walk" phase where countdown signals are used. Countdown pedestrian signals have also been found to reduce pedestrian injury crashes and improve pedestrian compliance to traffic controls in several national studies.

Photo of a countdown signal

- *Protected left-turn phasing and split-phasing*: Both protected and split signal phasing reduce left-turn conflicts with pedestrians by prohibiting pedestrian movements during the active vehicle phase. The northbound and southbound left-turn movements from Georgia Avenue onto Connecticut Avenue are controlled by protected (i.e. exclusive) signal phasing, reducing pedestrian-vehicle conflicts by eliminating permissive turning movements that require left turners to yield to opposing traffic and concurrent pedestrian movements. Similarly, the northbound and southbound left-turn movements from Connecticut Avenue at both the Aspen Hill Road and Independence Street/Aspen Hill Shopping Center driveway intersections operate under protected phasing. The eastbound and westbound approaches to the Connecticut Avenue/Georgia Avenue intersection operate under split-phasing, meaning that the eastbound and westbound approaches do not have concurrent "green" indications. The Connecticut Avenue at Aspen Hill Road intersection traffic signal operates under protected/permissive phasing for the eastbound and westbound left-turn movements, which means left turning vehicles must yield to opposing vehicular and concurrent pedestrian movements following a protected left turn phase.

- *Raised medians and median pedestrian signals:* While primarily intended for vehicle separation and turning movement vehicle storage, the raised medians along Connecticut Avenue are also used as refuge areas for pedestrians within the roadway. The Connecticut Avenue/Georgia Avenue intersection provides medians on all approaches, although medians have been reduced on the north, west, and east legs of the Connecticut Avenue/Georgia Avenue intersection to provide unobstructed pedestrian paths along the crosswalks. Pedestrian push buttons are provided in the Connecticut Avenue medians at Aspen Hill Road.
- *Pedestrian Connections to Private Properties*: Some of the land uses within the study area provide amenities intended to aid in pedestrian connectivity and safety, including internal sidewalks and crosswalks in the Aspen Hill Shopping Center that provide connections between the storefront walkway and the sidewalk on the east side of Connecticut Avenue. However, these treatments are not necessarily located in the most advantageous locations or designed for universal accessibility. More thoughtful pedestrian access placement and treatments at the developments within the study area might improve overall pedestrian connectivity and safety.
- *Red Light Cameras*: Cameras have been installed at the Georgia Avenue/Connecticut Avenue intersection to record vehicles violating red light indications on Georgia Avenue. Red light violation cameras help to reduce vehicle speeds and deter aggressive driving behaviors that may typically result in angle and pedestrian crashes.

These measures help improve driver awareness of pedestrians and compliance of traffic signals. In general, implementation of these features can reduce the potential for collisions.

2.2 Observed Issues, Contributing Factors, and Opportunities for Improvements

The Connecticut Avenue PRSA team identified a number of pedestrian safety issues in the study area during the audit. These issues were discussed by the team and prioritized to identify the issues presenting the greatest challenges to pedestrian safety in the study area. This section describes the observed safety issues by intersection, in order of importance to the PRSA team.

Pedestrian-Vehicle Conflicts – Pedestrian-vehicle conflicts, not including those involving uncontrolled midblock crossings, are comprised of turning movement conflicts and conflicts at marked unsignalized crosswalks. They were observed most frequently along Connecticut Avenue at Georgia Avenue and Aspen Hill Road. A combination of factors including frequency of turning movements, pedestrian volume, vehicle speeds, signal phasing/timing settings, and sight line limitations contributed to conflicts.

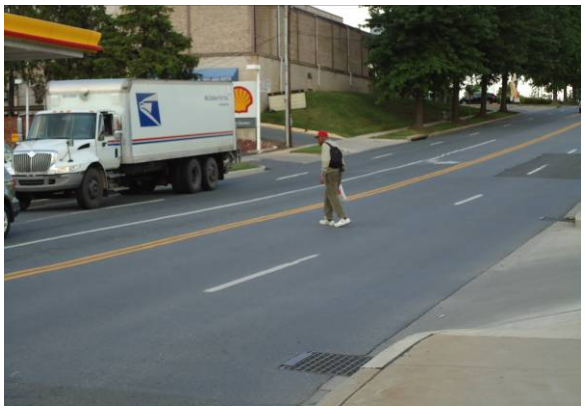



Pedestrian-vehicle conflicts were observed at a free-flow right-turn ramp (upper left and upper right). Visual limitations at a right-turn (lower left) and wide corner radii contribute to conflicts.

Uncontrolled Midblock Crossings – Uncontrolled midblock crossings are prevalent throughout the study area and were identified as one of the primary contributing factors to pedestrian collisions. Pedestrians were frequently observed running across Connecticut Avenue to avoid oncoming traffic and walking along or waiting in medians. The locations of compatible land uses, locations of bus stops, signal cycle lengths, the distances between marked crossings, and pedestrian impatience all contribute to uncontrolled midblock crossings. Pedestrian warning signage, which increases driver awareness of pedestrian activity, is limited within the study area.

Uncontrolled midblock crossings are prevalent on Connecticut Avenue

Access Conflicts – The presence of many driveways in study area leads to conflicts between pedestrians walking on sidewalks and vehicles entering and exiting commercial properties. In the vicinity of the Connecticut Avenue/Georgia Avenue and Connecticut Avenue/Aspen Hill Road intersections, in particular, commercial driveways tend to be numerous and closely-spaced. On high speed and volume facilities, like Georgia Avenue, vehicles entering access points have also contributed to rear-end vehicle crashes or run-off-road crashes by drivers attempting to avoid rear-end crashes.



Pedestrian and bicyclist activity near the Aspen Hill Shopping Center driveway on Aspen Hill Road

Aggressive Driver Behaviors – Aggressive driver behaviors were observed at multiple locations in the study area. The most frequently observed behaviors included vehicles violating red signal indications, vehicles entering driveways at high speeds, turning vehicles accepting short gaps in oncoming traffic, and vehicles failing to yield to pedestrians in crosswalks.

Pedestrian Compliance with Signals – Pedestrians were frequently observed violating pedestrian signals. Relatively long pedestrian wait times, significant transit activity, and pedestrian impatience contribute to the reluctance to cross during the pedestrian walk phase.

Pedestrian crossing during Connecticut Avenue during Don't Walk and exclusive left-turn phase

Pedestrian Facility Limitations – Several issues concerning the sidewalk design, continuity of pedestrian facilities, and pedestrian accessibility were observed. These issues include substandard and deteriorating pedestrian signal equipment, inaccessible push-button locations, the lack of push-button signage and indications, poor median surface conditions, misaligned curb ramps, narrow effective sidewalk widths, the lack of pedestrian buffers, discontinuous sidewalks, the lack of sidewalks along some pedestrian desire lines, foliage obstructing sidewalks, narrow pedestrian landings, and exposed drainage structures posing safety concerns for pedestrians.

Pedestrian facilities limitations along Connecticut Avenue include substandard pedestrian signal equipment (upper left), an absent crosswalk (upper right), an inaccessible push button (lower left), and an exposed drainage structure (lower right).

Maintenance – The PRSA team observed a number of conditions that may contribute to pedestrian safety issues and that could be resolved through maintenance actions. These issues included missing crosswalks, water ponding, missing signage, signage and sidewalks obstructed by foliage, and faded or deteriorating pavement markings.

Tree canopy obstructs driver visibility of speed limit sign (circled) on southbound Connecticut Avenue.

Lighting Conditions – Limited street lighting is provided along relatively long stretches in the study area, particularly on the west side of Connecticut Avenue. Lighting conditions are a particular concern in the Connecticut Avenue HIA considering that pedestrian behaviors contributing to collisions, including crossing at uncontrolled midblock locations and non-compliance with signals, appear prevalent during nighttime conditions.

2.3 Summary of Issues and Suggestions

2.3.1 Study Area Issues and Suggestions

The following section provides a summary of the issues identified during the PRSA process and the suggestions for improvements at each location discussed in this report. The anticipated timeframe for completion [Short Term (ST), Intermediate (I), and Long Term (LT)] is referenced after each suggestion.

Safety Issue	Suggestions
Pedestrian-Vehicle Conflicts	▪ Consider signage and pavement markings to improve driver awareness of pedestrians and reduce turning movement conflicts at intersections and marked crossings. (ST) ▪ Consider implementing lead pedestrian interval (LPI) phasing for pedestrian signals. (ST) ▪ Explore pedestrian signal timing modifications. (ST) ▪ Consider evaluating appropriate levels of enforcement to deter turning movement violations. (ST) ▪ Consider installing, upgrading, or relocating crosswalks, compliant with MDSHA standards. (I) ▪ Consider installing rumble strips or striping narrower lanes to reduce vehicle speeds. (I) ▪ Determine the feasibility of relocating potential curbside obstructions to improve driver sight lines. (I) ▪ Consider working with the Transportation Management Section to determine the operational impacts of protected phasing for left turns, where appropriate. (I) ▪ Determine feasibility of geometric roadway improvements to reduce pedestrian crossing distances, improve pedestrian refuge spaces, or reduce corner radii. (LT) ▪ Consider evaluating the need for signal controls at unsignalized intersections in the study area. (LT)

Safety Issue	Suggestions
Uncontrolled Midblock Crossings	▪ Consider installing signage to improve driver awareness of pedestrians. (ST) ▪ Consider pedestrian signal upgrades, including accessible/audible pedestrian signals and countdown pedestrian signals (APS/CPS), extended pedestrian signal timings, and LPI phasing to make signalized crossings more convenient relative to midblock crossings. (ST) ▪ Consider working with Transit Services to determine the feasibility of relocating or consolidating bus stops. (I) ▪ Consider working with MDSHA to pursue installing a non-traversable barrier to deter uncontrolled midblock crossings. (I) ▪ Consider working with adjacent property owners to modify access permits and close undesignated pedestrian access points to block pedestrian desire lines at uncontrolled midblock locations. (I) ▪ Consider working with community groups, public agencies, and property owners to provide a designated location for day labor congregation further from pedestrian conflict areas. (I) ▪ Consider working with adjacent property owners to close selected driveways to limit pedestrian exposure. (LT)
Access Conflicts	▪ Consider installing crosswalks across driveways to increase driver awareness and expectation of pedestrians. (I) ▪ Consider evaluating the need for signal controls at unsignalized intersections in the study area. (LT) ▪ Consider turn restrictions for vehicles exiting driveways. (LT) ▪ Explore opportunities for future redevelopment to consolidate access points and reduce pedestrian exposure to turning vehicles. (LT) ▪ Explore working with adjacent property owners to consolidate driveways. (LT) ▪ Determine the feasibility of constructing narrower curb cuts at driveways. (LT)
Aggressive Driver Behaviors	▪ Consider lowering the posted speed limits or relocating speed limit signs to reduce vehicle speeds approaching the study area. (ST) ▪ Consider installing pedestrian warning signage to improve driver awareness of pedestrian activity in the study area. (ST) ▪ Ensure appropriate levels of enforcement of traffic laws. (ST) ▪ Consider pedestrian and driver education programs to address aggressive behaviors. (I) ▪ Consider working with MDSHA and MCPD to explore installing red-light enforcement cameras to discourage red-light running. (LT)
Lighting Conditions	▪ Repair non-functioning lamps. (ST) ▪ Evaluate the need for additional street lighting. (I)

Safety Issue	Suggestions
Pedestrian Compliance with Signals	▪ Review traffic signal controller settings and modify pedestrian signal timings to comply with MUTCD guidance, if necessary. (ST) ▪ Work with MDSHA to pursue installing APS/CPS equipment. (I) ▪ Consider community-based educational efforts and enforcement strategies. (I)
Pedestrian Facility Limitations	▪ Consider implementing lead pedestrian interval (LPI) phasing. (ST) ▪ Consider extending pedestrian signal timings to reduce pedestrian exposure. (ST) ▪ Consider installing pedestrian crossing signage. (ST) ▪ Trim foliage obstructing sidewalks. (ST) ▪ Consider installing detectable warning surfaces at wheelchair ramps. (ST) ▪ Consider installing new landscaping or street furniture to close openings in landscaping along commercial frontage. (ST) ▪ Consider installing crosswalks across driveways to increase driver awareness and expectation of pedestrians. (I) ▪ Work with MDSHA to pursue installing APS/CPS equipment. (I) ▪ Consider installing, upgrading, or relocating crosswalks, compliant with MDSHA standards. (I) ▪ Work with property owners to ensure barriers protect pedestrians from exposed drainage structures. (I) ▪ Work with Transit Services Division to explore relocating bus stops further from the roadway to increase sidewalk width. (I) ▪ Determine feasibility and constructability of median improvements at intersections including level landing areas, accessible push buttons, and refuge from turning vehicles. (I) ▪ Consider reconstructing wheelchair ramps to properly align them with crosswalks. (I) ▪ Consider the feasibility of reconstructing curb and gutter in the vicinity of a wheelchair ramp to eliminate water ponding. (I) ▪ Determine feasibility of expanding pedestrian landing areas. (LT) ▪ Consider widening sidewalks and constructing a grass buffers between the sidewalk and roadway, where absent. (LT)
Maintenance	▪ Trim tree canopies to improve visibility of signage and remove obstructions on sidewalks. (ST) ▪ Consider restriping all crosswalks and stop bars during next roadway resurfacing project or sooner. (I) ▪ Determine the operational impacts of installing No Turn on Red signs at selected locations. (I) ▪ Consider installing turning arrow pavement markings and lane use signage to define proper lane use where appropriate. (I)