

Pedestrian Road Safety Audit

Bel Pre Road
From Beaverwood Lane to Georgia Avenue

November 2015

Prepared for



Montgomery County
Department of Transportation

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1. Introduction

1.1 Objective

The objective of this study was to complete a Pedestrian Road Safety Audit (PRSA) for Bel Pre Road between Beaverwood Lane and Georgia Avenue located in Aspen Hill, Maryland. The study limits are shown in **Figure 1**. For the purposes of this report, Bel Pre Road is assumed to have an east-west orientation. The corridor was selected for a PRSA based on its inclusion on the Montgomery County Department of Transportation's (MCDOT) list of High Incidence Areas (HIA), and the audit was conducted to identify safety issues related to pedestrian and bicycle safety in the study area. 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 audit area.

1.2 Background

The study area is an approximately one-mile segment of Bel Pre Road located in Aspen Hill, Maryland. The study area includes three signalized intersections at Connecticut Avenue, Homecrest Road, and Beaverwood Lane, three unsignalized midblock crosswalks near Tynewick Drive, Georgian Court, and Weeping Willow Drive, and a series of closely spaced unsignalized intersections and driveways. Pedestrian activity throughout the study area is primarily generated by the adjacent residential land uses and the public transit stops within the corridor. Available public transit in the area includes high-frequency Montgomery County Ride On and WMATA Metrobus lines, with seven bus stops on the north side and eight bus stops on the south side of Bel Pre Road within the study area.

The Bel Pre Road study area was identified as an HIA for pedestrian-related crashes, as part of the Montgomery County Executive's Pedestrian Safety Initiative. Based on crash data provided by MCDOT, nine pedestrian crashes occurred during the study period from January 2010 through December 2013. The purpose of this PRSA is to identify safety issues that may be contributing to the observed pedestrian crashes in the study area.

The PRSA was performed on June 2 and June 3, 2015 during daytime and nighttime hours. The PRSA team consisted of nine members with expertise in pedestrian and bicycle safety and traffic engineering, representing:

- MCDOT,
- SHA,
- Montgomery County Police, and
- STV, the PRSA consultant.

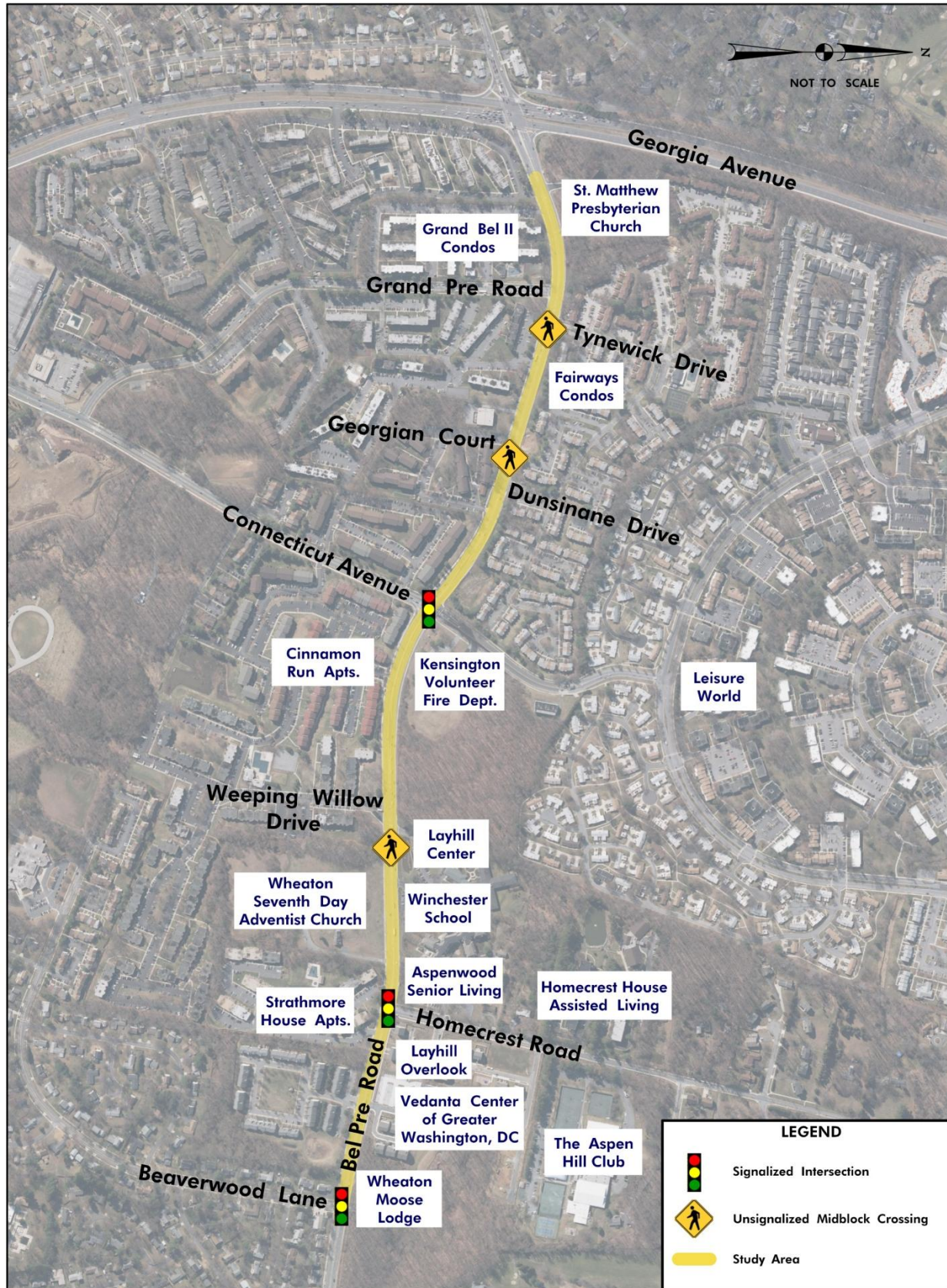


Figure 1: Bel Pre Road PRSA Study Area

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 details the existing conditions and general issues throughout the corridor identified by the PRSA team. Finally, the report presents suggestions for pedestrian safety improvements based on the issues identified throughout the corridor.

This report has served as a resource to SHA and MCDOT, as well as other stakeholders, for implementing pedestrian safety improvements within the audit area. There has been 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 to assess the feasibility and constructability of long-term projects. Ultimately, as a result of this process, a range of pedestrian safety recommendations will be implemented.

1.4 Existing Conditions

1.4.1 Site Characteristics

Within the study area, Bel Pre Road is a four lane arterial with a center two-way left-turn lane that serves Aspen Hill, Maryland. The posted speed limit on Bel Pre Road is 35 miles per hour in the study area. The lane geometry throughout the corridor is shown in **Figure 2**. The study area includes three signalized intersections:

- Bel Pre Road at Connecticut Avenue,
- Bel Pre Road at Homecrest Road, and
- Bel Pre Road at Beaverwood Lane.

Within the study area, there are also three unsignalized midblock crosswalks which provide access between residential land uses and adjacent bus stops:

- Bel Pre Road near Tynewick Drive,
- Bel Pre Road near Georgian Court, and
- Bel Pre Road near Weeping Willow Drive.

The roadways intersecting Bel Pre Road at signalized intersections are summarized below:

Connecticut Avenue

- Varies between a two-lane and a four-lane roadway that runs in the north-south direction that consists of dedicated left-turn, through, and right-turn lanes in the north- and southbound directions
- The northern leg of Connecticut Avenue provides access to Leisure World
- Provides a regional connection to the south and is a county-maintained arterial in the vicinity of Bel Pre Road

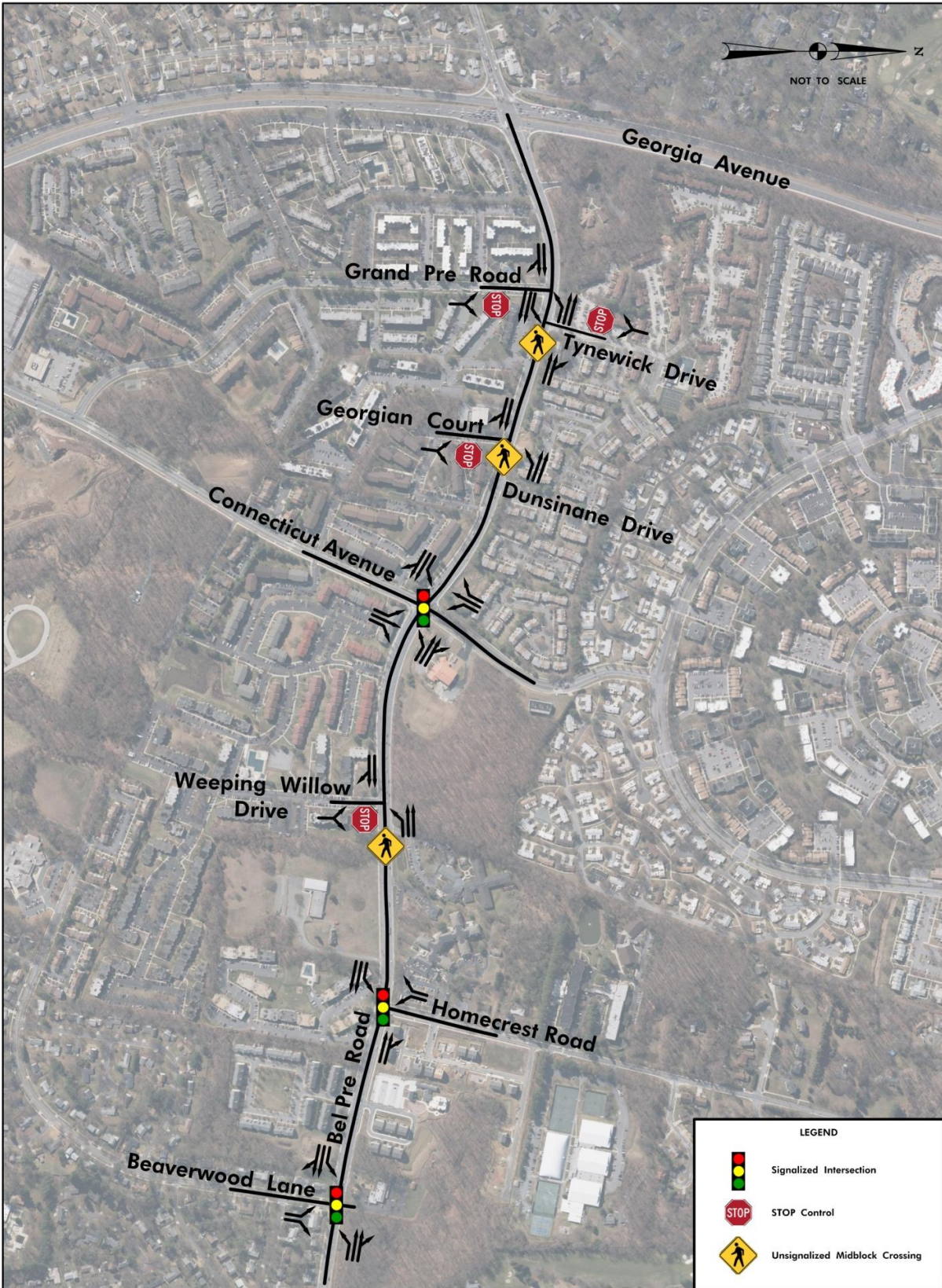


Figure 2: Study Area Peak Hour Lane Geometry

Homecrest Road

- Two-lane roadway that runs in the north-south direction that consists of one dedicated left-turn lane and a dedicated right-turn lane in the southbound direction
- Extends from Bel Pre Road to Longmead Crossing Drive and is approximately 1.1 miles long

Beaverwood Lane

- Two-lane roadway that runs in the north-south direction at Bel Pre Road
- Consists of two unmarked turn lanes in the northbound direction

Bel Pre Road offers a number of pedestrian and bicycle accommodations including a concrete sidewalk of varying width along the north side of Bel Pre Road and an eight foot concrete path along the south side throughout the entire length of the study area. Marked crosswalks and countdown pedestrian signals are provided at each of the signalized intersections. In addition, there are three unsignalized midblock crosswalks providing additional crossing opportunities along the corridor.

1.4.2 Traffic Data

Average annual daily traffic (AADT) volumes in vehicles per day for Bel Pre Road were obtained from SHA traffic count records. The 2014 AADT data is provided in **Table 1**.

Table 1: 2014 AADT

Road	Location	AADT
Bel Pre Road	0.1 Miles West of Layhill Road	22,502 vpd

Peak hour vehicular volumes, provided in vehicles per hour (vph), from turning movement counts conducted by STV in 2015 for Bel Pre Road are shown in **Table 2**.

Table 2: Traffic Count Data

Year	Location	AM Peak Hour	AM Peak Volume	PM Peak Hour	PM Peak Volume
2015	Bel Pre Road at Connecticut Avenue	7:30 – 8:30 AM	2,358 vph	5:15 – 6:15 PM	2,569 vph
2015	Bel Pre Road at Homecrest Road	7:45 – 8:45 AM	2,257 vph	5:15 – 6:15 PM	2,201 vph

There are fifteen bus stops within the study area that serve Montgomery County Ride On routes 26, 34, 41, and 49 and Metro Bus route L8. Headways range from 10 to 40 minutes in the eastbound direction and 15 to 30 minutes in the westbound direction. A map of bus stops is shown in **Figure 3**.

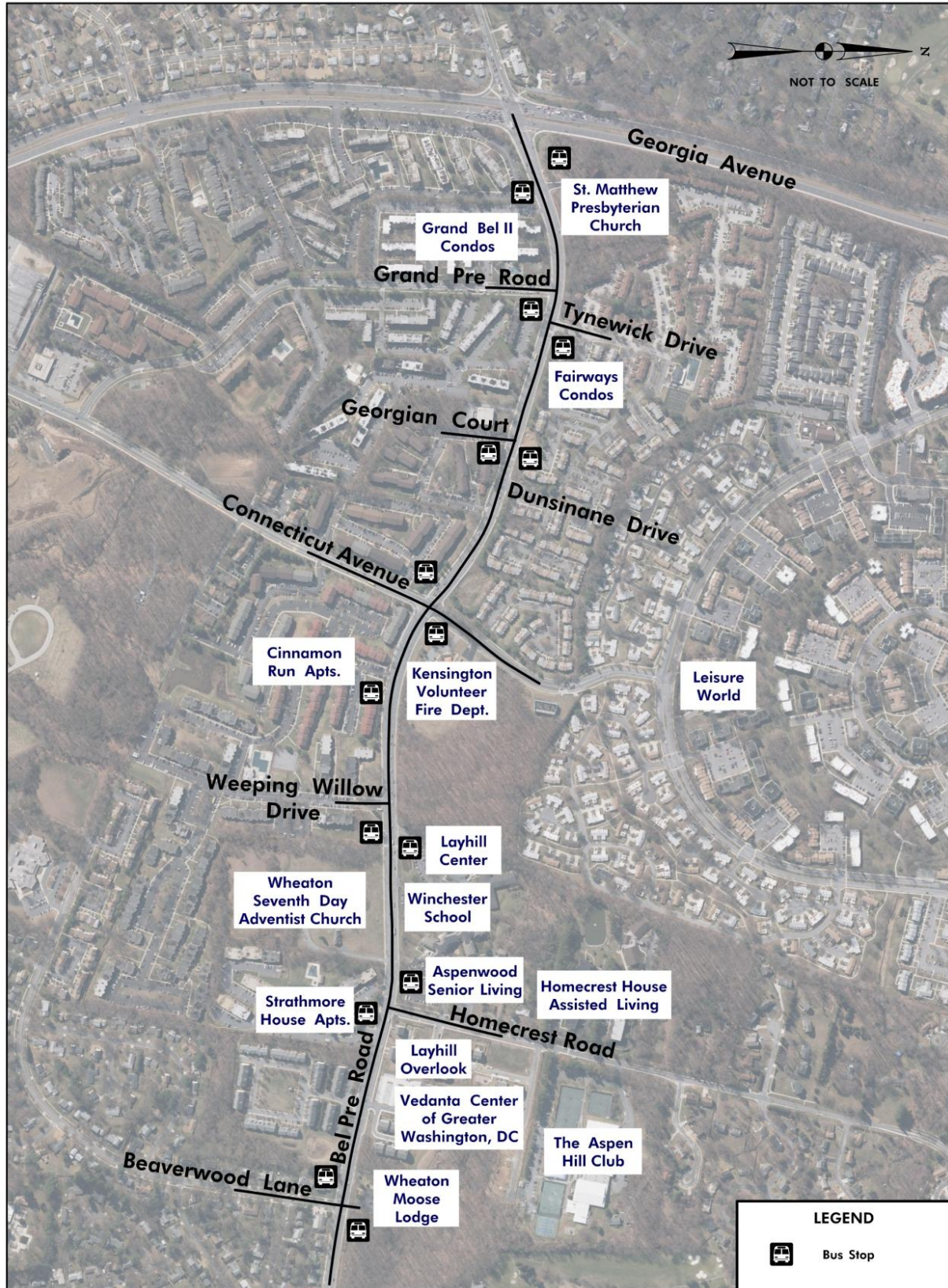


Figure 3: Study Area Bus Stops

1.4.3 Crash Data

The PRSA team reviewed all crash records collected by Montgomery County Police in the study area during the study period from January 2010 through December 2013 to identify the location of all reported pedestrian and bicycle crashes within the corridor. **Figure 4** summarizes the location, date, time, severity, type, and ambient conditions of each reported pedestrian and bicycle crash.

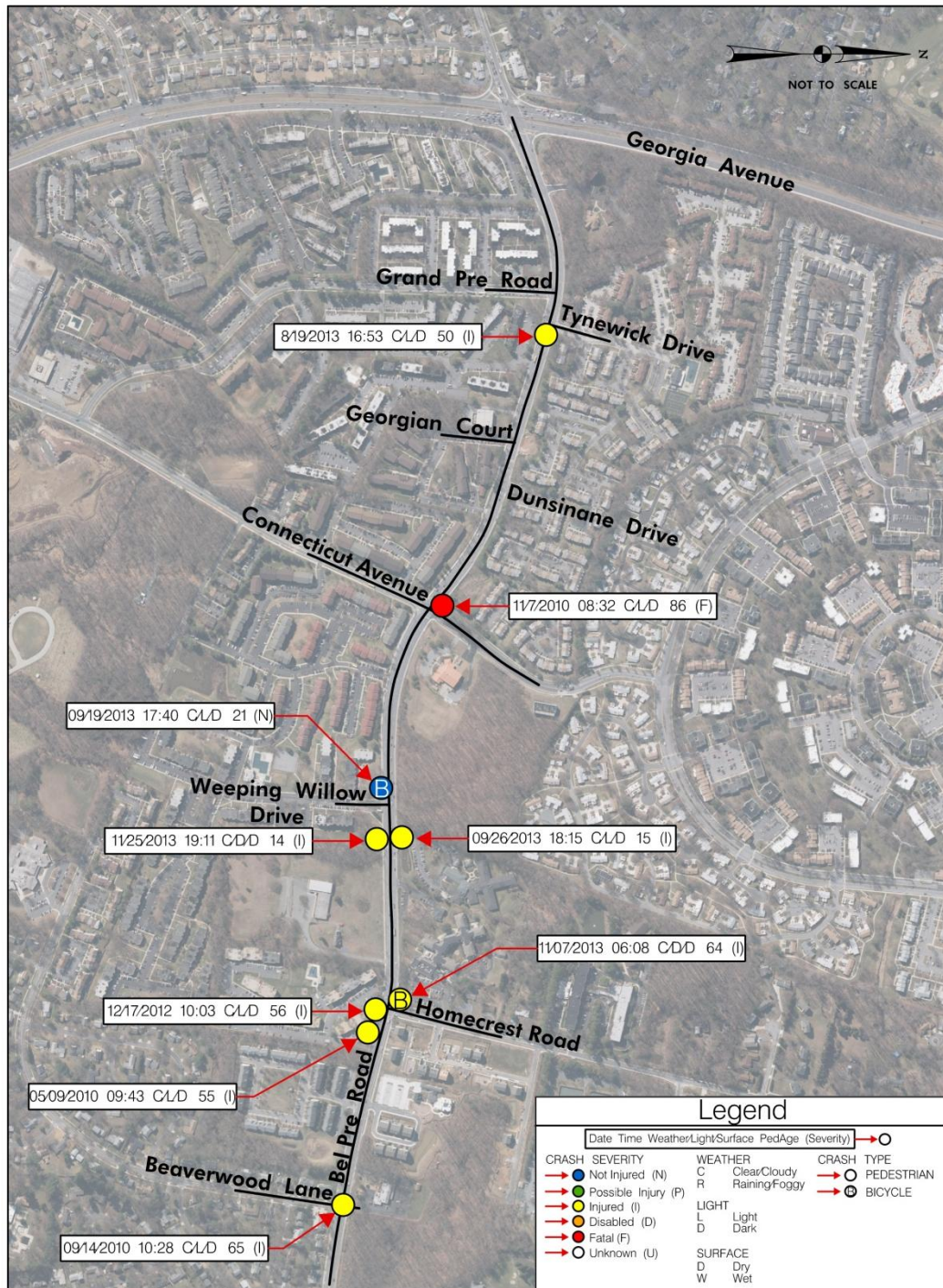


Figure 4: Pedestrian Crashes on Bel Pre Road between Georgia Avenue and Beaverwood Lane 2010 – 2013

As shown in **Figure 5**, nine pedestrian-related crashes occurred during the study period. Two of the nine crashes involved bicyclists. There were 107 vehicle crashes within the study limits from 2010 through 2013, of which nearly 50 percent (53 crashes) occurred at the intersection of Connecticut Avenue at Bel Pre Road. Pedestrian crashes reached a four year high in 2013 with five pedestrian related crashes.

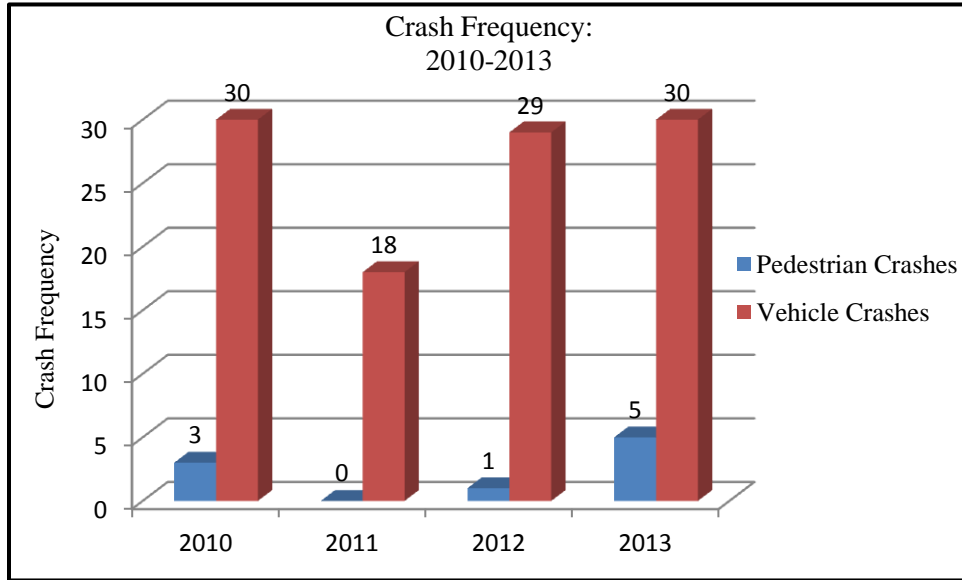


Figure 5: Study Area Crash Frequency 2010 – 2013

Crash data indicates that of the nine pedestrian crashes, seven resulted in injuries, as shown in **Figure 6**. One of the pedestrian crashes resulted in a fatality which occurred in the west leg crosswalk of the intersection of Bel Pre Road at Connecticut Avenue.

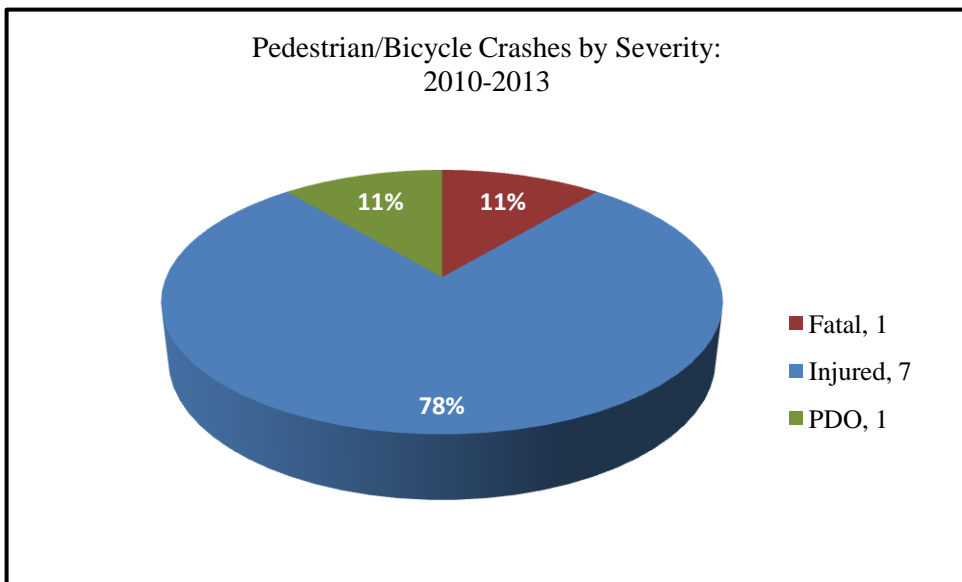


Figure 6: Pedestrian Crashes by Crash Severity 2010 – 2013

Figure 7 shows the vehicle movements prior to the pedestrian crashes. As shown, vehicle movement prior to crash was spread between several different movements with no discernible pattern.

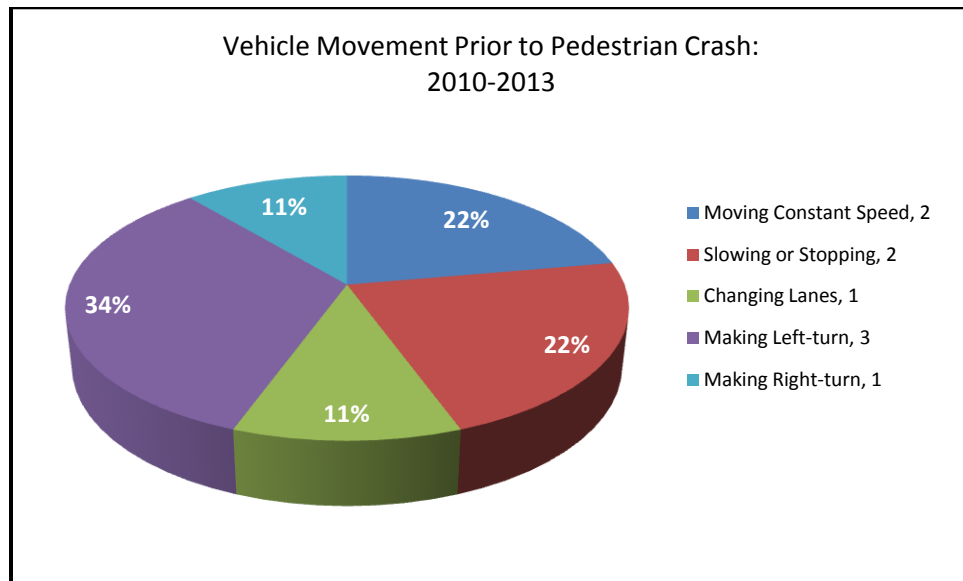


Figure 7: Vehicle Movement Prior to Pedestrian Crash 2010 – 2013

Figure 8 shows the distribution of pedestrian crashes compared to the expected frequency of crashes by age group based on study area residential demographics. The number of crashes involving pedestrians between the ages of 50 through 69 is higher than the number of expected crashes based on study area demographics obtained from 2010 Census data (www.census.gov).

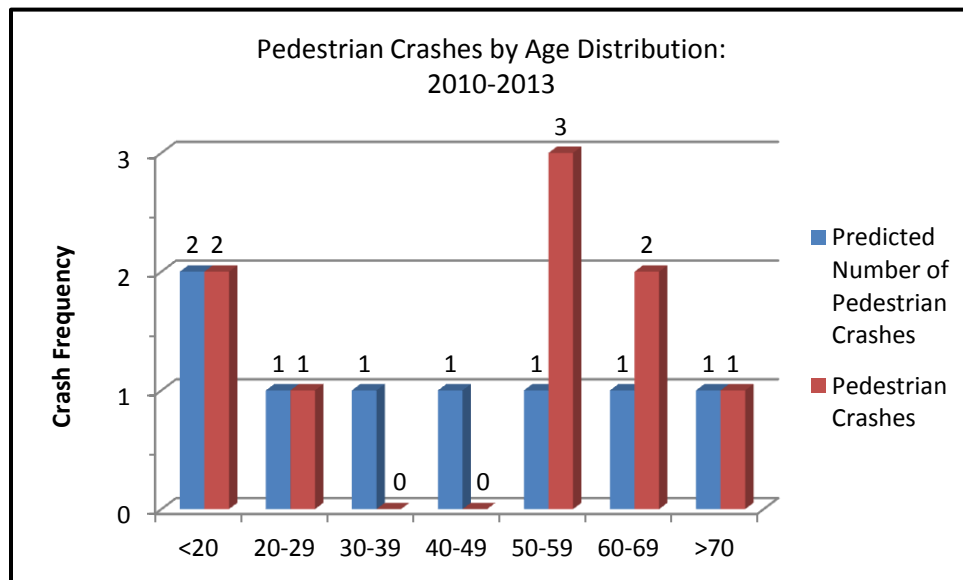


Figure 8: Pedestrian Crashes by Age 2010 - 2013

As shown in **Figure 9**, seven of the nine pedestrian crashes occurred under daylight conditions, while two occurred under dark conditions. Of the crashes that occurred under dark conditions, one occurred in an area with street lighting and the other in an area without street lighting.

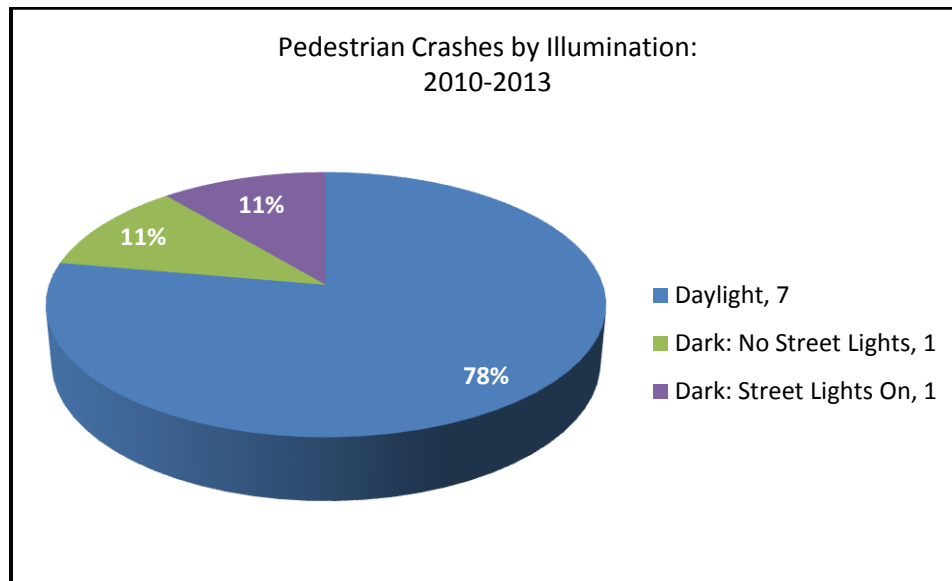


Figure 9: Pedestrian Crashes by Illumination Condition 2010 - 2013

Note that all of the pedestrian crashes occurred under dry pavement conditions. This implies that roadway surface conditions were not a primary factor in pedestrian crashes on Bel Pre Road.

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:

- **Mid-block Crossings:** Three unsignalized midblock crosswalks are located within the study area near Tynewick Drive, Georgian Court, and Weeping Willow Drive. These midblock crossings are located near transit stops and provide refuge islands for pedestrians. Signage is also provided indicating that motorists must stop for pedestrians within the crosswalk.
- **Continuous Sidewalks:** A concrete sidewalk of varying width is present along the north side of Bel Pre Road and an eight foot concrete path is present along the south side throughout the entire length of the corridor. A continuous sidewalk is also provided along Connecticut Avenue, Homecrest Road, and Beaverwood Lane. The majority of the sidewalks are of sufficient width; however, portions of the sidewalk within the study area are limited to an effective width of less than the SHA required five feet, primarily due to obstacles such as utility poles and fire hydrants.
- **Countdown Pedestrian Signals (CPS):** Countdown pedestrian signals are provided at each of the study's signalized intersections. Countdown pedestrian signal research has shown that pedestrians easily understand how the signal works, that more pedestrians start during the Walk

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.

- **Accessible Pedestrian Signals (APS):** Accessible pedestrian signals are provided at each of the study area's signalized intersections, though one intersection is missing the required education signs. Accessible pedestrian signals provide direction through audible and tactile signals which help pedestrians with hearing and visual impairments to cross the street safely.
- **Pedestrian Signage:** Pedestrian crossing and advance pedestrian crossing signs are located along east- and westbound Bel Pre Road leading to the unsignalized pedestrian crossings near Tynewick Drive, Georgian Court, and Weeping Willow Drive.
- **Speed Cameras:** Speed cameras have been installed along east- and westbound Bel Pre Road near the Winchester School to record vehicles violating the posted speed limit. Speed cameras help to reduce vehicle speeds and deter aggressive driving behaviors that may result in pedestrian crashes.



Accessible Pedestrian Signal and Education Sign



Westbound Speed Camera

2.2 Observed Issues, Contributing Factors, and Opportunities for Improvements

The Bel Pre Road 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 impediments to pedestrian safety in the study area. This section describes the observed safety issues identified by the PRSA team and suggests improvements to address each issue.

Pedestrian-Vehicle Conflicts

Pedestrian-vehicle conflicts are comprised of turning movement conflicts at intersections, unsignalized midblock crosswalks, and nearby access points. At multiple locations along the corridor, the locations of the bus stops along Bel Pre Road create potentially unsafe conditions by either blocking pedestrian sight lines when buses stop or by encouraging pedestrians to cross Bel Pre Road at uncontrolled and unmarked locations. The audit team recommends that bus stops be relocated further from major intersections and median improvements be constructed to deter pedestrians from crossing at potentially unsafe locations.



Left: Pedestrians stand in small median to cross near Homecrest Road. Right: Pedestrian crosses midblock to access bus stop near Georgia Avenue.

Figure 10: Examples of Pedestrian-Vehicle Conflicts

Pedestrian Facility Conditions

A number of issues related to pedestrian facilities were observed during the audit. Examples include missing detectable warning surfaces, damaged sidewalks, faded crosswalks, and the ADA compliance of various facilities. Further, the existing pedestrian ramps at some intersections are not aligned correctly and direct pedestrians into the center of the intersection.



Left: Crosswalk is faded. Center: Damaged Sidewalk. Right: Pedestrian ramp is not aligned with pedestrian crossing path.

Figure 11: Examples of Pedestrian Facility Issues

The audit team identified a number of suggestions to improve the condition of the existing pedestrian facilities including, but not limited to, the installation of detectable warning surfaces on all pedestrian ramps and cutouts at the unsignalized crossings, and restriping all pavement markings for crosswalks along Bel Pre Road. Additionally, ADA compliance should be verified at all existing pedestrian ramps and pedestrian push buttons.

Drainage Conditions

Drainage issues were observed during the audit, including ponding on multiple side streets within the pedestrian path.



Water pools in the pedestrian crossing area.

Figure 12: Example of Drainage Conditions

The audit team recommends that the feasibility of surface improvements or median improvements be reviewed at Dunsinane Drive and Tynewick Drive to prevent the formation of standing water.

Lighting Conditions

While the majority of pedestrian crashes occurred under daylight conditions, observations during dark conditions indicated that visibility along the corridor, particularly at the unsignalized midblock crosswalks, is low at night due to limited lighting. During the audit, multiple light fixtures were observed as non-functioning and have been reported for repair. The audit team performed an evaluation of street lighting and determined that additional street lighting is necessary.



Left: Light not functioning. Right: Lighting insufficient at midblock crosswalk.

Figure 13: Example of Lighting Conditions

The audit team recommends considering the feasibility of an actuated lighting system at the midblock crosswalks due to the sporadic use of these crosswalks at night.

Maintenance

A number of conditions were observed that may detract from pedestrian safety and that could be resolved through maintenance improvements. Such issues include overgrown vegetation reducing effective sidewalk width or overhead space, blocking pedestrian signage or vehicular signals, and obstructing lighting throughout the corridor.



Left: Overhead utility lines block vehicular signal head at Homecrest Road. Right: Overgrown vegetation impedes the sidewalk.

Figure 14: Examples of Maintenance Issues

The audit team recommends that all overgrown vegetation should be trimmed or removed to increase the effective sidewalk widths and allow all signage and signals to be seen or accessed. Tree trimming should be coordinated with the utility company as several trees along the corridor have been marked for removal.

2.3 Summary of 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	Suggestion(s)
Pedestrian Vehicle Conflicts	<ul style="list-style-type: none"> ▪ Coordinate with MCDOT – Transit Services Division to determine the feasibility of relocating the Ride On bus stop further south along the northbound approach of the intersection at Bel Pre Road and Connecticut Avenue to avoid busses blocking the channelized right turn lane. (ST) ▪ Evaluate the feasibility of installing a crosswalk along the west leg of the intersection of Bel Pre Road at Homecrest Road. (ST) ▪ Consider restriping the eastbound two-way left turn lane to a dedicated left turn storage bay along the eastbound approach of the intersection of Bel Pre Road at Beaverwood Lane. (I) ▪ Ensure appropriate levels of enforcement of posted speed limits. (I) ▪ Consider increasing the size of the triangular island and relocating the crosswalk and ADA curb ramps to improve sight distance while maintaining ADA accessibility on the southwest corner of Bel Pre Road at Connecticut Avenue. (LT) ▪ Coordinate with the Transportation Management Section (TMS) to evaluate the need for a signal head along the southbound approach of the intersection of Bel Pre Road at Beaverwood Lane. (LT) ▪ Evaluate the feasibility of installing context sensitive non-traversable barrier along the median at uncontrolled midblock locations where pedestrians were observed crossing. (LT)
Pedestrian Facility Issues	<ul style="list-style-type: none"> ▪ Consider relocating the pedestrian warning sign along the northbound approach of the intersection of Bel Pre Road at Connecticut Avenue closer to the intersection and relocating the existing fire and rescue sign. (ST) ▪ Relocate the newspaper bins on the south side of Bel Pre Road near Homecrest Road to maintain full width of the shared use path. (ST) ▪ Consider restriping all faded crosswalk markings with ladder markings. (ST) ▪ Consider restriping all faded stop lines. (ST) ▪ Consider installing crosswalk and stop line markings where applicable. (ST) ▪ Consider installing missing Accessible Pedestrian Signal (APS) education signs. (ST) ▪ Reprogram APS voice operation to ensure consistency throughout the corridor (ST). ▪ Consider installing Detectable Warning Surfaces (DWS), where necessary, to comply with ADA requirements (ST).

Safety Issue	Suggestion(s)
Pedestrian Facility Issues (Continued)	<ul style="list-style-type: none"> ▪ Consider updating all “Stop Here for Pedestrians” signs with the graphic sign that includes the “Stop” symbol. (ST) ▪ Evaluate the feasibility of relocating all pedestrian warning signs that are blocked by adjacent structures so they are easily visible to approaching drivers. (ST) ▪ Repair the fallen pedestrian warning sign east of the Winchester School driveway. (ST) ▪ Work with the Transit Services Division to evaluate the feasibility of relocating nearby Ride On bus stops closer to midblock crossings so that stopped busses load and unload on a level surface and block the crosswalk. (ST) ▪ Replace the vandalized “AHEAD” plaque (W16-9P) on the south side of Bel Pre Road just west of Grand Pre Road. (ST) ▪ Evaluate the guardrail for potential repair at the Winchester School driveway. (ST) ▪ Raise the height of the Two Way Left Turn sign east of Bel Pre Road at Homecrest Road. (ST) ▪ Consider installing guardrail between the sidewalk and storm water retention area on the northeast corner of the intersection of Bel Pre Road at Connecticut Avenue. (I) ▪ Assess the condition of damaged sidewalk and determine the feasibility of repairs. (I) ▪ Consider relocating pedestrian push buttons to conform to ADA standards. (LT) ▪ Determine the feasibility of reconstructing sidewalk ramps to align with adjacent crosswalks and comply with ADA requirements. (LT) ▪ Evaluate the ADA compliance of cutouts in the pedestrian refuges at all unsignalized midblock crossings. (LT) ▪ Coordinate with PEPCO and WSSC to determine the feasibility of relocating utility poles and fire hydrants to maintain the full-width of the shared use path and sidewalk. (LT)
Lighting	<ul style="list-style-type: none"> ▪ Inspect street lighting throughout the corridor and repair or replace as necessary. (ST) ▪ Trim trees blocking luminaires. (ST) ▪ Determine the feasibility of additional lighting at the unsignalized midblock crossing locations where lighting is insufficient. (LT)
Maintenance	<ul style="list-style-type: none"> ▪ Trim the foliage blocking pedestrian warning signs. (ST) ▪ Trim the foliage along and above the sidewalk and shared use path. (ST) ▪ Coordinate with PEPCO to determine the feasibility of relocating utility line wires blocking the signal heads for the southbound approach at the intersection of Bel Pre Road at Homecrest Road. (LT)
Drainage	<ul style="list-style-type: none"> ▪ Determine the feasibility of constructing drainage improvements in the pedestrian crossings at Dunsinane Drive and Tynewick Drive. (LT) ▪ Determine the feasibility of modifying the medians at Dunsinane Drive and Tynewick Drive so as to not impede the pedestrian crossing area or to extend through the pedestrian crossing path. (LT)