



Randolph Road 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 Randolph Road between Selfridge Road and Colie Drive in Silver Spring, 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 0.25-mile segment of Randolph Road located in a high-activity zone supporting multiple land uses, including a mixture of retail and residential uses. The study area includes three signalized intersections at Veirs Mill Road, Colie Drive, and Selfridge Road. Randolph Road and Veirs Mill Road (MD Route 586) are heavily traveled, divided, major arterial roadways. Selfridge Road and Colie Drive are residential streets that provide local access to residential neighborhoods and commercial properties.

Randolph Road and Veirs Mill Road 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 Randolph Road study area was identified as one of Montgomery County's High Incidence Areas for pedestrian-related collisions, as part of the Montgomery County Executives' pedestrian safety initiative. Based on collision data provided by Montgomery County and the Maryland State Highway Administration, 15 pedestrian collisions occurred in the study area between January 2004 and December 2008. The purpose of this PRSA was to identify safety issues that may be contributing to the observed pedestrian collisions in the study area.

The PRSA was performed on September 22 and September 23, 2010 during daytime and nighttime hours. The PRSA team consisted of nine members, representing:

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

The audit team members included individuals with expertise in the pedestrian and bicycle safety, traffic engineering, transportation planning, transportation design, and law enforcement disciplines.

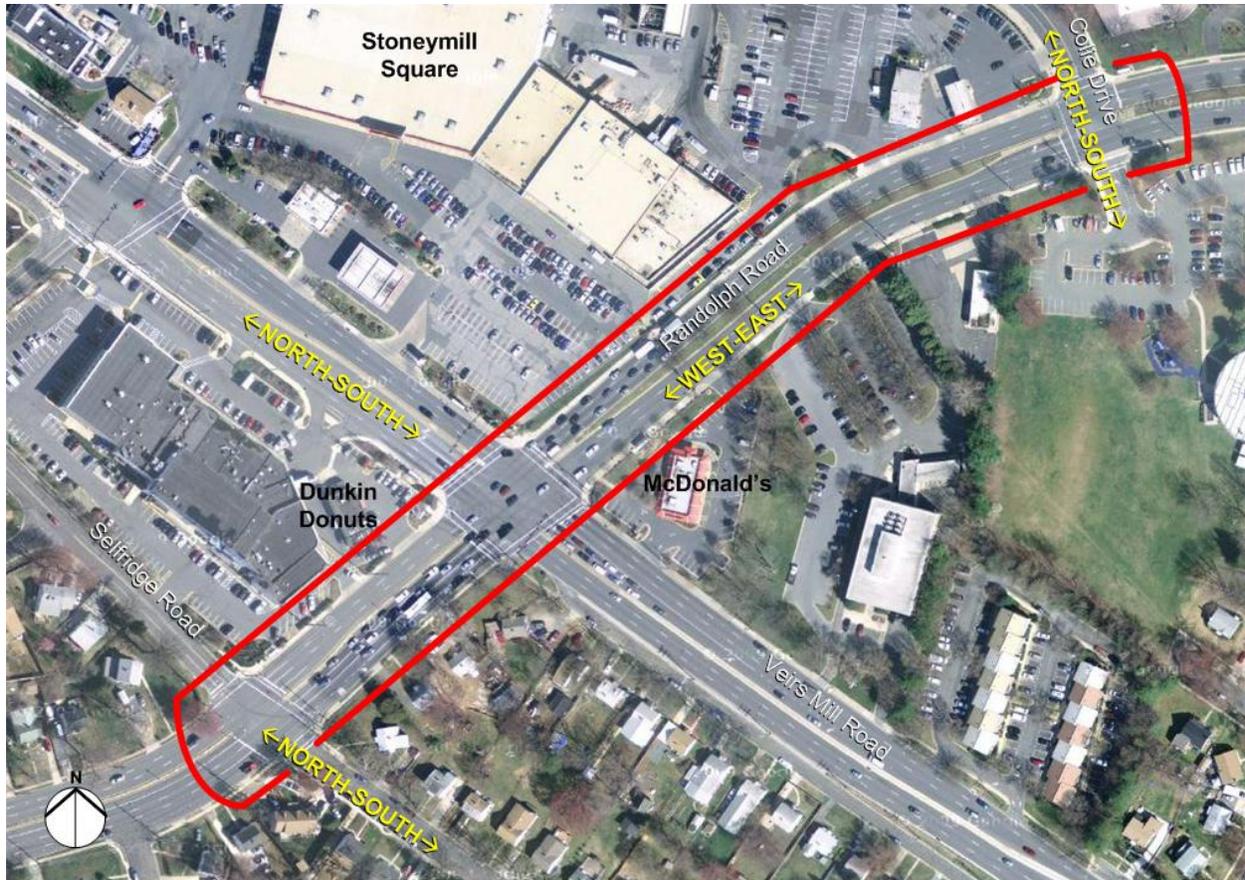


Figure 1: Study Area

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 identifies the existing conditions and general issues identified within the corridor by the PRSA team. Finally, the report presents suggestions to enhance pedestrian safety at 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, Randolph Road is a divided, six-lane roadway that runs in the east-west direction (Figure 1). The study area includes three signalized intersections along Randolph Road:

- Veirs Mill Road (MD 586) at Randolph Road
- Randolph Road at Selfridge Road
- Randolph Road at Colie Drive

In proximity to the study area, Veirs Mill Road is a divided, six-lane arterial roadway that runs in the north-south direction. The southbound approach of the Veirs Mill Road and Randolph Road intersection includes two exclusive left-turn lanes, two through lanes, and a shared through-right turn lane. The northbound approach contains two exclusive left-turn lanes, two through lanes, and a shared through-right turn lane. The eastbound approach contains three through lanes and an exclusive right-turn lane. The westbound approach includes two through lanes and a shared through-right lane. Left turns along Randolph Road at Veirs Mill Road are not permitted.

In proximity to the site area, Selfridge Road is a two-lane Business Street and residential roadway with on-street parking along some sections. A shared through/left-turn lane and an exclusive right turn lane are present on the southbound approach to the intersection. The northbound approach is one shared lane. The westbound approach contains an exclusive left turn lane, two through lanes, and a shared through-right turn lane. The eastbound approach contains an exclusive left turn lane, three through lanes, and an exclusive right turn lane which extends to the Veirs Mill Road intersection.

Colie Drive is a two-lane Business Street with on-street parking that runs in the north-south direction. Colie Drive originates at Randolph Road opposite of the Montgomery County Recreation Department Center, on the south side of Randolph Road, and terminates at Havard Street approximately 1/3 mile north of the intersection. An exclusive left-turn lane, two through lanes, and a shared through/right-turn lane are present on the eastbound approach. A shared left-turn/through lane, a through lane, and a shared through/right-turn lane are present in the westbound approach. The northbound and southbound approaches each contain an exclusive left-turn lane and a shared through/right-turn lane.

Sidewalks are present along both sides of Randolph Road within the study area. Standard marked crosswalks are provided at all of the signalized intersections within the study area. Medians on Randolph Road and Veirs Mill Road provide limited pedestrian refuge when crossing these roadways. In many locations the medians are very narrow or steeply sloped, which indicates that the medians were not intended for use by pedestrians.

1.4.2 Traffic Data

Average annual daily traffic (AADT) volumes for Randolph Road and Veirs Mill Road were obtained from MDSHA traffic count records. All traffic volume data and estimates are provided in Table 1.

Table 1: 2009 AADT

Road	Location	AADT
Randolph Road	0.1 miles east of MD 586	29,860 vpd
Veirs Mil Road	0.1 miles west of MD 185	39,442 vpd
Randolph Road	0.1 miles east of MD 355	29,143 vpd
Veirs Mil Road	0.1 miles east of Twinbrook Parkway	47,792 vpd

Public transportation is heavily utilized in the study area through the 8 bus stops located on Randolph Road and Veirs Mill Road. WMATA bus routes C4, C8, Q1, Q2, Q4, Q5, and Q6 and Montgomery County Ride On routes 10 and 48 have stops within the study area. A summary of bus stop locations and ridership is shown in Figure 2.



Figure 2 : Randolph Study Area Bus Stop Ridership

Peak hour vehicular and pedestrian volumes from the most recent MDSHA traffic volume counts for the Randolph Road and Veirs Mill Road intersection are shown in Table 2.

Table 2: Traffic Count Data

Year	Location	AM Peak Hour	AM Peak Volume	PM Peak Hour	PM Peak Volume	Daily Ped Volume
2005	Randolph Road at Veirs Mill Road	8 – 9 AM	5,474 vph	5 – 6 PM	6,261 vph	1,274 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 2004 through 2008 allowed the PRSA team to identify the location of all reported pedestrian and bicyclist crashes within the corridor (Figure 3). Between 2004 and 2008, a total of 123 vehicular crashes, 13 pedestrian, and two bicyclist crashes were reported in the study area (Figure 4).

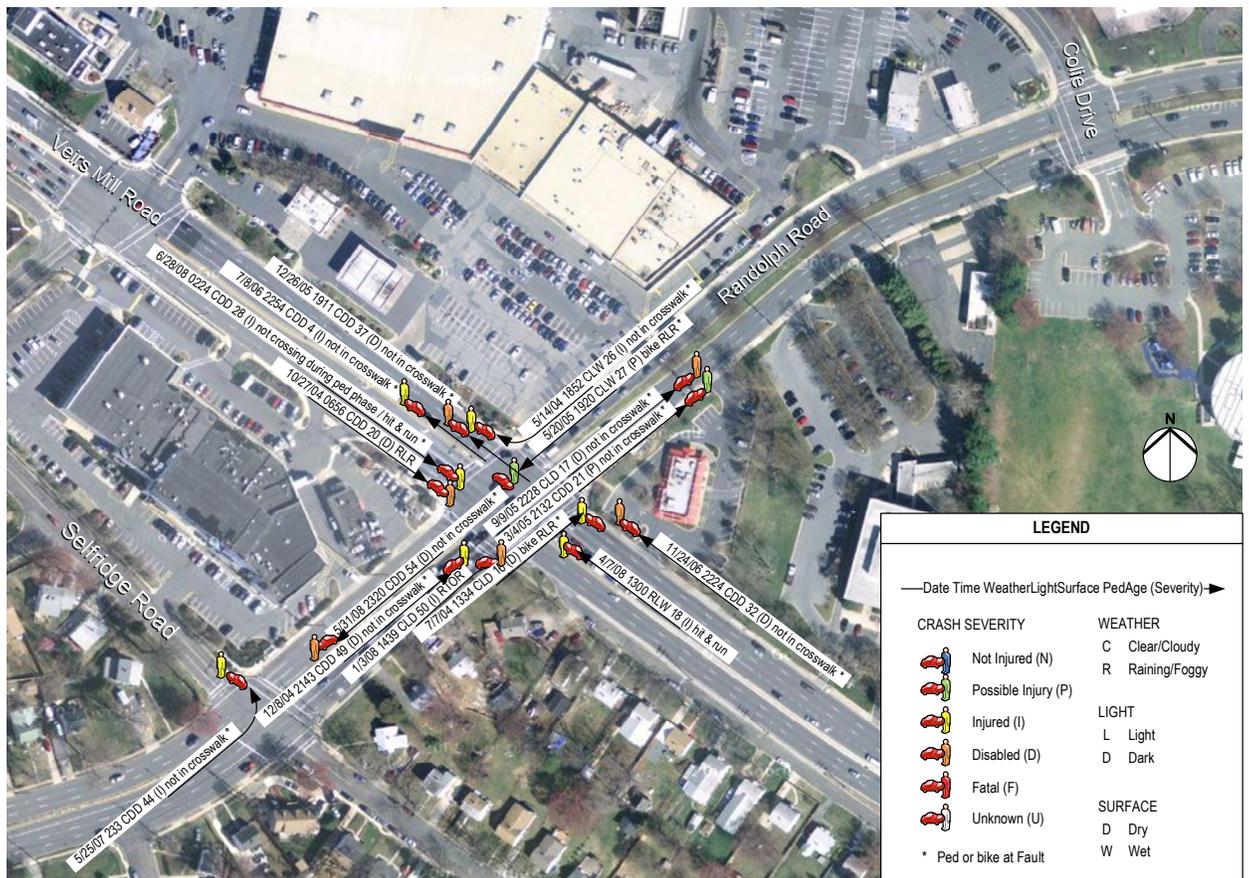


Figure 3: Pedestrian and Bicyclist Crashes – Randolph Road (Selfridge Road to Colie Drive) 2004-2008

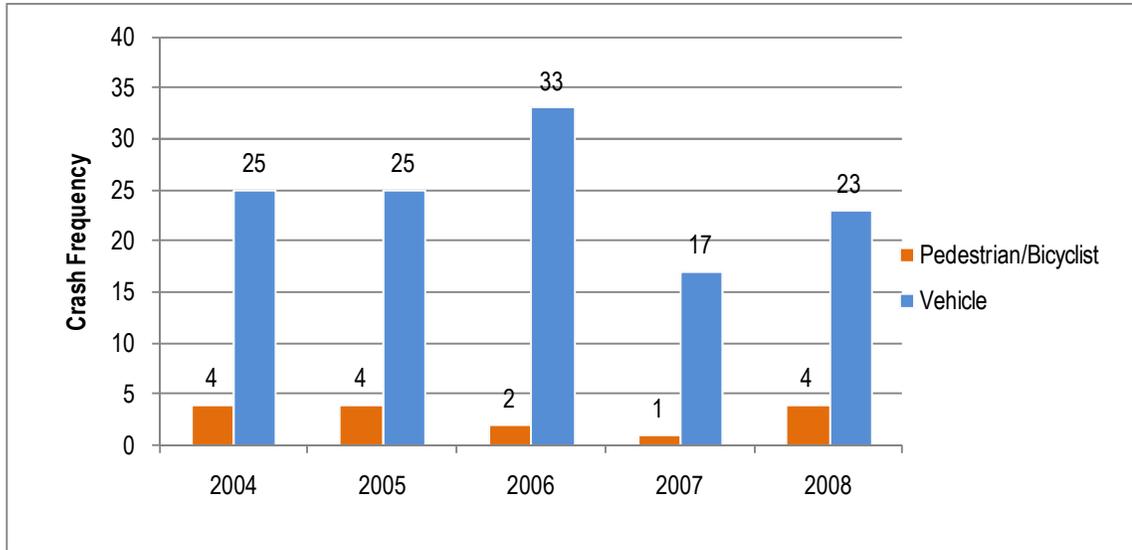


Figure 4: Study Area Crash Frequency 2004 – 2008

Crash data indicate that all 15 pedestrian and bicyclist crashes resulted in injuries or possible injuries (Figure 5). Although there were no pedestrian or bicyclist fatalities, six crashes resulted in disabling injuries, seven crashes resulted in non-incapacitating injuries, and two crashes resulted in possible injuries. In addition to the total number of pedestrian collisions, the large proportion of moderate to severe injury crashes supports the need for additional pedestrian safety measures in the corridor.

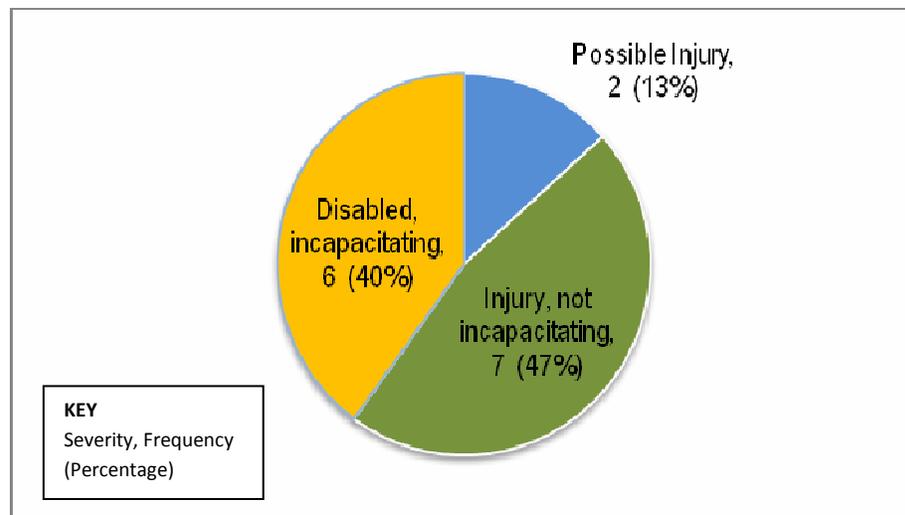


Figure 5: Pedestrian/Bicyclist Crashes by Crash Severity

Figure 6 shows vehicle movements prior to the pedestrian crashes at all study locations. Nine of 15 crashes involved vehicles moving at constant speed. This finding suggests that drivers typically did not see pedestrians in the roadway or did not expect pedestrian activity at the location of the crash. These circumstances may indicate that poor visibility or uncontrolled midblock crossing activity contributed to a majority of the crashes. Other vehicle movements prior to the crashes involved making a left turn, making right turns, and accelerating.

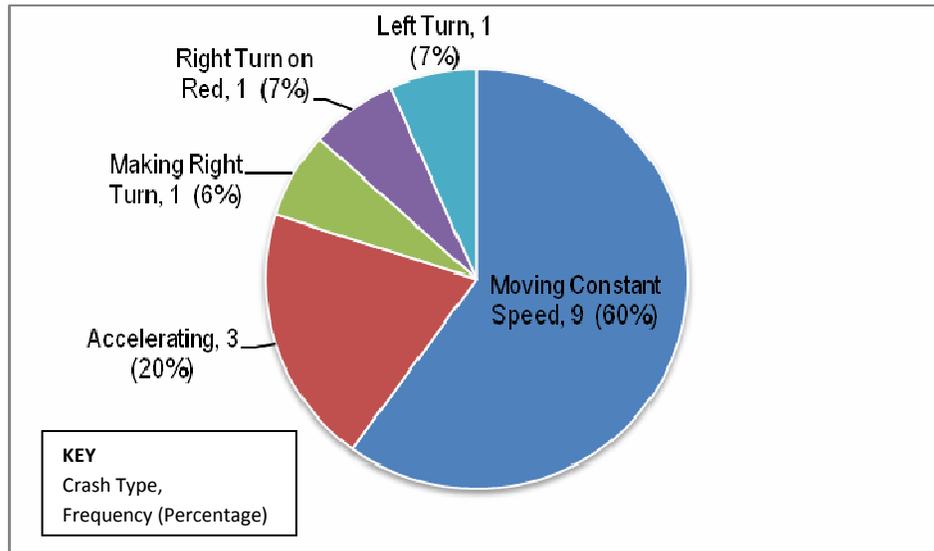


Figure 6: Vehicle Movement Prior to Pedestrian/Bicyclist Crash

Figure 7 shows the age distribution of pedestrians by age group. Pedestrians involved in crashes represented a range of ages. The distribution does not suggest that age was a primary factor in the pedestrian crashes on Randolph Road, although many pedestrians involved in crashes were 30 years old and younger.

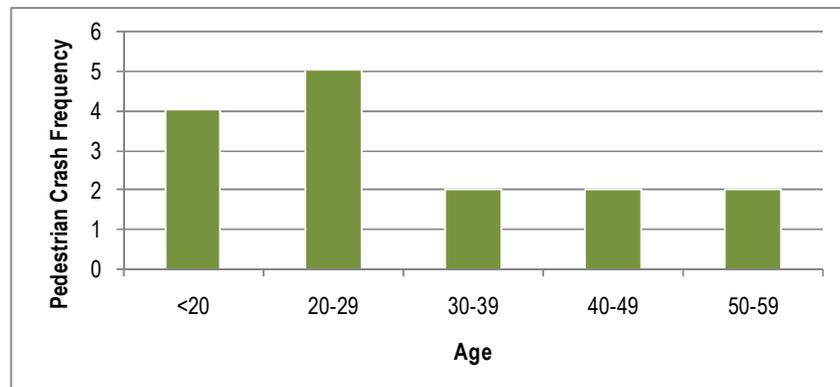


Figure 7: Pedestrian/Bicyclist Crashes by Age

The majority of pedestrian and bicyclist crashes occurred under dry surface conditions, and two-thirds of the crashes occurred under dark conditions (Figure 8). Of the 15 crashes, 12 occurred under dry conditions and 3 occurred under wet conditions. Nine of 15 crashes occurred under dark lighting conditions, suggesting that low lighting levels may be a significant 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 or unpredictable human factors. The remaining six crashes occurred under daylight conditions.

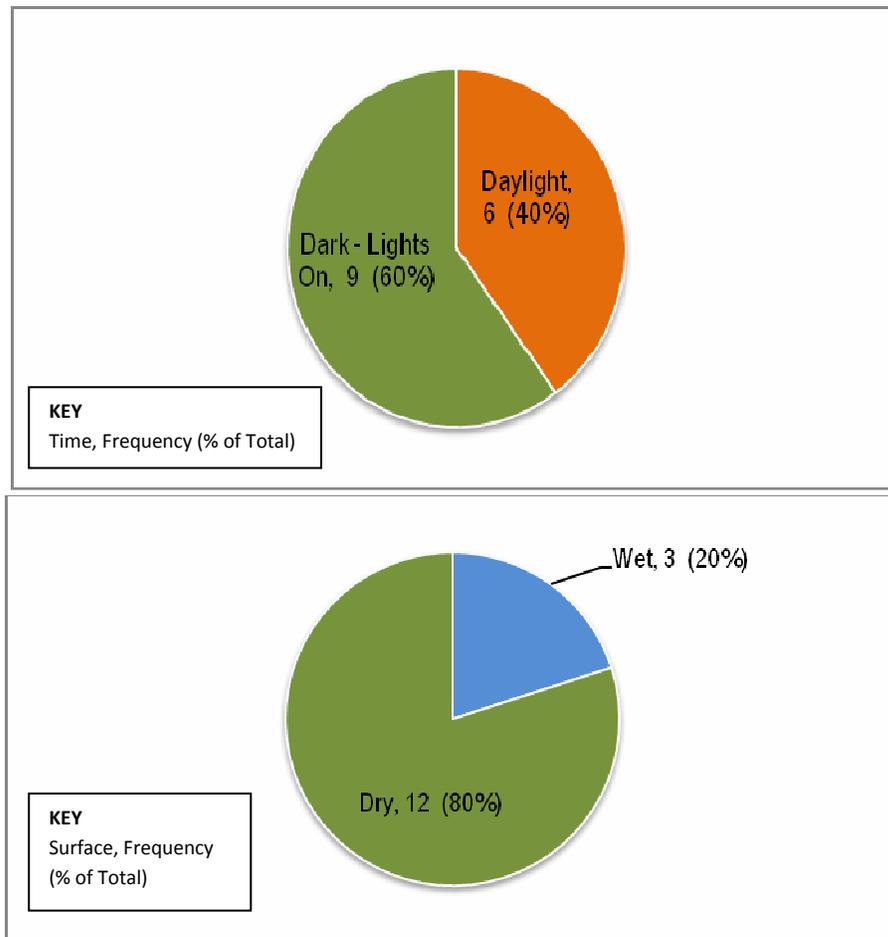


Figure 8: Pedestrian and Bicyclist Crashes by Time of Day and Road Surface Conditions

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 Randolph Road and Veirs Mill Road within the study area are continuous and provide a designated space for pedestrians in the corridor. Generally, sidewalks are of sufficient width; however, portions of the sidewalk along the south side of Randolph Road, between Veirs Mill Road and Selfridge Road, are limited to an effective width of less than the preferred five feet. While some utility poles encroach on the sidewalk within the study area, three sidewalk extensions are provided at the utility poles in the constrained section between Veirs Mill Road and Colie Drive.
- *Countdown pedestrian signals:* Pedestrian countdown signals are provided at the intersections of Randolph Road at Selfridge Road and Colie Drive. 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.
- *Turn restrictions and protected left-turn phasing:* Left-turn movements from Randolph Road onto Veirs Mill Road are prohibited, effectively eliminating all left-turn conflicts on the north and south crosswalks at the intersection. The northbound and southbound left-turn movements from Veirs Mill Road onto Randolph Road are controlled by protected signal phasing, which reduces pedestrian-vehicle conflicts by eliminating permissive turning movements. No left-turn pedestrian collisions were reported at the Veirs Mill Road/Randolph Road intersection during the study period.
- *Raised medians:* While primarily intended for vehicle separation and turning movement control, the raised medians along Randolph Road and Veirs Mill Road also provide some refuge area for pedestrians within the roadways. At the Randolph Road and Veirs Mill Road intersection, the median has been cut back at the north, west, and east legs to provide unobstructed pedestrian paths along the crosswalks.
- *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 a staircase from the Stonemill Square to the sidewalk along Randolph Road and crosswalks within the Dunkin Donut/Latin Bakery parking lot. However, these treatments are not necessarily placed in the most advantageous locations or designed for universal accessibility.



Photo of a countdown signal

Standardized pedestrian access treatments at the developments within the study would likely improve overall pedestrian connectivity and safety.

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 Randolph 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 challenges to pedestrian safety in the study area. This section describes the observed safety issues throughout the study area, 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. They were observed most frequently along Randolph Road at Veirs Mill Road and Selfridge Road. The frequency of turning movements, pedestrian non-compliance with signals, and vehicle speeds contributed 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 both Randolph Road and Veirs Mill Road 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. Limited pedestrian warning signage, to increase driver awareness of the significant pedestrian activity, is provided within the study area.

Pedestrian Compliance with Signals – Pedestrians were frequently observed violating pedestrian signals. Pedestrian wait times, signal cycle lengths, transit activity, and pedestrian impatience contribute to the reluctance to cross during the pedestrian walk phase. The team also observed pedestrians yielding to vehicles despite having right-of-way during the pedestrian walk phase. This behavior may indicate that regular pedestrian-vehicle conflicts at some locations have altered pedestrian behaviors.

Pedestrian Facility Limitations – Several issues concerning the sidewalk design, continuity of pedestrian facilities, and pedestrian accessibility were observed. These issues include push-button locations, push-button signage and indications, curb ramps, crosswalk obstructions (i.e., median nose), narrow effective sidewalk widths, lack of pedestrian buffers, discontinuous sidewalks, crosswalk skew, and the steep roadside buffer along the Stonemill Square frontage.

Pedestrian Signal Timings – A preliminary review of the pedestrian signal timing plans was conducted to verify the Flashing Don't Walk intervals for all of the pedestrian signals relative to the Manual on Uniform Traffic Control Devices (MUTCD) guidelines for pedestrian signal timings. MCDOT is conducting a formal review of pedestrian signal timings County-wide, to update these timing parameters to current standards.

Aggressive Driver Behaviors – The effects of speeding and aggressive driving maneuvers are compounded by the horizontal and vertical alignments of Randolph Road at Veirs Mill Road, which may meet sight distance requirements, but still contribute to limited visibility of pedestrians for drivers traveling in both directions on Randolph Road.

Limited Sight Distance – While apparently meeting current standards for required sight distance, the vertical and horizontal alignments of Randolph Road may contribute to limit visibility between drivers and pedestrians. Overgrown vegetation may also affect driver sight distance and ability to see approaching vehicles or pedestrians in some locations.

Limited Bicycle Facilities – The team observed several bicyclists riding on sidewalks along Randolph Road and Veirs Mill Road, likely avoiding the roadways due to relatively high vehicle speeds and traffic volumes on both roads. The vertical profile of northbound Randolph Road approaching the intersection may contribute to long crossing times for bicyclists, resulting in bicycle conflicts with signal indications. A number of bicycles were observed parked in undesignated locations in proximity to commercial properties along Randolph Road. Limited travel lane widths and the lack of bicycle facilities in proximity to the study area tend to discourage bicycle use along the corridor.

Lighting Conditions – Overall lighting levels appeared limited by lower wattage lamps and the spacing of street lighting along Randolph Road. Lighting may particularly be an issue considering that pedestrian behaviors, including crossing at uncontrolled midblock locations and non-compliance with signals, appears to continue during nighttime conditions.

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 uneven sidewalks poor pavement and marking conditions, damaged signage, a damaged traffic controller box foundation, damaged railing, overgrown vegetation, damaged truncated dome mats, and a hanging utility wire.

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
<p>Pedestrian-Vehicle Conflicts</p>	<ul style="list-style-type: none"> ▪ Consider signage to improve driver awareness of pedestrians and reduce turning movement conflicts at intersections. (ST) ▪ Consider installing or upgrading crosswalks, compliant with MDSHA standards. (I) ▪ Determine feasibility of geometric roadway improvements to reduce pedestrian crossing distances or improve pedestrian refuge spaces. (LT) ▪ Explore feasibility of access management improvements and traffic control measures to reduce turning speeds and minimize pedestrian exposure. (LT) ▪ Explore pedestrian signal timing modifications. (I) ▪ Evaluate signal timing modifications to reduce conflicts and minimize queuing. (I) ▪ Evaluate feasibility of relocating a bus shelter to improve sight lines. (LT) ▪ Consider installing additional signage to support automated photo enforcement to deter blocking the intersection and crosswalks. (ST)
<p>Uncontrolled Midblock Crossings</p>	<ul style="list-style-type: none"> ▪ Consider installing signage to improve driver awareness of pedestrians. (ST) ▪ Pursue installing a barrier or landscaping in the median to deter uncontrolled midblock crossings. (I) ▪ Determine feasibility and constructability of bus stop relocation or expansion of landing areas to increase waiting space and encourage pedestrian activity closer to marked crosswalks. (LT) ▪ Consider limiting pedestrian access at midblock locations through review of site design in future redevelopment applications. (LT) ▪ Conduct a pedestrian education program at the shopping centers and within the surrounding community. (I)

Safety Issue	Suggestions
Pedestrian Compliance with Signals	<ul style="list-style-type: none"> ▪ Consider installing signage to encourage pedestrian compliance with signals and control devices. (ST) ▪ Review traffic signal controller settings and modify pedestrian signal timings to comply with MUTCD guidance, if necessary. (ST) ▪ Pursue installing accessible countdown pedestrian signals and push-buttons. (I) ▪ Consider community-based educational efforts and enforcement strategies. (LT)
Pedestrian Facility Limitations	<ul style="list-style-type: none"> ▪ Determine feasibility of expanding pedestrian landing areas. (I) ▪ Consider reducing or eliminating encroachment of medians on crosswalks. (I) ▪ Pursue installing accessible countdown pedestrian signals and push-buttons. (I) ▪ Pursue constructing formalized pedestrian pathways to commercial properties at existing informal pathways. (LT) ▪ Replace deteriorating plastic truncated dome mats with more durable materials. (LT) ▪ Determine constructability of providing a grass or landscaped buffer to provide separation for pedestrians from the roadway. (LT) ▪ Determine feasibility and constructability of re-grading grassy slope or installing a pedestrian barrier along sidewalks. (LT) ▪ Explore feasibility of wheelchair ramp and gutter pan modifications to eliminate vertical displacement at one corner. (I) ▪ Determine feasibility and constructability of relocating a utility pole away from a wheelchair ramp. (LT) ▪ Consider refreshing pavement markings. (ST) ▪ Consider relocating newspaper stands to the side of sidewalks. (ST)
Pedestrian Signal Timings	<ul style="list-style-type: none"> ▪ Review traffic signal controller settings and modify pedestrian signal timings to comply with MUTCD guidance, if necessary. (ST)
Aggressive Driver Behaviors	<ul style="list-style-type: none"> ▪ Confirm that red-light enforcement cameras are functioning properly. (ST) ▪ Ensure appropriate levels of enforcement. (I)
Limited Sight Distance	<ul style="list-style-type: none"> ▪ Consider trimming vegetation to improve driver sight lines. (ST)
Limited Bicycle Facilities	<ul style="list-style-type: none"> ▪ Evaluate feasibility of dedicated bicycle lanes within or along Randolph Road as part of future roadway projects. (LT)
Lighting Conditions	<ul style="list-style-type: none"> ▪ Consider repairing non-functioning lamps. (ST) ▪ Consider replacing low-wattage street lamps with higher luminosity equipment. (ST) ▪ Evaluate the need for additional street-lighting. (I)

Safety Issue	Suggestions
<p>Maintenance</p>	<ul style="list-style-type: none"> ▪ Determine feasibility of sidewalk improvements to eliminate obstructions and provide even walking surfaces. (I) ▪ Consider replacing or repairing damaged signs. (ST) ▪ Consider refreshing pavement markings. (ST) ▪ Consider installing or upgrading crosswalks, compliant with MDSHA standards. (I) ▪ Consider trimming vegetation to improve driver sight lines. (ST) ▪ Consider repairing low-hanging utility wire. (ST) ▪ Consider removing loose gravel and debris near driveways. (ST) ▪ Pursue constructing a new traffic controller box foundation. (I) ▪ Pursue repairing or replacing damaged railing along sidewalks. (I)