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Darlene C. McKnight Elementary School Travel Plan

Trenton, NJ

Prepared By

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INTRODUCTION

This Safe Routes to School (SRTS) travel plan is for Darlene C. McKnight Elementary School, located in Trenton, Mercer County. This plan was prepared by Greater Mercer Transportation Management Association (GMTMA), a nonprofit, public-private partnership dedicated to promoting and providing transportation choices designed to reduce congestion, improve mobility, increase safety, and further sustainability in Mercer and Ocean County. Established in 1984, the association consists of large and small employers, local governments, metropolitan planning organizations, and state agencies who share a commitment to providing transportation choices that are good for the community, commuters, businesses, and the environment. Trenton and Darlene C. McKnight Elementary School were interested in creating a school travel plan to explore ways to support and encourage safe walking and biking to school.

TRAVEL PLAN GOALS

A School Travel Plan documents specific challenges to walking and biking to school and identifies short-term and long-term solutions to address these issues. The School Travel Plan aims to create a safer walking and bicycling environment for students so that more students and their parents can comfortably choose active transportation for the trip to school. An increase in students walking and biking contributes to additional Safe Routes to School goals, including improving children's overall health through increased physical activity and reducing congestion and the accompanying negative environmental impacts of automobile trips to school.

SAFE ROUTES TO SCHOOL

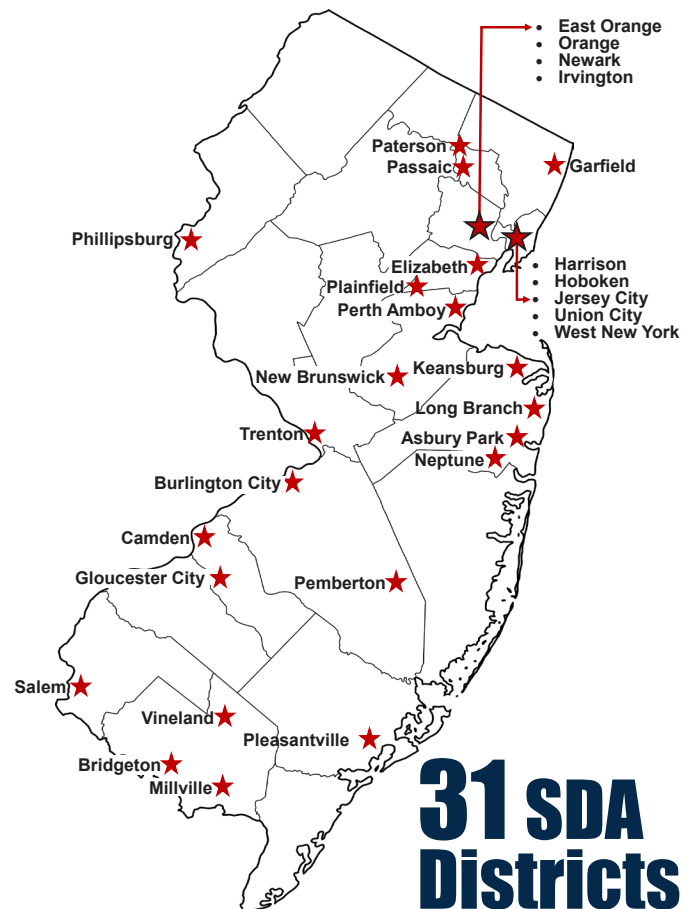
Safe Routes to School is a federal, state, and local program that aims to make it safer and more accessible for students to walk and bike to school. To achieve its goals, Safe Routes to School programs incorporate the Six E's: engagement, equity, engineering, encouragement, education, and evaluation.

The NJ Safe Routes to School Program, provided by Greater Mercer TMA in Mercer and Ocean County, and the NJ Safe Routes to School Resource Center, is sponsored by the New Jersey Department of Transportation with funding from the Federal Highway Administration.

SETTING AND SCHOOL DESCRIPTION

Trenton is the capital of New Jersey and the county seat of Mercer County. It is a densely populated, 8.20-square-mile urban community with approximately 12,000 people per square mile. In the 2020 Census, the population was reported to be 90,871 residents. Trenton directly borders the Philadelphia metropolitan area to its west and Ewing, Lawrence, and Hamilton Townships to the north, east, and south. In the neighborhood known as East Trenton sits Darlene C. McKnight Elementary School (formerly named Woodrow Wilson Elementary School before July 2022). The Delaware and Raritan Canal State Park Trail and the Trenton Freeway, or US 1, borders the school's neighborhood to the north. Urban minor arterial streets, including Mulberry Street, North Clinton Avenue, and North Olden Avenue, surround the rest of the school's neighborhood area and divide the catchment area. The catchment area extends south-southeast on North Olden Avenue, leaving students with a walk just over a mile from the school.

Darlene C. McKnight Elementary School is in a Schools



Map 1 - SDA Districts

Development Authority (SDA) district located in a Targeted Urban Municipality. The New Jersey Schools Development Authority (commonly referred to as NJSDA or SDA) is the State agency responsible for fully funding and managing the new construction, modernization, and renovation of school facilities projects in 31 New Jersey school districts known as the ‘SDA Districts.’ Targeted Urban Municipalities (TUMs) are municipalities in New Jersey that meet certain criteria, such as having a population greater than or equal to 10,000 and a municipal housing density at least 2x the state housing density.¹

Darlene C. McKnight Elementary School is a kindergarten through third grade school located at 175 Girard Avenue, Trenton, New Jersey, 08638. It is part of the Trenton Public School District, which serves pre-kindergarten through twelfth-grade students in thirteen elementary schools, six intermediate schools, three middle schools, and three high schools.

SCHOOL DEMOGRAPHICS

For the 2024-2025 school year, there were 359 students enrolled at Darlene C. McKnight Elementary School. Table 2 summarizes the number of students by grade.

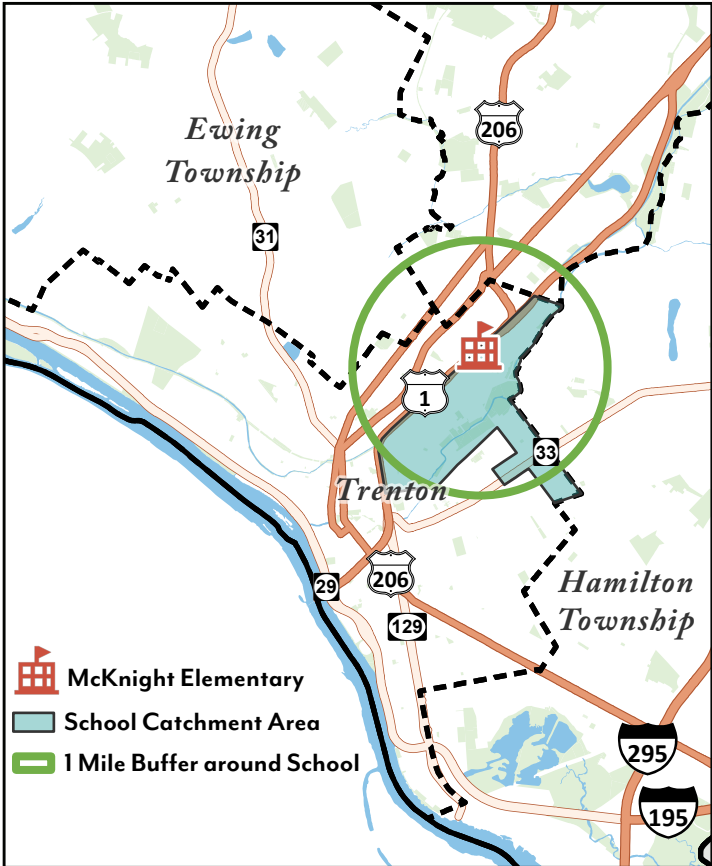
According to the NJ Department of Education 2022-23 School Performance Report:

- 12.1% of students had disabilities
- 59.8% of students were Hispanic
- 38.0% of students were Black or African American
- 1.7% of students were White
- 0.06% of students were of two or more races
- 40.2% were English learners
- 77.7% were economically disadvantaged

Table 1 - Darlene McKnight Elementary Typical School Day Hours		
Grade	Start Time	End Time
K-3 Full Day	8:45 AM	3:15 PM
Reduced Day K-3 *	8:45 AM	1:00 PM
1 Hour Delay	9:45 AM	3:15 PM
90 minute Delay	10:15 AM	3:15 PM
2 Hour Delay	10:45 AM	3:15 PM

Breakfast served at 8:15 AM

*Students will receive a grab-and-go lunch upon dismissal on Reduced Day



Map 2 - Location of Darlene C McKnight Elementary School

Table 2 - Students Per Grade (2024-2025 School Year)	
Grade	Students
Kindergarten	91
1st Grade	87
2nd Grade	84
3rd Grade	97
Total	359

¹ https://www.nj.gov/dca/hmfa/developers/docs/lihtc/tax/tum_methodology.pdf

WORKING GROUPS AND PARTNERSHIPS

Greater Mercer TMA developed this plan in partnership with the Working Group shown below. Key partners for implementation are also listed. An asterisk (*) indicates which members also participated in the August 21st walk audit.

Table 3 - Working Groups and Partnerships		
Organization	Role/ Responsibility	Contact
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NJ Division of Highway Traffic Safety		Marissa Rodriguez* marissa.rodriguez@njoag.gov
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Darlene C. McKnight Elementary School	Key Partner	Elijah Pereira*, Principal epereira@trenton.k12.nj.us
Darlene C. McKnight Elementary School	Key Partner	Freddy Albarran*, Parent Liason
Delaware Valley Regional Planning Commission		Marrisa Volk Binjaku*, Transportation Planner mvolk@dvrpc.org
Delaware Valley Regional Planning Commission		Jennifer Farris*, Transportation Planner jfarris@dvrpc.org
*Participated in the August 21st, 2024 walk audit		

EXISTING SCHOOL TRAVEL CONDITIONS

ARRIVAL

We observed arrival and dismissal on April 10, 2024, at Darlene C. McKnight Elementary School. Students typically arrive via family car or van (est. 74%), and a small percentage of students walk (est. 15%), bus (est. 8%), or bike to school (est. 3%). These estimated modes of travel are from the school principal. In addition, almost one-third of Trenton City households do not have a car, with the percentage of zero-car households at 29.4%¹.

The cafeteria serves breakfast beginning at 8:15 a.m. and school starts at 8:45 a.m. Students dropped off by car began to arrive at 7:55 a.m. Some students were lined up, waiting for the cafeteria doors to open. Students dropped off by car are greeted by the parent liaison (a school employee) along the curb or in the street on Girard Avenue near the cafeteria. The earliest arriving students have breakfast. Drivers do not follow any organized queue to drop off their students. Some drivers park their vehicles on either side of the street and walk their student(s) up to the doors, and some stop in the middle of the street to let their children out. The parent liaison attends to as many students as possible.

Two Type A school buses drop off students each morning on Girard Avenue. The students exited the bus opposite the street from the school entrance and had to cross the busy road with the liaison's help.

Walking students approached from the surrounding neighborhood. We saw small groups of students with parents/guardians coming from Klagg Avenue, Breunig Avenue, and Girard Avenue. On the west side of the school, more small groups of walking students were seen approaching as they accessed the parking lot on the Houghton Avenue side of the school property and proceeded underneath the raised building lot area to the cafeteria doors. Additional walking groups were seen approaching from the Sherman Avenue area and walking down Cortland Street on the school side of the street. Most of the student walking groups were seen using the sidewalks.

We did not witness any bicycle riders on our visit to observe school arrival. The principal informed us that a few students bike to school. The school does not have bicycle racks for bicycle parking.



Figure 1 - Old student entry door



Figure 2 - New student entry door



Figure 3 - Students crossing in front of bus

1 2022: ACS 5-Year Estimates Data Profiles

Overall, the arrival period was busy and chaotic. Cars were parked facing each other on either side of the street, creating issues when it was time to depart. During the height of arriving students, a couple of cars maneuvered a K-turn on Girard Avenue near Klagg Avenue, creating more of a traffic jam and confusion. There were lots of honking horns. A city garbage truck came down Girard Avenue and was honking its horn, as the school traffic was sometimes at gridlock. We also witnessed a near-miss as a student navigated, crossing the street amongst moving cars. The parent liaison has a vital role outside of helping upon the student's arrival. The proposed transition to one-way streets for Girard Avenue and Houghton Avenue should dramatically help reduce this chaos.

DISMISSAL

The Darlene C. McKnight Elementary school day ends at 3:15 pm. Most parents/guardians are parked along Girard Avenue, Houghton Avenue, and some along Cortland Street by 2:55 p.m. Dismissal is staggered between 3:00 p.m. and 3:15 p.m., so the students come out in small waves. Kindergarten through 1st-grade students and a couple of 2nd-grade classes are dismissed on the Houghton Avenue side of the school. The rest of the 2nd-grade classes and the 3rd-grade students are dismissed to the asphalt play lot underneath the raised building area at the south end of the property.

About 75 students leave school early for local after-school clubs like the YMCA. They get picked up by vans or buses. This leaves roughly 250-300 students to be picked up by parents and guardians at the end of the day. The school's property is not currently designed for an organized pick-up line. The parents/guardians must park their vehicles in the neighborhood and walk to the designated pick-up areas to get their children.

The two Type A school buses pick up the students on the Houghton Avenue side of the school. The students accessing the bus do not have to enter the street - the bus doors are on the school side.

Multiple groups of walking students left the school property with parents/guardians. We did not observe any bicyclists on this day.

The dismissal process is more orderly and less hectic than the arrival, though the streets are still narrow and overcrowded. There are no crosswalks, school zone signs, or other traffic calming measures along Houghton Avenue or Cortland Avenue to

help students crossing the street at dismissal. The proposed one-way transition for Houghton Avenue would greatly benefit students at dismissal. Houghton Avenue has a high volume of two-way car traffic at dismissal, making it dangerous for students crossing the street. By 3:20 p.m., most of the school traffic had cleared out.

EXISTING POLICIES

Complete Streets Policy

According to Trenton's Bicycle and Trails Planning web page², the City of Trenton has been working towards the vision of a bikeable and walkable city over the last decade. In 2012, the City Council passed an award-winning resolution that directed the City to design all projects using Complete Streets principles. Complete Streets are streets designed so that people of all ages and abilities can get around safely without a car. In 2021, the City published its Complete Streets Design Handbook, which describes how Trenton streets should be adjusted to meet this vision. In 2022, the City completed a concept design plan for redesigning intersections around the Trenton Transit Center that would make them easier to bike through and walk across and secured funding for construction. Later, in 2022, the City Council passed the Complete and Green Streets ordinance³ requiring new projects to follow the Trenton Complete Streets Design Handbook. This ordinance included the formation of a Safe Streets for All Committee, which convened its first meeting in January 2025. Our Streets: A Trenton Bike Plan for All will build on these plans and mark an essential step toward the vision of a more bikeable and walkable city.

School District Transportation Policy

The Trenton Public School District does not offer district-wide school bus service. Trenton only offers busing for students with an Individualized Education Program (IEP). McKnight Elementary School has two Type A school buses that drop off and pick up IEP students daily.

The district also offers a busing program partnered with NJ Transit for grades 6 through 12. Families must complete a form for each student requesting to qualify for NJ Transit Bus Tickets. Current Proof of residency must be attached to the application. (PSE&G, Lease, Phone Bill, Cable, or Water Bill). This information is sent to the Trenton Board of Education

² <https://www.trentonnj.org/244/Bicycle-Trails-Planning>

³ <https://njbikeped.org/wp-content/uploads/Trenton-Complete-and-Green-Streets-Ordinance-Signed.pdf>

Transportation Department at 1490 Prospect Street Ewing, NJ 08638. Eligibility is determined by the shortest walking distance from home to school. The distance must be over two miles (2.1 or more) for an elementary school pupil (kindergarten through eighth grade). The distance must be over two and a half miles (2.6 or more) for a secondary school pupil (ninth through twelfth grade) to be eligible for free bus transportation or bus tickets.

Elementary School Bike Policy

There is no specific bike policy for McKnight Elementary School. However, biking is mentioned in the district wellness policy as a part of the Safe Routes to School program. See below in the School Wellness Policy section.

School Wellness Policy

The Trenton Public School District provides guidance on overall wellness for students and faculty as described in the policy filed as “8505 Wellness Policy on Nutrition and Physical Activity.” Within this policy, walking and biking are addressed as follows: “Safe Routes to School - The school district will assess and, if necessary and to the extent possible, make needed improvements to make it safer and easier for students to walk and bike to school. When appropriate, the district will work together with local public works, public safety, and/or police departments in those efforts. The school district will explore the availability of federal “safe routes to school” funds administered by the NJ Department of Transportation to finance such improvements. The school district will encourage students to use public transportation when available and appropriate for travel to school and will work with the local transit agency to provide transit passes for students.”

SAFE ROUTES TO SCHOOL PROGRAMMING

Darlene C. McKnight Elementary School has participated in Safe Routes to School (SRTS) Programming. Recent program activities are summarized below:

- October 2024 - Bicycle & Pedestrian Safety classes for the 3rd grade given by GMTMA
- October 2024 - Walk & Roll to School Day tabling event upon students’ arrival by GMTMA
- May 2024 - Bicycle & Pedestrian Safety classes for the 3rd grade given by GMTMA

- April 2024 - Observation of arrival and dismissal of students by GMTMA, East Trenton Collaborative (ETC), and Delaware Valley Regional Planning Commission (DVRPC) staff
- 2023 - Walking School Bus Suggested Routes created for Darlene McKnight Elementary School and all of the elementary and intermediate schools in the Trenton Public School District
- August 2023 - Our Streets: Trenton Bike Plan outreach event with a Bike Rodeo organized for local children
- 2022 - Trenton City was awarded a Gold level award for the Safe Routes Recognition program

CROSSING GUARDS

McKnight Elementary School has not had crossing guards posted in the vicinity of the school in recent years. In the fall of 2024, however, one crossing guard was posted in front of the school at the Girard Avenue and Klagg Avenue crosswalk. The school’s parent liaison has been helping students out of the street as they arrive in the morning.

CATCHMENT AREA AND STUDENT LOCATIONS

During the 2022–2023 school year, the Trenton School District reconfigured school catchment areas to address uneven population growth and distribute students more evenly across schools. While this adjustment improved the efficient use of school buildings, it also led to longer walking distances for some families.

Map 3 (page 8) illustrates the walking times to McKnight Elementary School within its new catchment area, while Map 4 (page 9) shows the locations of enrolled students. According to data provided by the Trenton School District in 2022, the majority (60%) of students now have a walk of more than 15 minutes to McKnight Elementary. Of the remaining students, 28% have a walk of less than 10 minutes, and 12% have a walk lasting 10 to 15 minutes.

SPEED LIMITS

All roads have 25 MPH speed limits. There are no school zone speed limits.

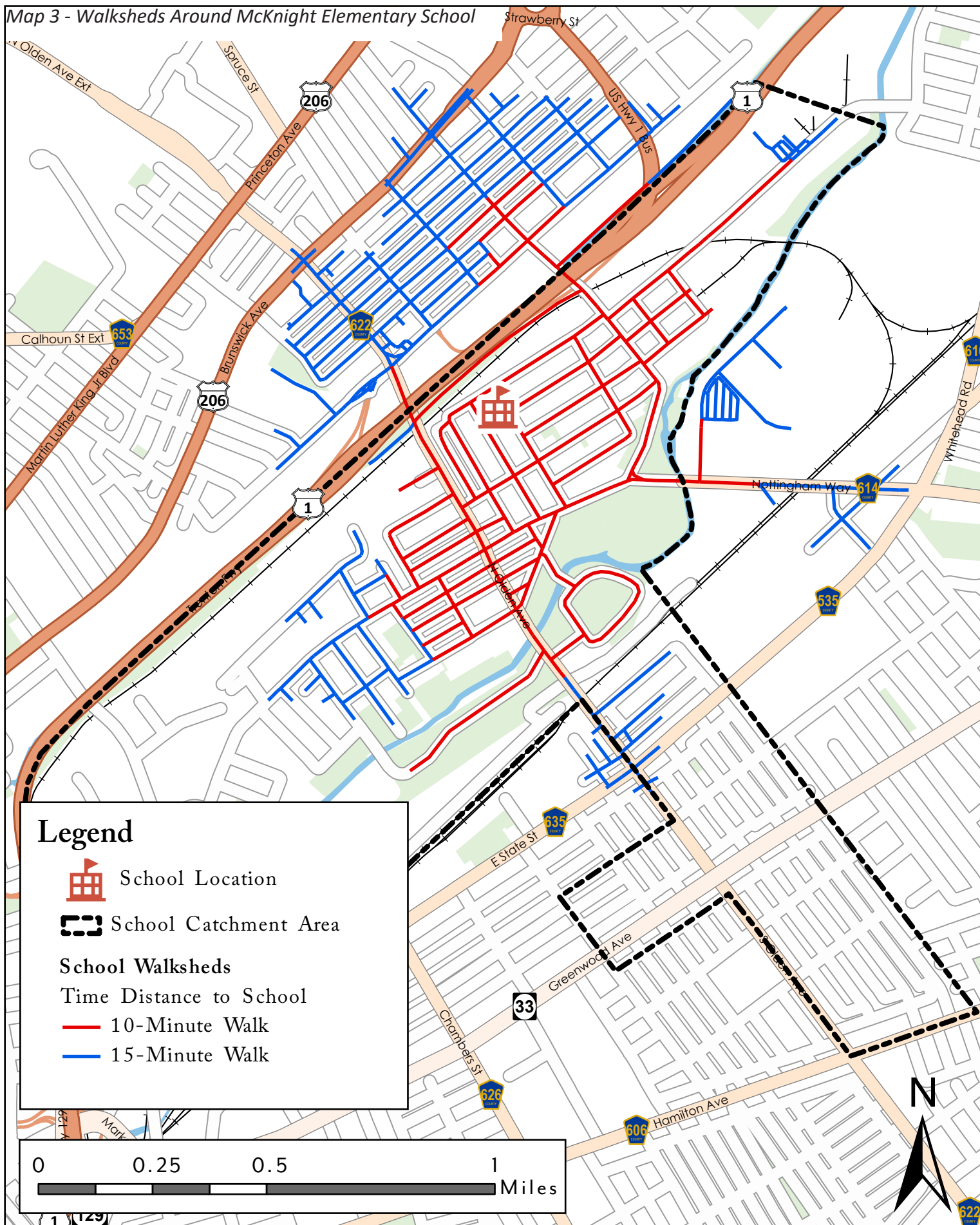
EXISTING PEDESTRIAN INFRASTRUCTURE

The area surrounding Darlene C. McKnight Elementary School has a fragmented sidewalk network. Of

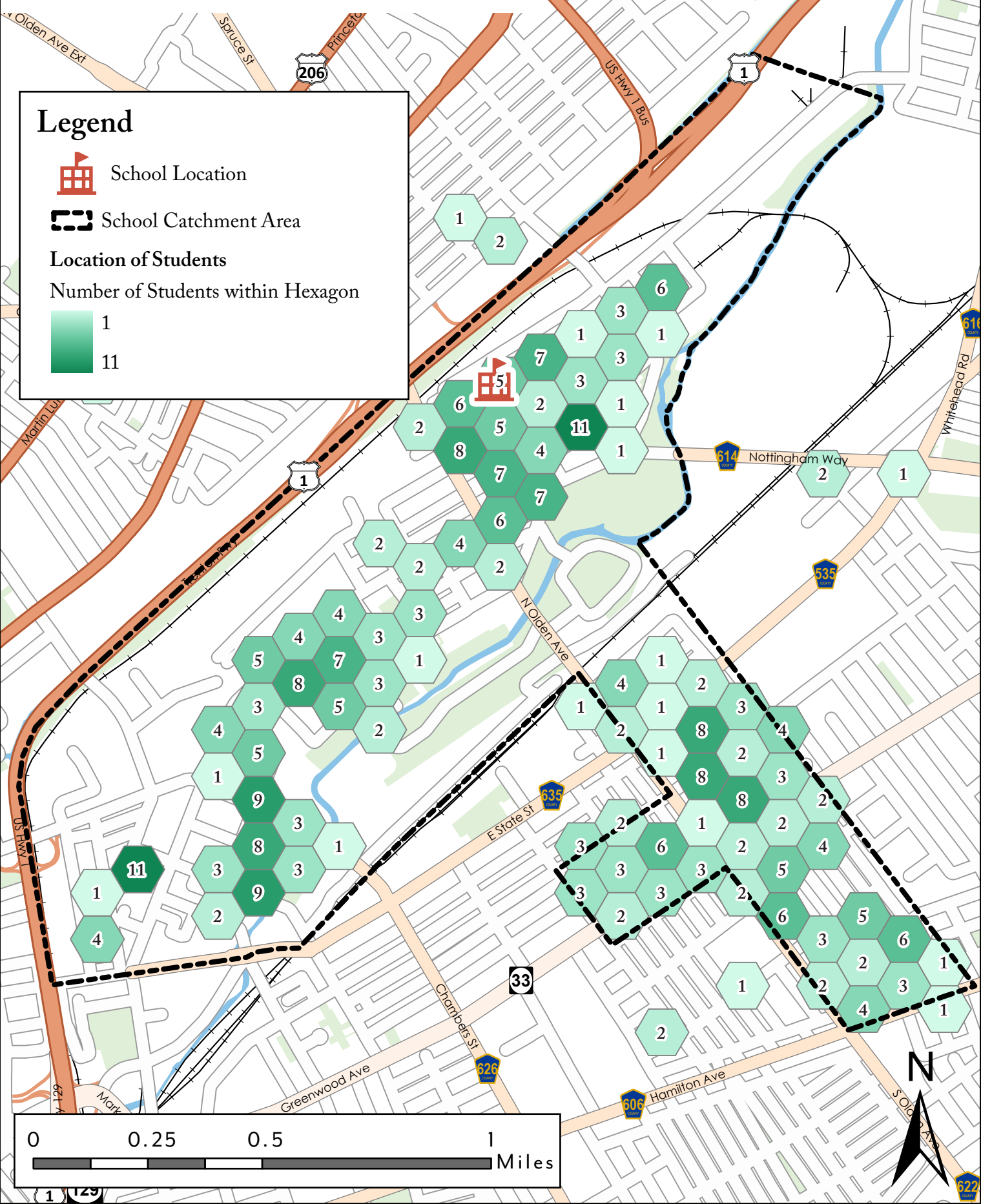
the 14,651 linear feet of sidewalk along the walk audit route, approximately 1,510 feet (10%) require replacement due to damage or use of unsuitable materials like slate or brick. Additionally, 123 linear feet lack sidewalks entirely and need new construction.

While most intersections include crosswalks, the majority are standard parallel-line designs rather than more visible continental or zebra-style crosswalks. Furthermore, 11 existing crosswalks are in poor condition and require replacement. Map 5 (page 10) highlights the locations of existing sidewalks, crosswalks, and areas needing sidewalk additions or repairs.

Map 3 - Walksheds Around McKnight Elementary School



Map 4 - Location of Students from the 2022-2023 School Year



Map 5 - Existing Sidewalk Network and Sidewalk Gaps



CRASH DATA

Data Set & Study Area

Crash records from the NJ DOT crash tables¹ were used for the most recent five years of complete data, 2017 through 2021. The study area is within one mile of the school and within the McKnight Elementary School catchment area. Since US 1 is a limited-access highway, crashes that occurred on it were excluded. A search distance of 10 feet was also used to select crashes near the border, resulting in a selection of 677 crashes.

Crash Overview

Of the 677 crashes in the study area, four were fatal, 151 involved injuries, and 522 caused property damage only. This is a count of crashes, not people.

The four fatal crashes resulted in four deaths. The 151 injury crashes resulted in two suspected serious injuries, 14 suspected minor injuries, and 135 possible injuries.

Fatalities

Pedestrians:

- On March 7th, 2017, at 12:33 AM, a 39-year-old female was killed crossing North Olden Avenue near St. Joe's Avenue by a hit-and-run driver.
- On October 20th, 2019, at 8:09 PM, a 30-year-old male was killed at North Olden Avenue & NJ 33 by a 35-year-old male driving a 2007 Honda Accord.
- On March 8th, 2020, at 8:12 PM, a 62-year-old female was killed at the North Olden Avenue & East State Street intersection in a multi-car crash. One vehicle was flagged as a hit-and-run. Without the police report narrative, it is unclear what exactly happened.

It is noteworthy that all three pedestrian fatalities were at night.

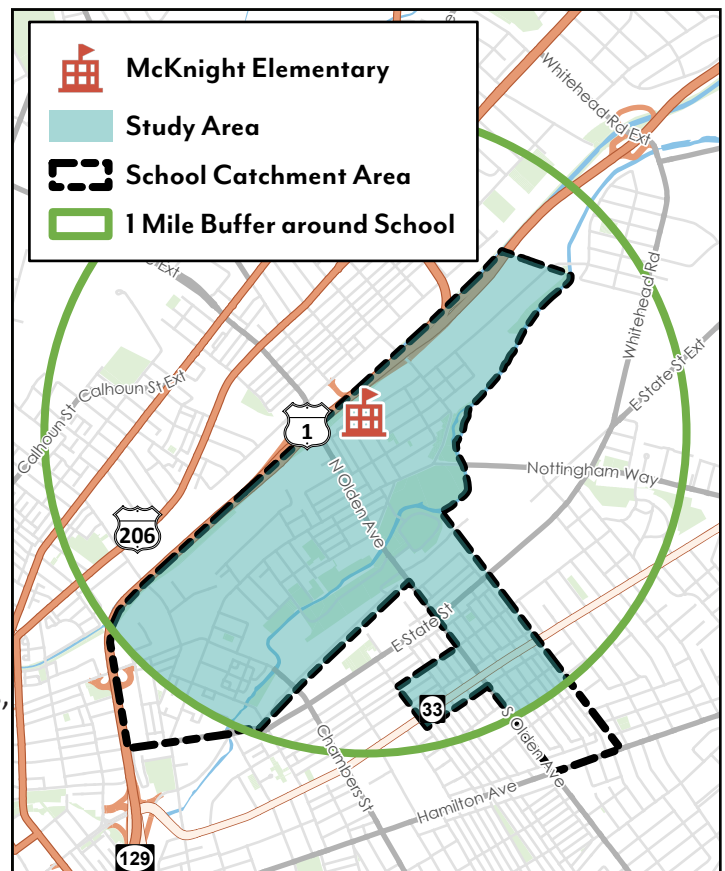
Vehicle Occupants:

- On December 23rd, 2021, a 64-year-old male driving a 1999 Honda Civic was killed in an opposite direction crash with a 38-year-old male driving a 2001 Ford Expedition.

Crash Types

As noted earlier, three of the fatalities were pedestrians, and one resulted from an opposite-direction crash. There were two suspected serious injury crashes: one from a rear-end crash and one from striking a fixed object. The other injury crashes are fairly evenly distributed; only right-angle crashes and rear-end crashes stand out in these two categories.

When property damage only (PDO) crashes are included, many drivers hit parked cars. In the study area, 25% of all crashes involved people hitting parked cars. The second and third largest categories are rear-end crashes (21%) and right-angle crashes (18%), respectively. Right-angle crashes (often called a t-bone crash) are when two cars collide while traveling in non-opposing directions and commonly occur when one car fails to stop at a stop sign or red light.



1 <https://www.nj.gov/transportation/refdata/accident/rawdata01-current.shtm>

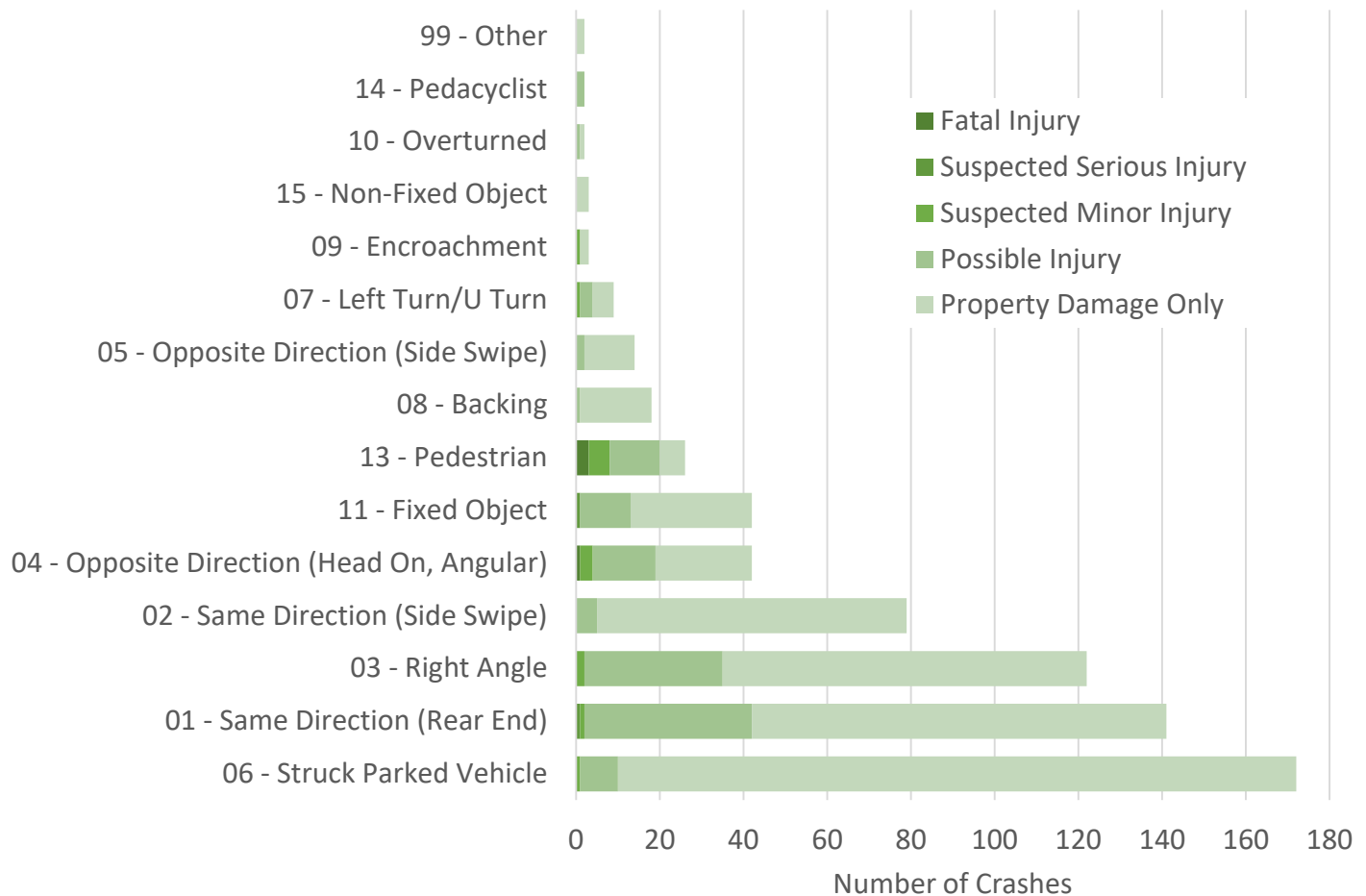


Figure 4 - Crash Type by Severity in the Study Area, 2017-2021

Comparing crash types between the study area, the City of Trenton, and Mercer County, parked vehicle strikes are 25% of all crashes in the study area and Trenton, while only 13% county-wide. This makes sense as Trenton is one of the densest areas of the county, with a large portion of on-street parking. Rear-end crashes are higher county-wide (28%) than they are in the study area (21%) and the city (19%). Right-angle crashes are higher in the study area and in Trenton (both 18%) compared to 15% county-wide. Right-angle crashes are concentrated at the traffic signals in the study area, which are older and may be a factor in non-compliance.

Crashes along Walk Audit Route

Along the route for the walk audit, 159 reported crashes occurred, 23% of all crashes in the study area. See Map 11 for map of the walk audit route.

Segment A: North Clinton Avenue between North Olden Avenue and Perrine Avenue. There were 30 reported crashes along this segment: one suspected minor injury, seven possible injuries, and 22 property damage only. Again, the largest crash type was drivers hitting parked vehicles, which accounts for 15 of the 30 crashes. Sideswipes were the next most frequent crash type, with four same-direction and four opposite-direction sideswipes.

There were two crashes involving pedestrians along segment A; both occurred at the Hart Avenue Intersection.

- A hit-and-run driver struck a 12-year-old male at 9:12 PM on 5/20/21, where there was a complaint of pain in the hip/upper leg. Medical treatment was refused. Apparently, the driver was making a right turn and failed to yield.
- The second pedestrian was a 51-year-old male who was crossing and struck by a hit-and-run driver at 1:37 AM on 8/29/21, where there was a complaint of pain in the knee/lower leg/foot. The man was

transported to Capital Health Regional Medical Center in Trenton.

Segment B: North Olden Avenue (CR 622) between North Clinton Avenue and East State Street (CR 635). There were 70 reported crashes along this segment: 1 pedestrian killed, 16 possible injuries, and 53 property damage-only crashes. Rear-end crashes are the most common crash along this segment, with 31 crashes, almost half of the total. Sideswipes are the next most common crash, with a total of 13. Street parking is prohibited along most of this segment, so only eight parked cars were hit here.

Table 4 - Crash Types Along Walking Route				
Crash Type	Seg. A	Seg. B	Seg. C	
Struck Parked Vehicle	15	8	26	
Same Direction (Rear End)	1	31	9	
Right Angle	1	6	11	
Same Direction (Side Swipe)	4	9	2	
Opposite Direction (Head On, Angular)	2	4	5	
Fixed Object	1	6	3	
Backing	0	2	3	
Pedestrian	2	3	3	
Opposite Direction (Side Swipe)	4	0	0	
Left Turn / U Turn	0	1	0	
Total	30	70	60	

Source: NJ DOT Crash Tables, 2017 - 2021

There were three crashes involving pedestrians or bicyclists along segment B.

- The person killed at North Clinton Avenue and East State St was discussed previously in the fatalities section.
- On 12/31/2018 at 9:22 PM, a 59-year-old female was struck by a hit-and-run driver at the North Clinton Avenue and East State St intersection. The crash is coded as property damage only, but there are not many details in the data.
- The third crash was at 3:40 PM on 12/17/2021, where a 12-year-old female riding a bicycle was struck by a 56-year-old male driving a 2014 Jeep Wrangler at the intersection of North Clinton Avenue and North Olden Ave. She was injured with bleeding from her head and transported to Capital Health Regional Medical Center in Trenton. The driver of the Jeep was heading north on North Olden Avenue and struck the child while making a right turn.

Segment C: This is a loop from the North Clinton Avenue & North Olden Avenue intersection through the neighborhood around the school. There were 62 reported crashes along this segment: one suspected serious injury, 13 possible injuries, and 48 property damage only. Most crashes on segment C are drivers hitting parked vehicles, accounting for 26 crashes (43%). The next highest category is right-angle, 11 crashes (18%). Two are at the traffic signal at North Clinton Avenue & North Olden Ave; the rest are at stop-sign-controlled intersections.

There were three crashes involving pedestrians along segment C.

- On 5/5/2019 at 12:08 AM a 43-year-old male was injured when a drunk driver near the intersection of Mulberry St and St. Joes Avenue struck him and a parked vehicle, then fled the scene. The most severe injury was a complaint of pain in his knee/lower leg/foot and he was transported to Capital Health Regional Medical Center in Trenton.
- On 11/24/2020 at 3:39 PM a 17-year-old female was struck by a hit-and-run driver at the Klagg Avenue and Mulberry St intersection. The crash is coded as property damage only. However, the details in the crash records are very limited/incomplete.
- On 8/16/2021 at 12:47 PM a 57-year-old person was struck by a hit-and-run driver of a 2015 Toyota Camry on Courtland St near Houghton Ave. There are no details on any injuries to the pedestrian.

Hit-and-Run Crashes

There were 217 hit-and-run crashes in the study area, 32% of all crashes. This is higher than the city as a whole, where 28% of crashes are flagged as hit-and-run, and significantly higher than the county, where 14% of all crashes are flagged as hit-and-run.

Table 5 - Hit & Run Crashes			
	Hit & Run Crashes	All Crashes	% Hit & Run
Study Area	217	677	32%
Trenton	3422	12058	28%
Mercer County	6993	49290	14%

Source: NJ DOT Crash Tables, 2017 - 2021

Of the 217 hit-and-run crashes in the study area, there were two fatal crashes, one suspected serious injury crash, four suspected minor injury crashes, 26 possible injury crashes, and 184 property damage only crashes.

The most common crash type for hit-and-run crashes was, again, striking a parked vehicle (42% of crashes). The second through fifth most common crash types are Rear-end (15%), Right Angle (14%), Same Direction Side-Swipe (11%), and Pedestrian (5%).

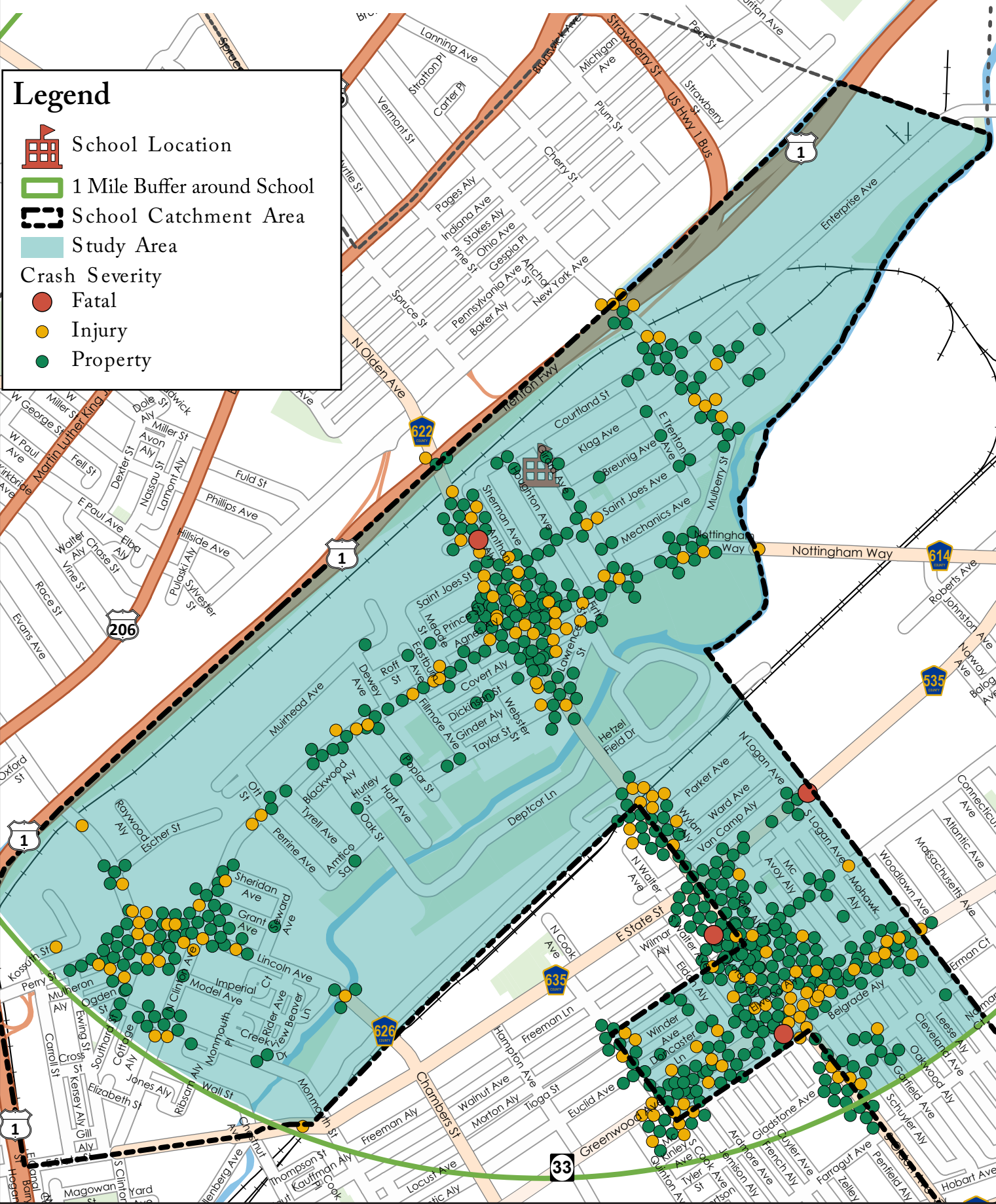
Not much can be done at the neighborhood scale for hit-and-run crashes. Most of the countermeasures are policy-based ones. The only infrastructure solution that may have an effect is better lighting. This is a two-fold solution – for crashes at night the crash may not happen in the first place if there is better lighting, and if the crash does happen, the driver may feel more visible and less inclined to run.

A policy solution showing a decrease in hit-and-run crashes in California² has recently taken effect in New Jersey. Allowing undocumented immigrants to receive driver's licenses reduces the likelihood of an undocumented immigrant fleeing the scene of a crash. NJ implemented this policy in 2021³, so we do not yet have enough completed crash data to measure the effect it will have.

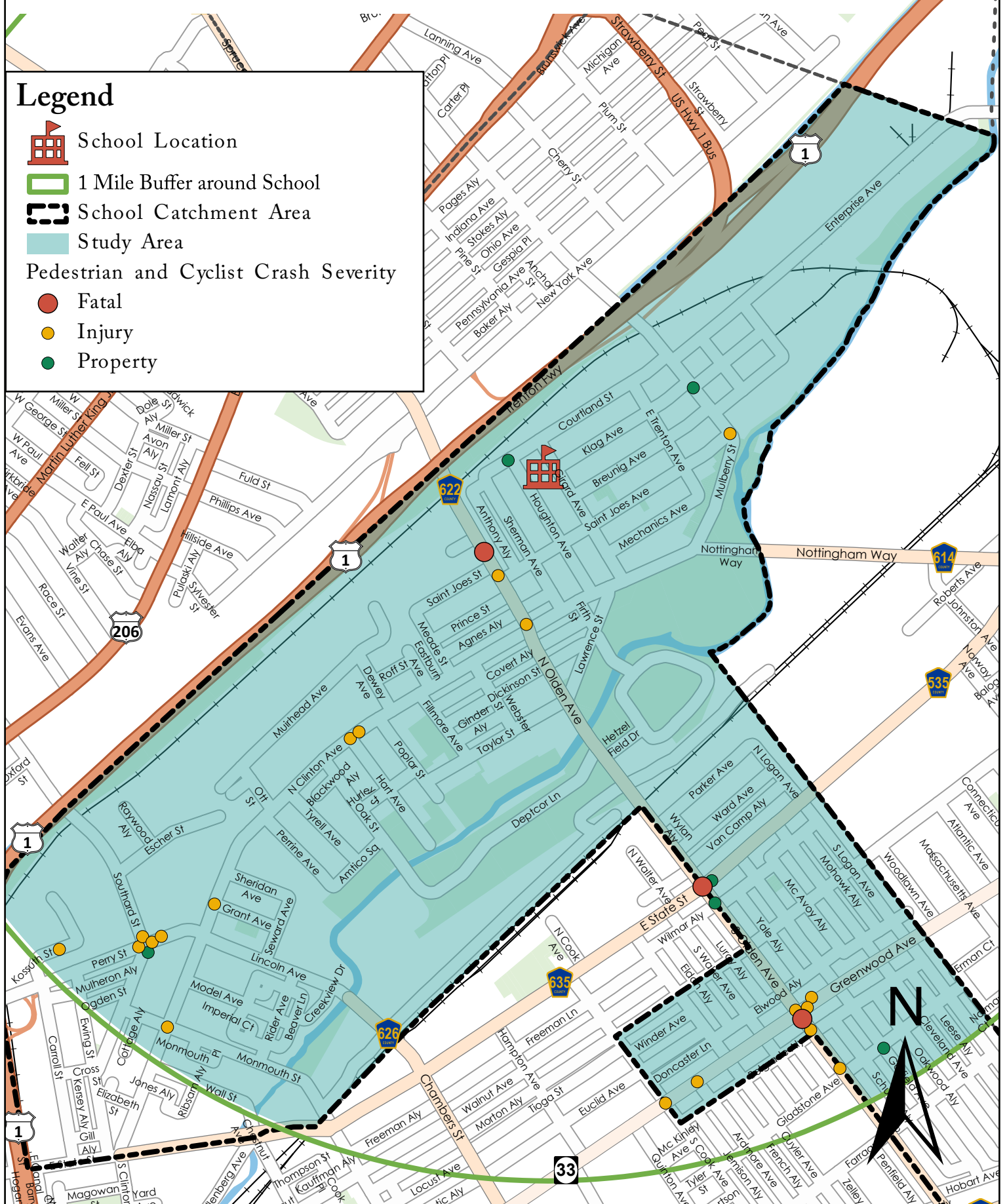
² Lueders, Hainmueller, and Lawrence (2017) analyzed the rates of hit-and-run crashes in every county in California before and after a law was put into place allowing undocumented immigrants to receive driver's licenses. They found that while rates of collisions remained the same before and after the law change, rates of hit-and-run crashes decreased. https://aaaafoundation.org/wp-content/uploads/2018/04/18-0058_Hit-and-Run-Brief_FINALv2.pdf

³ <https://www.nj.com/news/2021/04/new-drivers-license-for-undocumented-immigrants-takes-effect-saturday-here-are-all-the-details.html>

Map 7 - Location of Crashes Around McKnight Elementary School (2017 - 2021)



Map 8 - Location of Pedestrian and Cyclist Crashes Around McKnight Elementary School (2017 - 2021)



Map 9 - Location of Fatal Crashes Around McKnight Elementary School (2017 - 2021)

Legend

- School Location
- 1 Mile Buffer around School
- School Catchment Area
- Study Area
- Fatal Crashes**
 - Pedestrian Fatality
 - Vehicle Occupant Fatality

The map displays the following streets and features:

- Streets:** Escher St, Courtland St, Enterprise Ave, Klag Ave, Breunig Ave, Saint Joes Ave, Mechanics Ave, Nottingham Way, Mulberry St, E Trenton Ave, Cherry St, Houghton Ave, Sherman Ave, Anthony Aly, Girard Ave, Firth St, Lawrence St, Hetzel Field Dr, Deptcor Ln, Parker Ave, Ward Ave, Van Camp Aly, N Logan Ave, E State St, Wilmar Aly, S Olden Ave, S Walter Ave, N Cook Ave, Freeman Ln, Morton Aly, Tioga St, Euclid Ave, Winder Ave, Doncaster Ln, Elwood Aly, S C Ave, Cuyler Ave, Elder Aly, S W C Ave, Lundy Aly, Yule Aly, Garfield Ave, Mc Avoy Aly, Cleveland Ave, Mohawk Aly, Walnut Ave, S Logan Ave, Woodlawn Ave, Erman Ct, Norman Ct, Massachusetts Ave, Atlantic Ave, Lynwood Ave, Tipton St, Gladston Ave, Schuyler Aly, Oakwood Aly, Leesee Aly, Penfield Aly, Zelle Aly, Ardmore Ave, French Aly, Jernison Aly, Tyler St, Mc Kinley Ave, Quinton Ave, Culbertson Ave, Hampton Ave, Tyrell, mtico Sq, N Olden Ave, N Logan Ave, E State St, Greenwood Ave, Roberts Ave, Balcon Ave, Noway Ave, 635, 622, 33, 614, 535.
- Crashes:**
 - Pedestrian Fatalities (Red Dots):** Located at the intersection of N Olden Ave and E State St, and at the intersection of N Olden Ave and Greenwood Ave.
 - Vehicle Occupant Fatality (Yellow Dot):** Located at the intersection of N Logan Ave and E State St.

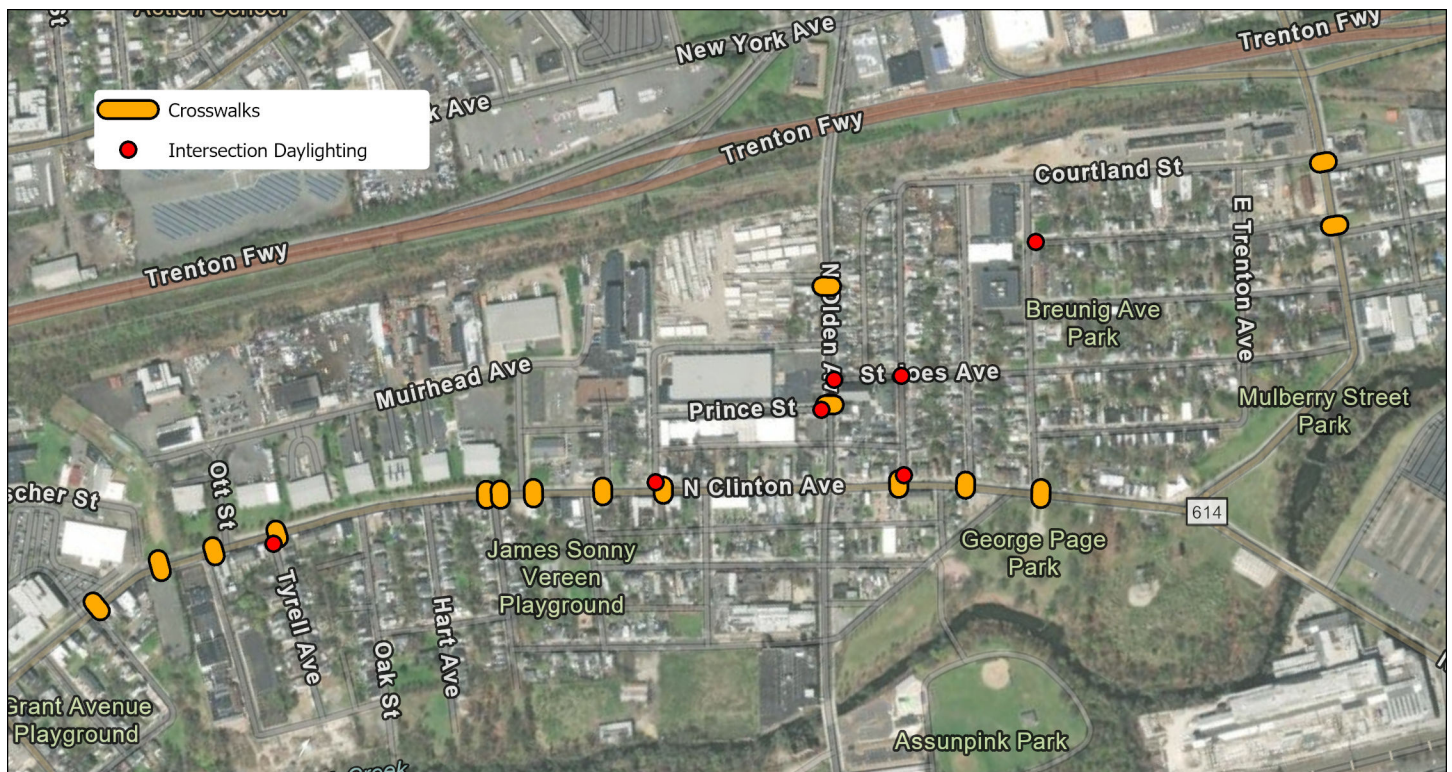
RELATED PLANS & PROJECTS

RELATED PLANS

East Trenton Traffic Safety Audit¹

In Summer 2022, East Trenton Collaborative's resident-led Traffic Safety Community Organizing Committee (TSCOC) walked the neighborhood to identify areas that feel unsafe for pedestrians, bike riders, and drivers, and compiled these findings into a traffic safety audit. Here are the general recommendations from this audit:

- Add crosswalks in front of businesses, churches, community centers, and other high foot traffic areas on North Clinton Avenue, North Olden Avenue, and Mulberry Street (12 Locations on North Clinton Avenue, two on North Olden Avenue, and two on Mulberry Street)
- Prioritize enforcement of the speed limit throughout the East Trenton neighborhood
- Install bike lanes or sharrows on less busy neighborhood routes, especially Sherman Avenue leading to the D&R Canal Trail
- Stronger presence of crossing guards during school hours at busy neighborhood intersections including North Clinton & North Olden Avenue and other intersections along North Clinton Avenue
- Add "No Parking Here to Corner" or install bollards near stop signs on streets that intersect with North Clinton Avenue & North Olden Avenue to prevent people from parking too close to intersection and obstructing views for pedestrians and drivers trying to turn onto North Clinton Avenue & North Olden Avenue



Map 10 - Locations where the TSCOC East Trenton Traffic Safety Audit recommends crosswalks or intersection daylighting

Mercer County Bike Plan²

Completed in 2020, the Mercer County Bike Plan recommends buffered bicycle lanes on North Olden

¹ <https://www.east-trenton.org/s/TSCOC-East-Trenton-Traffic-Safety-Audit.docx>

² <https://www.mercercounty.org/departments/planning/master-plan-and-studies/2020-mercercounty-bicycle-plan-element-copy>

Avenue (CR 622) and East State Street (CR 635) through the study area.

Trenton Complete Streets Design Handbook³

The Trenton Complete Streets Handbook was completed in 2021, and provides specific and general recommendations for building complete streets in Trenton. The following typologies and overlays apply to streets in the study area of this Travel Plan:

Table 6 - Trenton Complete Street Design Handbook Typology and Overlays		
Street	Typology	Overlay(s)
North Clinton Ave	Connector Corridor	Transit, Trail & Park Access from Houghton Avenue to Mulberry St.
North Olden Ave	Connector Corridor	Park Access (From Lawrence St. to Parker Ave)
East State Street	Connector Corridor	Transit, School
Houghton Ave & Girard Ave	Dense Residential	School (between Cortland St. & St. Joes Ave
Klagg Ave	Dense Residential	School (between Girard Avenue & E. Trenton Ave)
Cortland St	Industrial Access	School (Between Houghton Avenue & Girard Ave)
Mulberry St	Industrial Access	Transit, Trail Access

NEARBY PROJECTS

North Olden Avenue Multimodal Access & Safety⁴

Mercer County has completed concept development for multi-modal improvements to North Olden Avenue (CR 622) from New York Ave/US 1 Interchange to Pennington Road (NJ 31). It is currently in the preliminary engineering phase, with construction expected to begin in 2026-2027. Changes include converting the center turn lane to a curbed median, narrowing travel lanes to add buffered bicycle lanes and widening sidewalks. The project will also convert four signalized intersections into modern roundabouts. This ambitious project

³ <https://www.dvrpc.org/products/18041>

⁴ <https://www.mercercounty.org/departments/planning/transportation-projects/north-olden-avenue-multimodal-access-safety>



Figure 5 - Phase 1 of the Inspired Safe Streets in East Trenton Neighborhood project at Girard Ave and Lawrence St

is happening just outside of the Travel Plan study area, and future phases could extend along North Olden Avenue through the East Trenton neighborhood.

Inspired Safe Streets in the East Trenton Neighborhood⁵

Inspired Safe Streets in the East Trenton Neighborhood is a project that directly responds to issues identified by East Trenton Collaborative's resident-led Traffic Safety Community Organizing Committee (TSCOC). The project "daylights" intersections along North Clinton Avenue by physically blocking cars from illegally parking too close

to intersections. Daylighting makes it easier to see pedestrians crossing the street and drivers pulling up to an intersection. This is especially important near schools, because small children are shorter and harder for drivers to see.

Phase 1 of Inspired Safe Streets includes freshly painted crosswalks and curb extensions, bollards, art, and planters along North Clinton Avenue at the Sherman Avenue, Lawrence Street, and Girard Avenue intersections. It also includes a new pedestrian crossing at North Clinton Avenue and Girard Avenue near George Page Park (see Figure 5).

Phase 2 of this project involves converting Girard Avenue and Houghton Avenue into one-way streets and adding painted curb extensions and

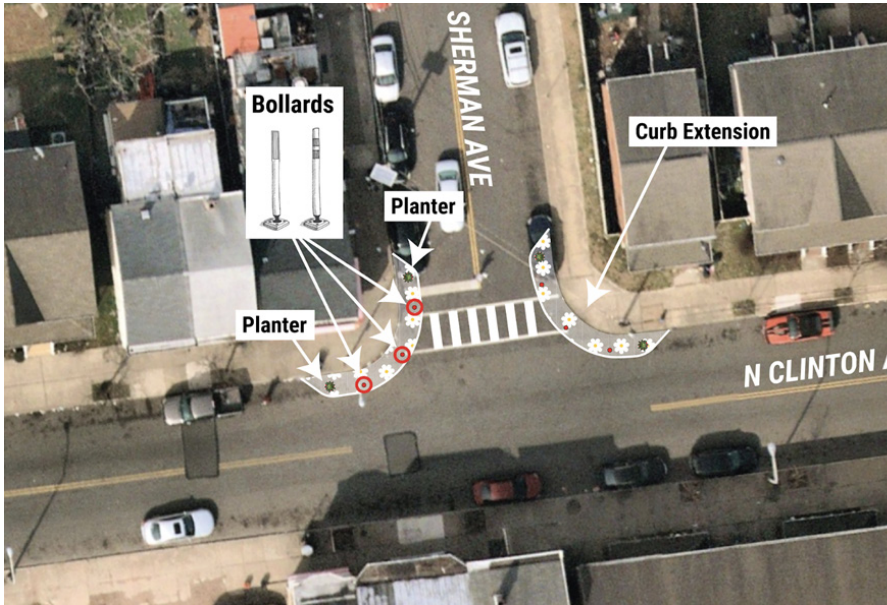


Figure 6 - Phase 1 of the Inspired Safe Streets in East Trenton Neighborhood project at Sherman Ave

traffic calming measures to Girard Ave, Houghton Ave, and Cortland Street. The residents of Girard Avenue and Houghton Avenue have completed petitions in support of converting to one-way streets, and have been approved by city council. The change will include striping to create a designated area for drop-off/pick-up in front of the school. Striping and signage are expected to be installed in early 2025.

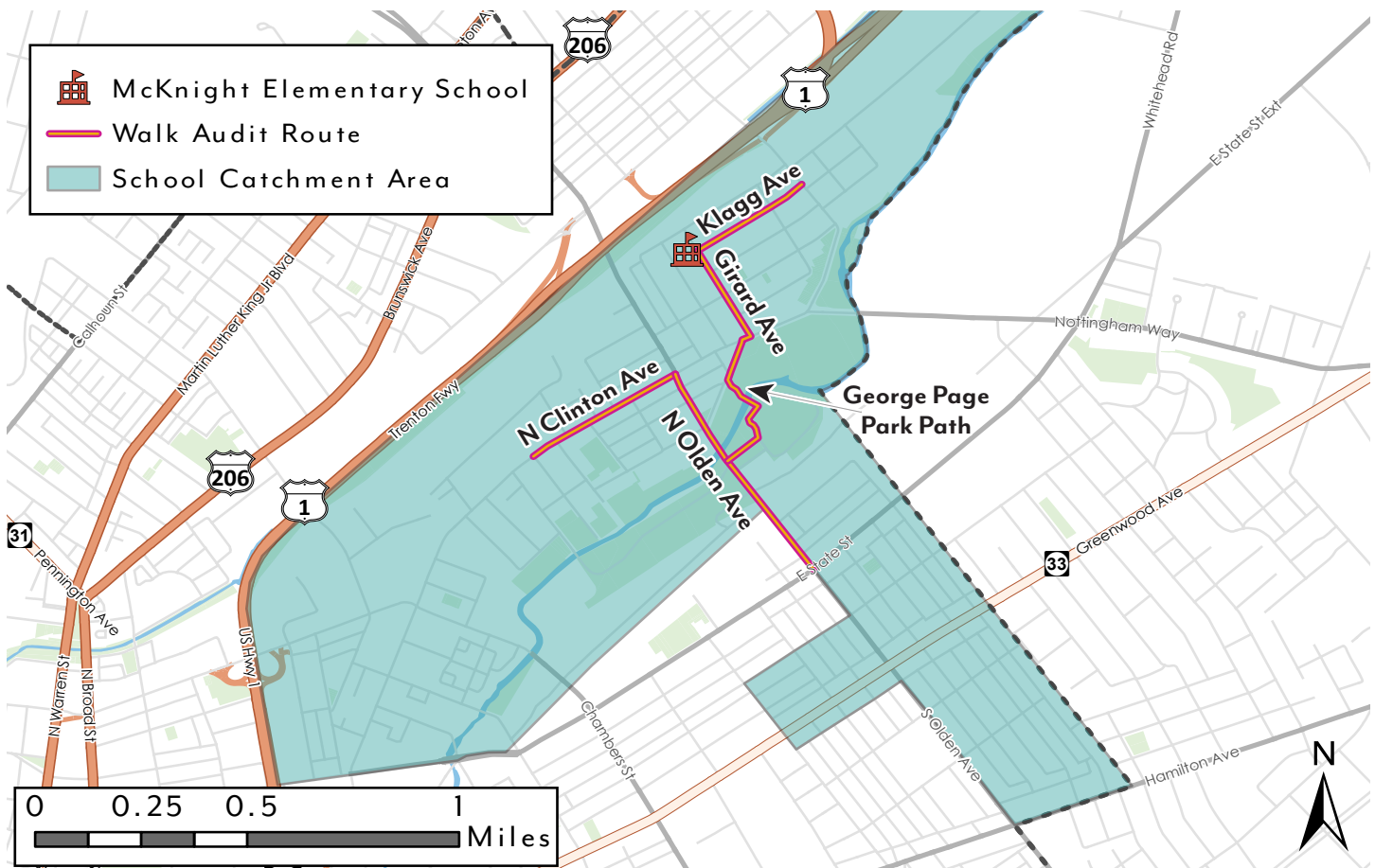
AUDIT FINDINGS AND RECOMMENDED INFRASTRUCTURE IMPROVEMENTS

The following sections discuss the findings of the walk audit. It is divided up into two sub-sections. The first section provides a general overview of the walk audit conducted. The following two sections, “General Findings and Recommendations” and “Intersection & Corridor Findings and Recommendations,” summarize the issues and recommendations found during the walk audit. The “General Findings and Recommendations” section summarizes issues observed multiple times during the audit or not on a major corridor. The “Intersection & Corridor Findings and Recommendations” describes issues and recommendations at key intersections and corridors.

DESCRIPTION OF WALK AUDIT

Pedestrian safety conditions near the Darlene C. McKnight Elementary School in Trenton were assessed by conducting a walk audit on August 21st, 2024. See Table 3 (page 3) for details about who attended the walk audit. The audit aims to identify strengths and weaknesses of the existing infrastructure available to students to walk or bike to school and offer recommendations based on the findings.

The walk audit began at the North Clinton Avenue and North Olden Avenue intersection and headed east on North Clinton Avenue to Hart Avenue. The group then returned to North Clinton Avenue and North Olden Avenue and walked south on North Olden Avenue to the intersection with East State Street. From there, the group walked north back up North Olden Avenue to the Hetzel Pool, and walked through the park, across the pedestrian bridge over the Assupink Creek, to the intersection of Lawrence Street and Firth Street. At this point, some participants had to leave. Representatives from GMTMA, McKnight Elementary School, and East Trenton Collaborative continued to the Girard Avenue and N. Clinton Avenue intersection, walking north on Girard Avenue to Klagg Avenue. The group walked Klagg Avenue to Mulberry Street, observing crossing conditions at Mulberry Street. See the included map for the exact locations.



GENERAL FINDINGS AND RECOMMENDATIONS

Sidewalks

Well-designed and maintained sidewalks improve the safety and mobility of pedestrians and provide dignity to those who travel without a vehicle. People should have a comfortable, direct, and connected network of walking routes to desired destinations without gaps or abrupt changes, especially students trying to reach their school. Sidewalks provide a 65% - 89% reduction in crashes involving pedestrians walking along the roadway.¹

There were various sidewalk conditions along the walk audit route, ranging from recently installed ADA-compliant sidewalks and curb ramps to deteriorating concrete or gaps where the sidewalk has been demolished or never existed. Other areas have older red brick or slate slabs, which are sometimes barely passable for people in wheelchairs. We observed a person in a wheelchair in the street since the sidewalk is not continuous. The majority of the intersections do not have ADA-compliant curb ramps.

Vertical and horizontal clearance is also an issue along many of the sidewalks. There should always be a minimum of 48" clear width along all sidewalks, although 60" is preferable. On many of the residential streets, the combination of building steps on one side and utility poles, street signs, vegetation, and trash cans on the other often made the sidewalk narrower than 48", and on some streets, the walk audit group found it easier to walk in the street.

See the maps in Appendix A for a detailed inventory of the sidewalks along the walk audit route.

Recommendations

- Install or replace sidewalks at the locations shown on the sidewalk inventory in Appendix A.
- Ensure that there is a minimum 48" clear width along all sidewalks, as required by the Public Right-of-Way Accessibility Guidelines (PROWAG) R302.2; multiple obstructions were observed during the walk audit and are noted on the sidewalk inventory.
- Ensure that there is a minimum 80" vertical clearance along all sidewalks, as required by PROWAG R402.4, including trimming low tree branches as necessary.



Figure 7 - Deteriorated sidewalks on N. Clinton Ave



Figure 8 - Sidewalk Gap on N. Clinton Ave near Webster St



Figure 9 - Slate sidewalk at N. Clinton Ave & Eastburn Ave

¹ <https://highways.dot.gov/safety/proven-safety-countermeasures/walkways>



Figure 10 - Poor sidewalk condition on N. Olden Ave near Ward Ave.



Figure 13 - Missing sidewalk on Klagg Ave near Girard Ave



Figure 11 - Missing sidewalk at St. Joes Ave & Girard Ave



Figure 14 - Example of many curbs missing an ADA ramp



Figure 12 - Overgrown shrub on N. Olden Ave near Dickinson St



Figure 15 - Slate sidewalk in poor condition on Girard Ave

Crosswalks

Where they are present, the crosswalks in the study area are typically transverse line crosswalks, which are not as visible to drivers as other crosswalk types. According to the FHWA, high-visibility crosswalks like those shown in Figure 16 can reduce pedestrian injury crashes by up to 40%.¹

The existing transverse line crosswalks should be phased out and upgraded to high-visibility crosswalks. There are transverse line crosswalks across North Olden Avenue at Ward Avenue, Parker Avenue, Taylor Street, and Dickinson Street which are not controlled by a signal or sign. Current MUTCD guidance is to use high-visibility crosswalks where there is no other traffic control device.

Raised crosswalks and Rectangular Rapid Flashing Beacon (RRFB) can help slow vehicle speeds and make crossing for pedestrians more comfortable. Two locations have been previously identified that would benefit from this treatment: Girard Avenue and North Clinton Avenue was identified by the project team during the Inspired Safe Streets in East Trenton project, and the Capital City Farm entrance on North Clinton Avenue was identified in the TSCOC traffic audit and would help slow down vehicles entering the East Trenton neighborhood.

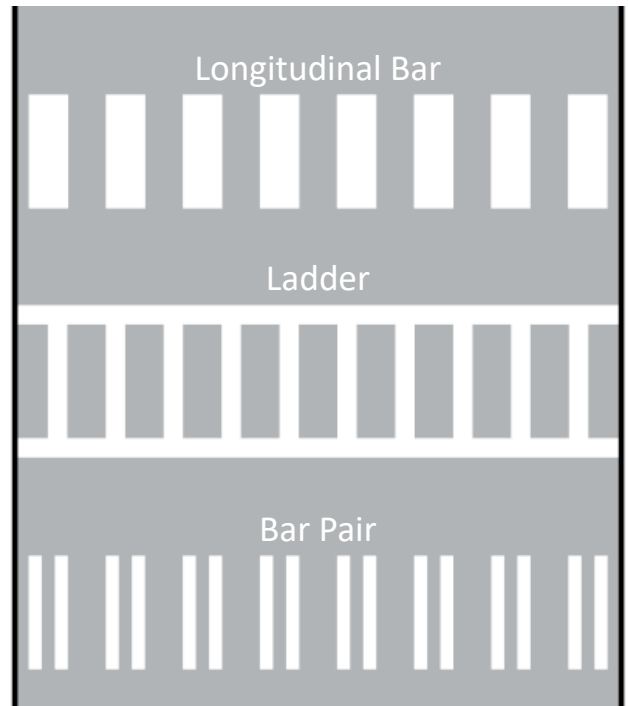


Figure 16 - High-visibility crosswalk examples from MUTCD Figure 3C-1 Crosswalk Markings

Recommendations

- Replace standard crosswalks with high-visibility crosswalks across all side streets intersecting North Clinton Avenue and North Olden Avenue.
- Add high-visibility crosswalks at key intersections across North Clinton Avenue, North Olden Avenue and Mulberry Street, also identified by the TSCOC traffic audit.
- Install a raised crosswalk with Rectangular Rapid Flashing Beacons (RRFB) at the Girard Avenue and North Clinton Avenue intersection to connect George Page Park and the new East Trenton Library Community Center. This is a main crossing for students walking to McKnight Elementary.
- Install a raised crosswalk with Rectangular Rapid Flashing Beacons (RRFB) at the Capital City Farm entrance, connecting to the police parking lot across the street, east of Escher Street.



Figure 17 - Worn Crosswalks at N. Clinton Ave & N. Olden Ave

¹ <https://highways.dot.gov/safety/proven-safety-countermeasures/crosswalk-visibility-enhancements>



Figure 18 - Unmarked crosswalk at Meade St & N. Clinton Ave



Figure 21 - Worn crosswalk at Ward Ave & N. Olden Ave



Figure 19 - Worn transverse line crosswalk across N. Olden Ave



Figure 22 - Location for new raised crosswalk at Girard Ave



Figure 20 - Family trying to cross Mulberry Street at Klagg Avenue. There are no marked crosswalks or safe places to cross this section of Mulberry Street

Lane Widths

Lane widths in an urban setting should be as narrow as possible to encourage slower vehicle speeds and increase safety for all road users. Currently, there are no edge lines on any of the streets in the study area to indicate the outside edge of the lane for drivers. Adding an edge line will help visually narrow the street and direct drivers to stay closer to the centerline, encouraging slower speeds. The Trenton Complete Street Design Handbook typically recommends 10' lane widths, with a maximum of 11' lanes where necessary for trucks and buses.

Recommendations

- Add an edge line or delineate parking lanes to make the travel lanes on North Clinton Avenue, North Olden Avenue, and Mulberry Street 11' wide.
- Once Girard Avenue and Houghton Avenue are one-way streets, they will feel very wide. Consider adding edge lines on either side to create a 10' lane in the center of the street.



Figure 23 - Wide lanes on N. Clinton Ave



Figure 24 - Wide lanes on N. Olden Ave

Lighting

With the overwhelming majority of pedestrians being killed in the dark, pedestrian-scale lighting is very important. Schoolchildren often leave for school early in the morning while it may still be dark in the winter, and if they stay late for after-school activities, they could be walking home near dusk. Well-lit sidewalks and crosswalks are vitally important. Intersection lighting can reduce pedestrian crashes up to 40%¹

Recommendations

- Evaluate current lighting at crosswalk locations and add pedestrian scale lighting where necessary.
- Evaluate current lighting along sidewalks and add pedestrian scale lighting where necessary.

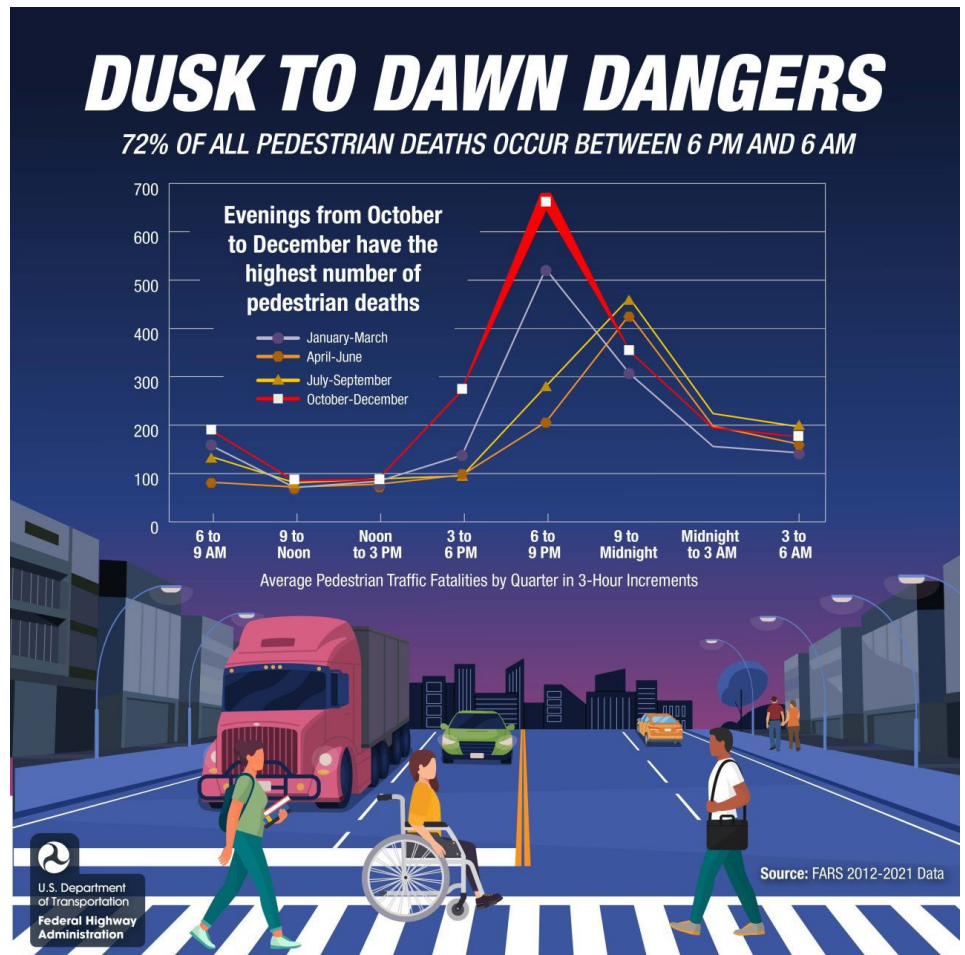


Figure 25 - FHWA night-time crash data



Figure 26 - N. Olden Ave & N. Clinton Ave intersection at 7pm on 10/16/24

¹ <https://highways.dot.gov/safety/proven-safety-countermeasures/crosswalk-visibility-enhancements>

Intersection Daylighting

When vehicles are parked too close to an intersection, they create an unsafe situation where drivers approaching an intersection cannot easily see people trying to cross the street. Intersection daylighting uses physical barriers to stop people from parking their vehicles too close to the corner. The images on the right show the progression of an intersection in Jersey City. In 2019, it was daylighted with a quick-build method using paint and flexible delineators, and then the city converted that to a permanent curb extension with pollinator gardens.

The Inspired Safe Streets in East Trenton project has begun quick-build intersection daylighting near McKnight Elementary School. Once evaluated, these should be converted to permanent infrastructure.

Recommendations

- At a minimum, install “No Parking Here to Corner” signs and paint the curb yellow within 25 feet of a crosswalk or 50 feet of a stop sign, as per NJ 39:4-138. We could not locate an ordinance in the Trenton code that would supersede the NJ code.
- Daylight intersections using quick-build methods to implement changes and test designs.
- Update quick-build curb extensions to permanent infrastructure, integrating green infrastructure wherever feasible.
- See Map 10 for intersection locations.



Figure 27 - Intersection before daylighting



Figure 28 - Intersection with quick-build curb extensions using flex posts and paint



Figure 29 - Permanent curb extensions using concrete sidewalks and plantings

INTERSECTION AND CORRIDOR FINDINGS AND RECOMMENDATIONS

This section addresses more specific issues observed at key corridors and intersections near McKnight Elementary School. These include North Olden Avenue, North Clinton Avenue, and Mulberry Street, as well as the intersections of North Olden Avenue and North Clinton Avenue, East State Street and North Olden Avenue.

North Clinton Avenue

North Clinton Avenue is a two-lane municipal street, functioning as a minor arterial, and is one of the main routes for students to walk or bike to school and anyone trying to get to or through the East Trenton neighborhood from east to west. Data collected by DVRPC in April of 2023 shows an average daily traffic volume of just over 35,000 vehicles per day, 18% of which are trucks. Speed data captured at the same time shows approximately 73% of vehicles were exceeding the 25 MPH speed limit. The travel plan focuses on the section of North Clinton Avenue between Perrine Avenue and Girard Avenue, approximately a half mile in length. Narrowing the travel lane, daylighting intersection and adding crosswalks as mentioned in the previous sections can all help reduce vehicle speeds.

In addition, there were maintenance issues along North Clinton Avenue, such as exposed wiring for street lights (Figure 30), and a damaged cabinet for the traffic signal near the North Olden Avenue intersection. During the walk audit, the group also encountered a dangerous section of sidewalk under construction, with gaps covered with plywood (Figure 31).

Recommendations:

- Ensure timely repairs of sidewalks and related infrastructure such as street lights and traffic signal cabinets to maintain safety and functionality.
- The city should enforce standards during construction to require safe access for pedestrians as per PROWAG R204.



Figure 30 - Light pole with exposed wiring



Figure 31 - Unsafe conditions during sidewalk construction

North Olden Avenue (County Road 622)

North Olden Avenue is an urban minor arterial street and the only connection between the southern catchment area and McKnight Elementary School, crossing the Northeast Corridor railroad tracks and the Assunpink Creek. The walk audit examined the segment between East State Street and North Clinton Avenue, where North Olden Avenue is a two-lane 25 MPH street.

During the walk audit, vehicles appeared to be exceeding the speed limit regularly. In general it was an unpleasant walk due to the poor sidewalk conditions, the fast moving traffic, and the adjacent industrial land-uses. Parked trucks were blocking the sidewalk in two locations during the walk audit, shown in Figure 33 and Figure 34.

The most notable barrier to walking along this section of North Olden Avenue is the bridge over the Northeast Corridor railroad tracks. It is an extremely unwelcoming path with high walls on both sides, shown in Figure 32. We observed trash, broken glass and feces while walking through this area. The high walls also make it difficult to see if anyone is waiting up ahead, and is a serious personal safety concern.

Recommendations

- Work with NJ DOT and Mercer County to expedite the replacement of the bridge over the railroad tracks.
- Consider redistricting the catchment area so students do not have to walk across this bridge.
- Work with local businesses and the police department to discourage trucks and other vehicles from blocking the sidewalks.



Figure 32 - Pedestrian walkway on the N. Olden Ave Bridge over the train tracks



Figure 33 - Parked truck blocking the crosswalk at Parker Ave and N. Olden Ave



Figure 34 - Truck blocking the sidewalk at building entrance on N. Olden Ave

Mulberry Street

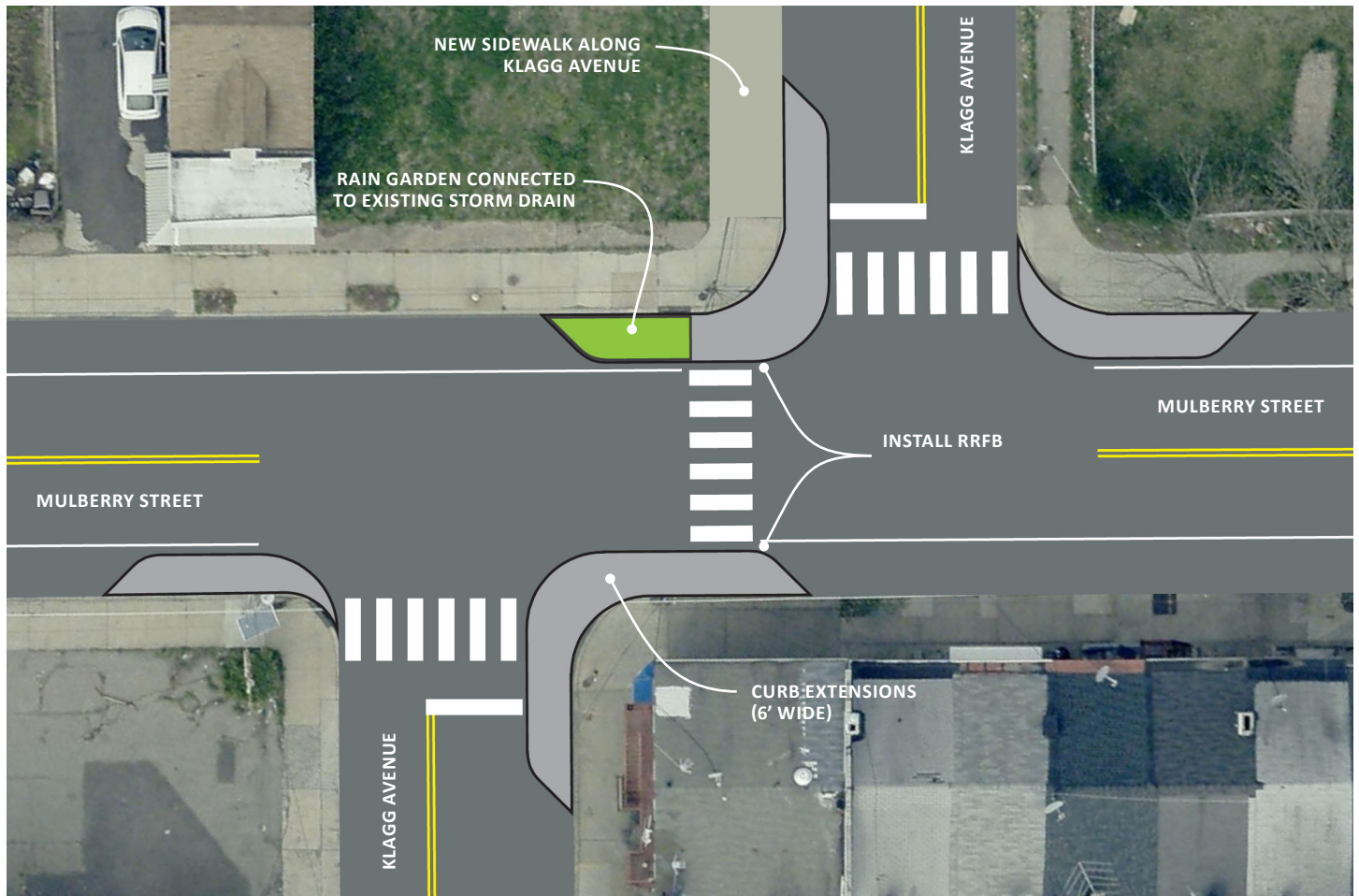
Mulberry Street is a two-lane municipal street, functioning as a major collector. Students living on the eastern side of Mulberry Street have to cross to get to their elementary school. There is heavy traffic, and a considerable amount of truck traffic. Counts conducted by DVRPC in April of 2023 on Mulberry Street showed an average daily traffic volume of roughly 11,000 vehicles, and 8.6% of those were trucks. Speed data collected also showed 60% of vehicles were exceeding the 25 MPH speed limit. Again, narrowing the travel lane, daylighting intersection and adding crosswalks as mentioned in the previous sections can all help reduce vehicle speeds.

Recommendations

- Recommended changes for the intersection of Mulberry Street and Klagg Avenue are shown below. Changes include: two 11 foot travel lanes with seven foot parking lanes on Mulberry Street; curb extensions to shorten the crossing distance and allow for improved curb ramps; and high-visibility continental style crosswalks. A rectangular rapid flashing beacon (RRFB) signal should be considered here also. Changes similar to these should be considered at the intersections of Cortland Street / Enterprise Avenue and Breunig Avenue along Mulberry Street as well.



Figure 35 - Truck traffic on Mulberry Street turning onto Enterprise Ave



North Olden Avenue & North Clinton Avenue Intersection

The majority of students must travel through the North Olden Avenue and North Clinton Avenue intersection on their way to McKnight Elementary School. As noted earlier, a 12 year-old child was struck by a car while riding their bike through this intersection in 2021.

This signal was installed in 1981. Currently, there are only pedestrian signal heads on two of the four corners, and some of them are not aligned properly (Figure 37). The pedestrian push buttons are old, and either not working or missing. Additionally the crosswalk is worn and the street needs to be repaved.

Recommendations

- Replace the traffic signal and include countdown pedestrian signal heads and accessible pedestrian signal buttons. Include a leading pedestrian interval to allow pedestrians time to cross before vehicles start moving.
- Repave the intersection and re-stripe existing crosswalks.
- Evaluate current lighting and add pedestrian scale lighting to illuminate the crosswalks at night if necessary.
- Restrict right-turn on red.
- Evaluate the need for a left turn phase for turns from North Olden Avenue onto North Clinton Avenue. The intersection is wide enough that drivers pass vehicles on the right when they are waiting to make a left turn.



Figure 36 - N. Olden Ave & N. Clinton Ave Intersection



Figure 37 - Misaligned pedestrian signals at N. Clinton Ave & N. Olden Ave



Figure 38 - Pedestrian push button missing from signal pole after being hit by a vehicle

East State Street & North Olden Avenue Intersection

This is a heavily trafficked intersection between two County roads where children are expected to cross to walk to school.

This signal was installed in 1981. There are no push buttons for the pedestrian signals at this intersection, and the signal heads are in poor condition. The street is so wide and the sidewalks so narrow, that the curb ramps at this intersection are not ADA compliant. Additionally the transverse line crosswalks (and most of the other road markings) are almost completely worn away. The pavement was also rutted from the heavy traffic so that the crosswalk was a tripping hazard.

Recommendations

- Replace traffic signal including countdown pedestrian signal heads and accessible pedestrian signal buttons. Include a leading pedestrian interval to allow pedestrians time to cross before vehicles start moving.
- Install curb extensions to allow room for ADA compliant curb ramps, this will also narrow the crossing for pedestrians and slow traffic
- Repave the intersection and re-stripe traffic markings, including high-visibility crosswalks.
- Evaluate current lighting and add pedestrian scale lighting to illuminate the crosswalks at night if necessary.
- Restrict right-turn on red



Figure 39 - E. State Street & N. Olden Ave intersection



Figure 40 - Northeast corner of E State Street and N Olden Ave



Figure 41 - No curb cuts at the northwest corner of E State Street and N Olden Ave

Other Roads Immediately Adjacent to McKnight Elementary School

Girard Avenue and Houghton Avenue, which run along the front and rear of the school, are being changed from two-way to one-way in the Fall/Winter of 2024. This will create a single lane about 14 feet wide, so speed humps are proposed to help reduce vehicle speeds. They were approved by the city, but are awaiting funding on a list of other approved speed humps city-wide. There are also plans to install curb extensions to daylight intersections around the school.

Additionally, there are sections of sidewalk missing on Cortland Street near the school (Figure 42 and Figure 43)

Recommendations

- Install speed humps on Girard Avenue and Houghton Avenue.
- Install new curb and sidewalk between Sherman Avenue and Houghton Avenue on the southern side of Cortland Avenue.
- Install new curb and sidewalk from Girard Avenue to the existing sidewalk on the southern side of Cortland Street
- Convert quick-build daylighting from the Inspired Streets in the East Trenton Neighborhood project to permanent curb extensions.
- Install School Zone Striping and Signage on Cortland Street, Girard Ave and Houghton Ave.



Figure 42 - Missing Sidewalk on Cortland St. Between Sherman Ave & Houghton Ave



Figure 43 - Missing sidewalk on Courtland St. at Girard Ave



Figure 44 - Quick-build daylighting at Girard Ave and N. Clinton Ave intersection

SUMMARY OF INFRASTRUCTURE AND NON-INFRASTRUCTURE RECOMMENDATIONS

The recommendations in this travel plan are intended to increase safety for students on their walk or bike ride to and from school and when appropriate, encourage more students to walk or bike. The table below identify those actions and a cost estimate. Cost estimates are for planning purposes only – a professional engineer should prepare the actual estimates used for grant application. These estimates were prepared using the NJDOT Transportation Alternatives Program 2022 Cost Estimate Guidelines And Recommendations For Pedestrian, Bicycle And Traffic Calming Projects. The estimated costs shown here have been escalated 5% per year for four years (2022 - 2026), and include a 30% allowance on top of construction costs for design fees. No costs are included for Maintenance and Protection of Traffic, Right-of-Way costs or Utility Relocation costs.

Table 7 - Summary of Recommendations				
ID	Recommendation	Category/Location	Type	Estimated Cost
1	Install or replace sidewalks at the locations shown on the sidewalk inventory	Sidewalks	Infrastructure	\$ 375,000
2	Ensure that there is a minimum 48" clear width along all sidewalks	Sidewalks	Policy	NA
3	Ensure that there is a minimum 80" vertical clearance along all sidewalks	Sidewalks	Policy	NA
4	Replace standard crosswalks with high-visibility crosswalks across all side streets intersecting N. Clinton Avenue and N. Olden Avenue	Crosswalks	Infrastructure	\$ 34,000
5	Add high-visibility crosswalks at key intersections across N. Clinton Avenue, N. Olden Avenue and Mulberry Street, identified by the TSCOC traffic audit	Crosswalks	Infrastructure	\$ 30,000
6	Install a raised crosswalk with Rectangular Rapid Flashing Beacons (RRFB) at the Girard Avenue and N. Clinton Ave	Crosswalks	Infrastructure	\$ 45,000
7	Install a raised crosswalk with Rectangular Rapid Flashing Beacons (RRFB) at the Capital City Farm entrance	Crosswalks	Infrastructure	\$ 45,000
8	Add an edge line or delineate parking lanes to make the travel lanes on N. Clinton Ave, N. Olden Ave, and Mulberry Street 11' wide	Lane Widths	Infrastructure	\$ 26,000
9	Add an edge line on either side of Girard Ave & Houghton Ave to create a 10' lane in the center of the street	Lane Widths	Infrastructure	\$ 7,500
10	Evaluate current lighting at crosswalk locations and add pedestrian scale lighting where necessary	Lighting	Planning	NA
11	Evaluate current lighting along sidewalks and add pedestrian scale lighting where necessary	Lighting	Planning	NA
12	Install "No Parking Here to Corner" signs and paint the curb yellow within 25 feet of a crosswalk or 50 feet of a stop sign, as per NJ 39:4-138	Daylighting	Infrastructure	TBD

Table 7 - Summary of Recommendations

ID	Recommendation	Category/Location	Type	Estimated Cost
13	Daylight intersections using quick-build methods to implement changes and test designs	Daylighting	Infrastructure	TBD
14	Update quick-build curb extensions to permanent infrastructure, integrating green infrastructure wherever feasible.	Daylighting	Infrastructure	TBD
15	Ensure timely repairs of sidewalks and related infrastructure such as street lights and traffic signal cabinets to maintain safety and functionality.	N. Clinton Ave	Policy	NA
16	Enforce standards during construction to require safe access for pedestrians as per PROWAG R204.	N. Clinton Ave	Policy	NA
17	Work with NJ DOT and Mercer County to expedite the replacement of the bridge over the railroad tracks.	N. Olden Ave	Planning	NA
18	Consider redistricting the catchment area so students do not have to walk across this bridge.	N. Olden Ave	Policy	NA
19	Work with local businesses and the police department to discourage trucks and other vehicles from blocking the sidewalks.	N. Olden Ave	Policy	NA
20	Curb Extensions/lane narrowing / hi vis crosswalks @ Mulberry & Klagg	Mulberry	Infrastructure	\$ 128,000
21	Replace the traffic signal and include countdown pedestrian signal heads and accessible pedestrian signal buttons. Include a leading pedestrian interval to allow pedestrians time to cross before vehicles start moving.	N. Olden Avenue & N. Clinton Avenue Intersection	Infrastructure	\$ 624,000
22A	Repave the intersection	N. Olden Avenue & N. Clinton Avenue Intersection	Infrastructure	TBD
22B	Re-stripe the existing crosswalks	N. Olden Avenue & N. Clinton Avenue Intersection	Infrastructure	\$ 12,000
23	Evaluate current lighting and add pedestrian scale lighting to illuminate the crosswalks at night if necessary	N. Olden Avenue & N. Clinton Avenue Intersection	Planning	NA
24	Restrict right-turn on red	N. Olden Avenue & N. Clinton Avenue Intersection	Infrastructure	\$ 1,800
25	Evaluate the need for a left turn phase for turns from North Olden Avenue onto N. Clinton Avenue.	N. Olden Avenue & N. Clinton Avenue Intersection	Planning	NA

Table 7 - Summary of Recommendations

ID	Recommendation	Category/Location	Type	Estimated Cost
26	Replace traffic signal including countdown pedestrian signal heads and accessible pedestrian signal buttons. Including a leading pedestrian interval to allow pedestrians time to cross before vehicles start moving.	E. State Street & N. Olden Avenue Intersection	Infrastructure	\$ 624,000
27	Install curb extensions to allow room for ADA compliant curb ramps, this will also narrow the crossing for pedestrians and slow traffic	E. State Street & N. Olden Avenue Intersection	Infrastructure	\$ 250,000
28A	Repave the intersection	E. State Street & N. Olden Avenue Intersection	Infrastructure	TBD
28B	Re-stripe traffic markings, including high-visibility crosswalks.	E. State Street & N. Olden Avenue Intersection	Infrastructure	\$ 30,000
29	Evaluate current lighting and add pedestrian scale lighting to illuminate the crosswalks at night if necessary.	E. State Street & N. Olden Avenue Intersection	Planning	NA
30	Restrict right-turn on red.	Other Roads Immediately Adjacent to McKnight Elementary School	Infrastructure	\$ 1,800
31	Install speed humps on Girard Avenue and Houghton Avenue. (two on each street)	Other Roads Immediately Adjacent to McKnight Elementary School	Infrastructure	\$ 63,000
32	Install new curb and sidewalk between Sherman Avenue and Houghton Avenue on the southern side of Cortland Avenue.	Other Roads Immediately Adjacent to McKnight Elementary School	Infrastructure	Included in ID 1
33	Install new curb and sidewalk from Girard Avenue to the existing sidewalk on the southern side of Cortland Street	Other Roads Immediately Adjacent to McKnight Elementary School	Infrastructure	Included in ID 1
34	Convert quick-build daylighting from the Inspired Streets in the East Trenton Neighborhood to permanent curb extensions	Other Roads Immediately Adjacent to McKnight Elementary School	Infrastructure	TBD

CONCLUSION

Trenton has unique challenges regarding students walking to school. During the 2022–2023 school year, the Trenton School District reconfigured school catchment areas to address uneven population growth and distribute students more evenly across schools. While this adjustment improved the efficient use of school buildings, it also led to longer walking distances for some families.

Darlene C. McKnight Elementary School, located in the East Trenton neighborhood, is home to over 350 students, as such, prioritizing the safety of students walking and biking to and from the school is of great importance in the City. The Darlene C. McKnight Elementary School Travel Plan was developed to identify issues and provide recommendations that would create a safer walking and bicycling environment in the City of Trenton. The overarching goal is to allow more students and their parents to choose active transportation for the trip to school.

Issues facing the East Trenton Neighborhood include crossing busy County roads, motorist speeding, broken pedestrian crossing signals, damaged and disjointed sidewalks, and faded crosswalks. A crash analysis of the area found that injury or fatal crashes are prevalent in the areas surrounding the school and that hit-and-run crashes are particularly common. This school travel plan is only the first step in improving the safety of students who walk and bike to school. It is up to all stakeholders to work together to bring these improvements to fruition.

With many students living within 15 minutes walking distance of Darlene C. McKnight Elementary School and dense residential development, the school is well-positioned to expand its walking and biking student body. Infrastructure improvements to address the issues detailed in this school travel plan, combined with safety programming, will undoubtedly increase safety and encourage more parents to have their children travel to school by walking or biking.

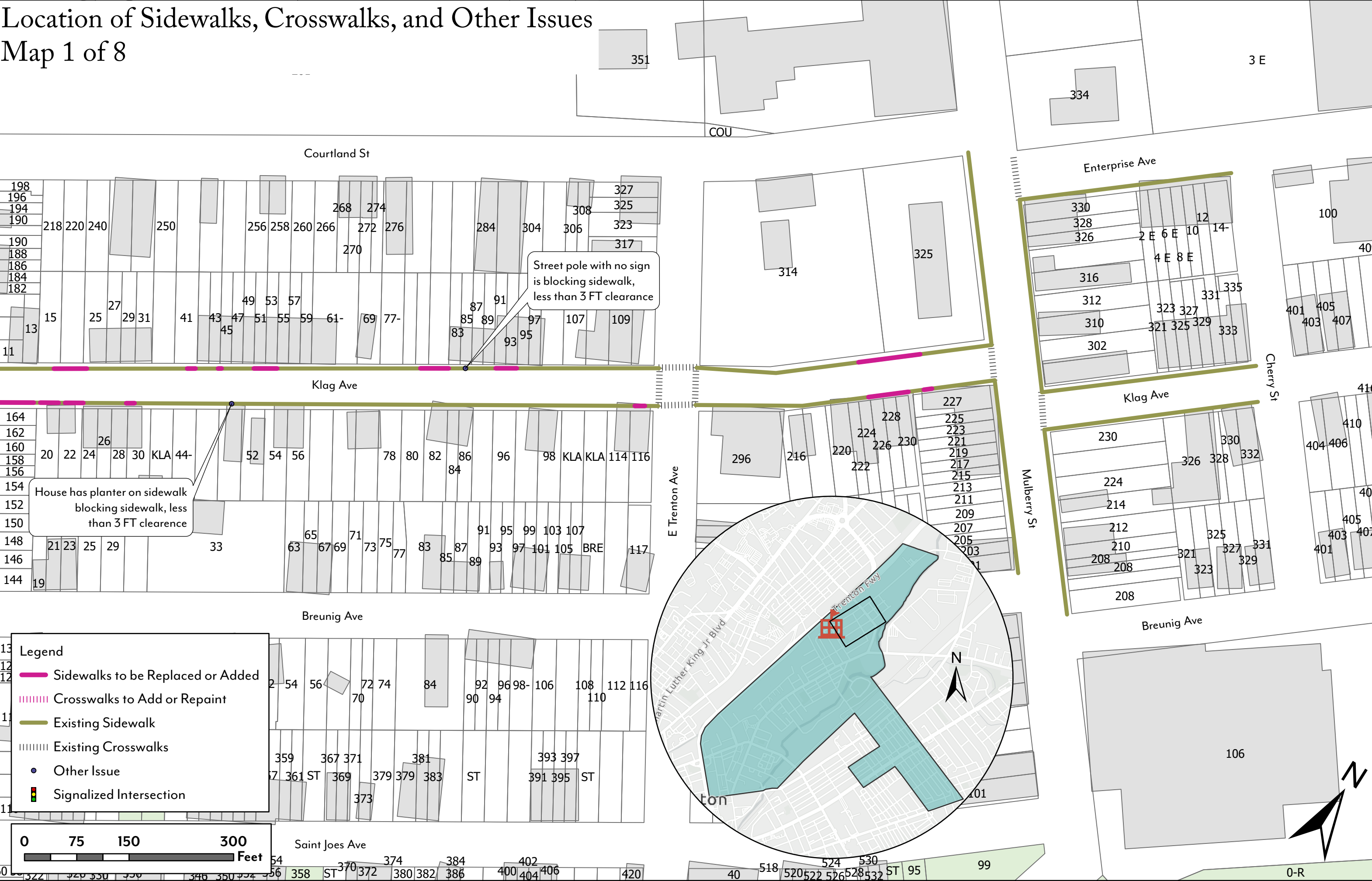
APPENDIX A: SIDEWALK INVENTORY MAPS

The following maps display the locations of damaged or missing sidewalks, faded crosswalks that need re-painting, places where new crosswalks are recommended, and ADA violations along the walk audit route. These maps are intended to be used to provide a more detailed location of proposed new sidewalks, crosswalks, or other issues. This data can also be viewed in a webmap by going to the following link:

<https://greatermercortma.maps.arcgis.com/apps/instant/basic/index.html?appid=ac2fd4398f0d42b3a8b046e1ecb3e0fb>

Location of Sidewalks, Crosswalks, and Other Issues

Map 1 of 8



Location of Sidewalks, Crosswalks, and Other Issues

Map 2 of 8

Escher St

201

Location of Sidewalks, Crosswalks, and Other Issues

Map 2 of 8

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Legend

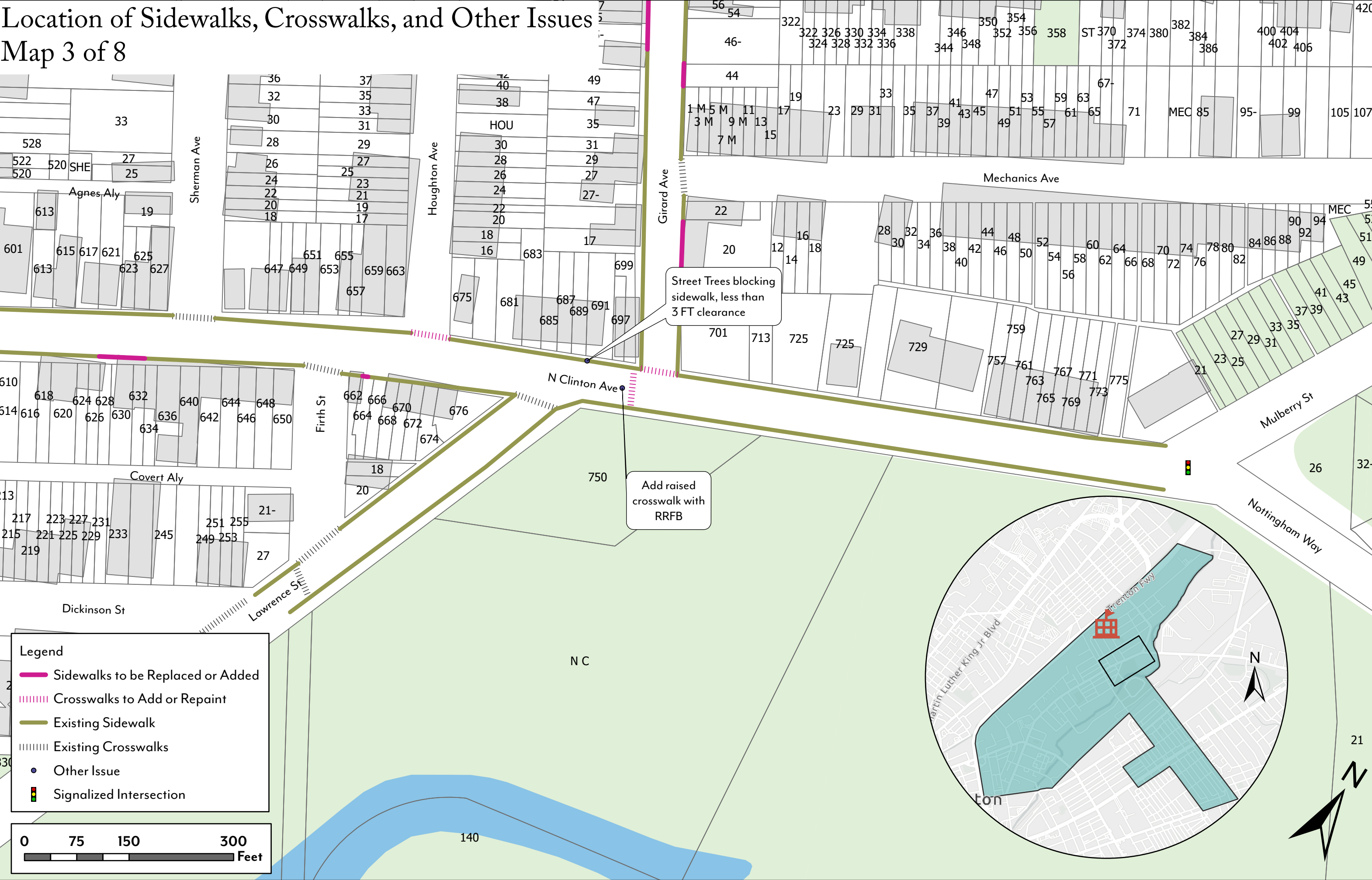
- Sidewalks to be Replaced or Added
- Crosswalks to Add or Repaint
- Existing Sidewalk
- Existing Crosswalks
- Other Issue
- Signalized Intersection

0 75 150 300 Feet



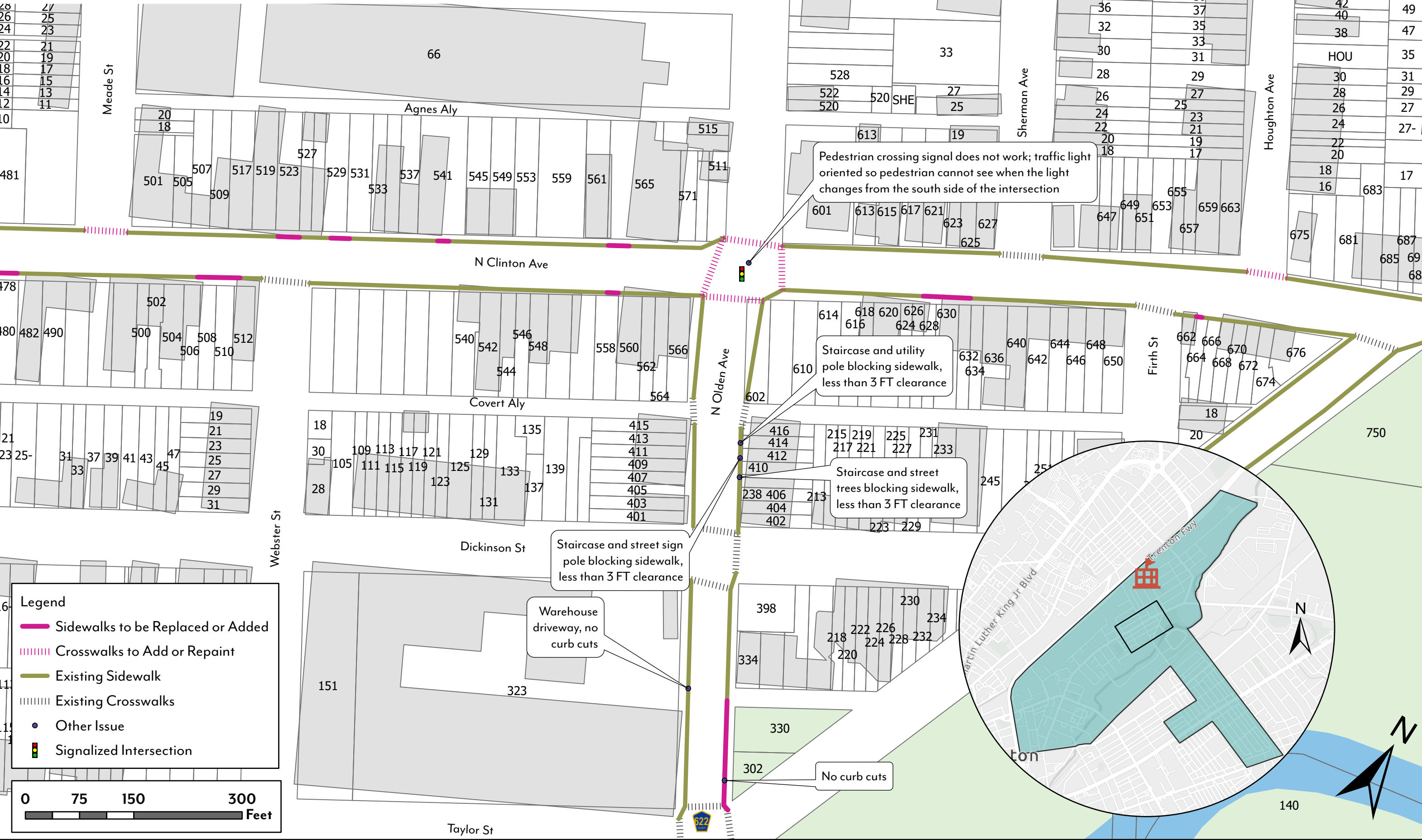
Location of Sidewalks, Crosswalks, and Other Issues

Map 3 of 8



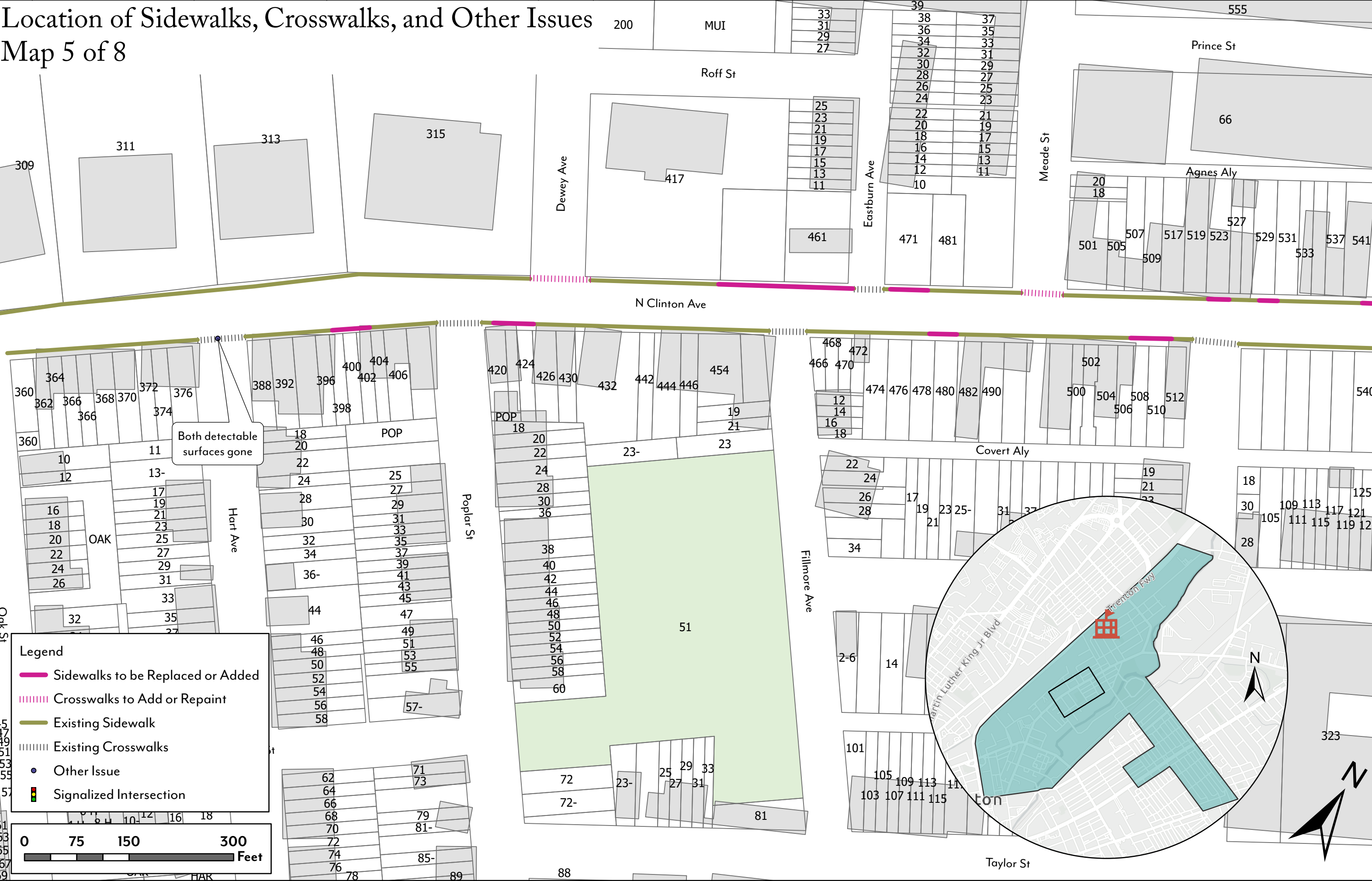
Location of Sidewalks, Crosswalks, and Other Issues

Map 4 of 8



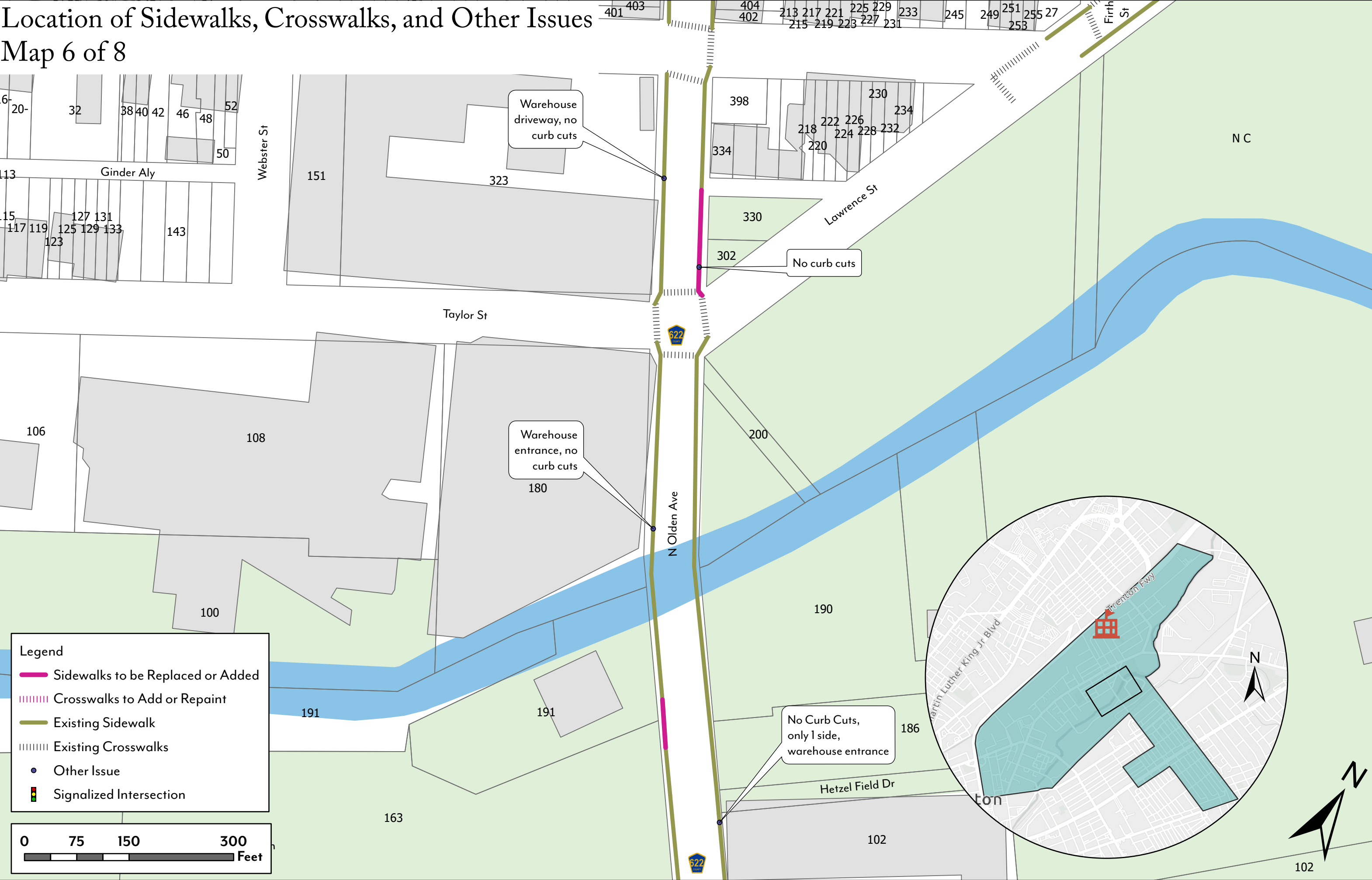
Location of Sidewalks, Crosswalks, and Other Issues

Map 5 of 8



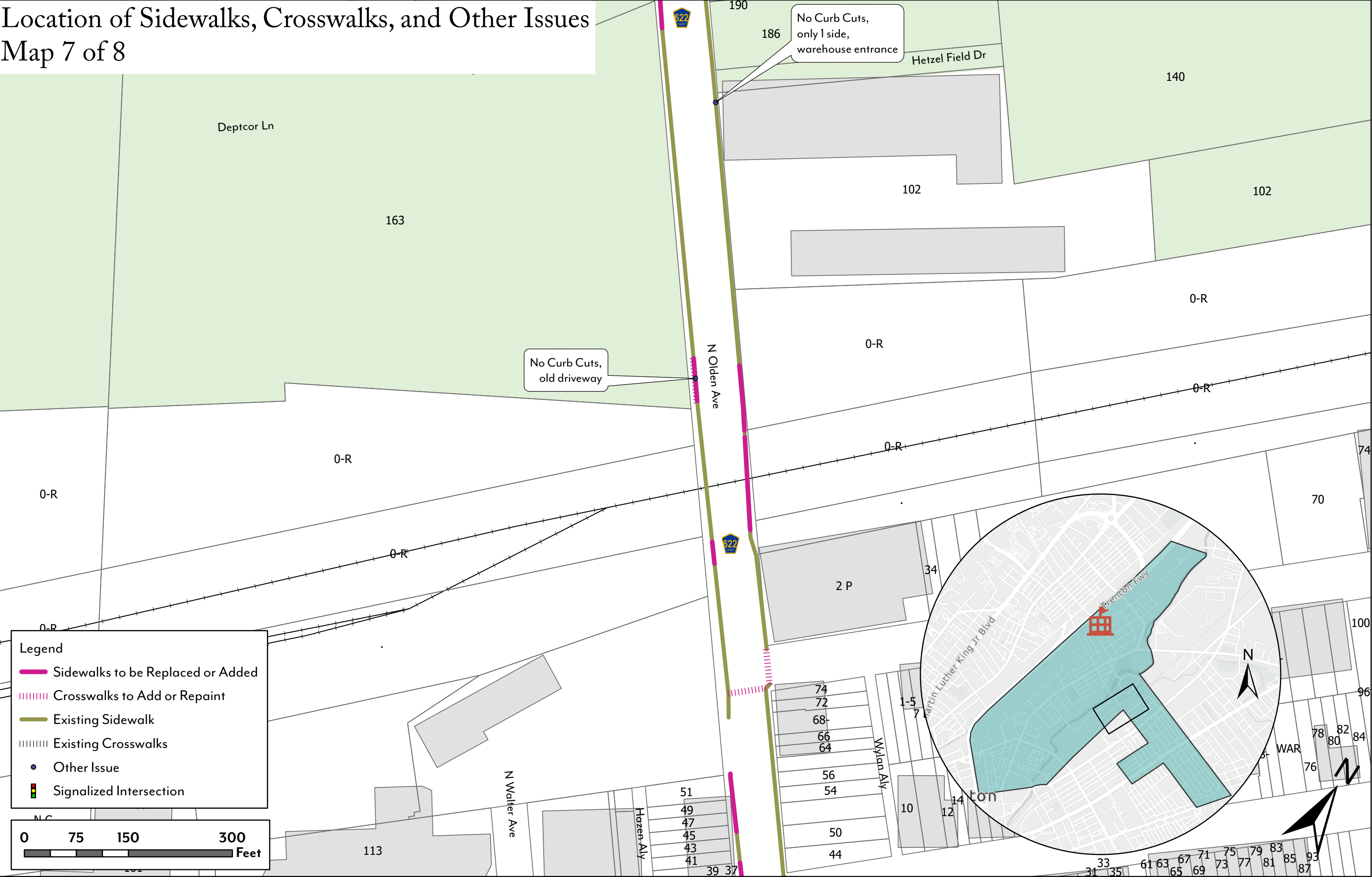
Location of Sidewalks, Crosswalks, and Other Issues

Map 6 of 8



Location of Sidewalks, Crosswalks, and Other Issues

Map 7 of 8



APPENDIX B: PROVEN SAFETY COUNTERMEASURES

The Federal Highway Administration is promoting safety through proven roadway design features.

For more information, see: <https://highways.dot.gov/safety/proven-safety-countermeasures>

Below is the complete list. The following pages provide a detailed explanation of select countermeasures.

OFFICE OF SAFETY

Proven Safety Countermeasures

SPEED MANAGEMENT

Speed Safety Cameras

Variable Speed Limits

Appropriate Speed Limits for All Road Users

ROADWAY DEPARTURE

Wider Edge Lines

Enhanced Delineation for Horizontal Curves

Longitudinal Rumble Strips and Stripes on Two-Lane Roads

SafetyEdge™

Roadside Design Improvements at Curves

Median Barriers

INTERSECTIONS

Backplates with Retroreflective Borders

Corridor Access Management

Dedicated Left- and Right-Turn Lanes at Intersections

Reduced Left-Turn Conflict Intersections

Roundabouts

Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections

Yellow Change Intervals

PEDESTRIANS/BICYCLES

Crosswalk Visibility Enhancements

Bicycle Lanes

Rectangular Rapid Flashing Beacons (RRFB)

Leading Pedestrian Interval

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

Pedestrian Hybrid Beacons

Road Diets (Roadway Reconfiguration)

Walkways

CROSSCUTTING

Pavement Friction Management

Lighting

Local Road Safety Plans

Road Safety Audit

FHWA-SA-21-082



Proven Safety Countermeasures



Safety Benefits:

Sidewalks

65-89%

reduction in crashes involving pedestrians walking along roadways.³

Paved Shoulders

71%

reduction in crashes involving pedestrians walking along roadways.³

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1.

Walkways

A walkway is any type of defined space or pathway for use by a person traveling by foot or using a wheelchair. These may be pedestrian walkways, shared use paths, sidewalks, or roadway shoulders.

With more than 6,200 pedestrian fatalities and 75,000 pedestrian injuries occurring in roadway crashes annually,¹ it is important for transportation agencies to improve conditions and safety for pedestrians and to integrate walkways more fully into the transportation system. Research shows people living in low-income communities are less likely to encounter walkways and other pedestrian-friendly features.²

Well-designed pedestrian walkways, shared use paths, and sidewalks improve the safety and mobility of pedestrians. Pedestrians should have direct and connected network of walking routes to desired destinations without gaps or abrupt changes. In some rural or suburban areas, where these types of walkways are not feasible, roadway shoulders provide an area for pedestrians to walk next to the roadway, although these are not preferable.

Transportation agencies should work towards incorporating pedestrian facilities into all roadway projects

unless exceptional circumstances exist. It is important to provide and maintain accessible walkways along both sides of the road in urban areas, particularly near school zones and transit locations, and where there is a large amount of pedestrian activity. Walkable shoulders should also be considered along both sides of rural highways when routinely used by pedestrians.



Example of a sidewalk in a residential area.
Source: pedbikeimages.org / Burden



Paved shoulder used as a walkway. Source: pedbikeimages.org / Burden

¹ National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration.

² Gibbs, et al. Income Disparities in Street Features that Encourage Walking. Bridging the Gap, (2012, March).

³ Gan et al. Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects. Florida DOT, (2005).



Safety Benefits:

**High-visibility crosswalks
can reduce pedestrian injury
crashes up to:**
40%¹

**Intersection lighting can
reduce pedestrian crashes
up to:**
42%²

**Advance yield or stop
markings and signs can
reduce pedestrian
crashes up to:**
25%³

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/techSheetVizEnhancemt2018.pdf>.

Crosswalk Visibility Enhancements

Poor lighting conditions, obstructions such as parked cars, and horizontal or vertical roadway curvature can reduce visibility at crosswalks, contributing to safety issues. For multilane roadway crossings where vehicle volumes are in excess of 10,000 Average Annual Daily Traffic (AADT), a marked crosswalk alone is typically not sufficient. Under such conditions, more substantial crossing improvements could prevent an increase in pedestrian crash potential.

Three main crosswalk visibility enhancements help make crosswalks and the pedestrians, bicyclists, wheelchair and other mobility device users, and transit users using them more visible to drivers. These include high-visibility crosswalks, lighting, and signing and pavement markings. These enhancements can also assist users in deciding where to cross. Agencies can implement these features as standalone or combination enhancements to indicate the preferred location for users to cross.

High-visibility crosswalks

High-visibility crosswalks use patterns (i.e., bar pairs, continental, ladder) that are visible to both the driver and pedestrian from farther away compared to traditional transverse line crosswalks. They should be considered at all midblock pedestrian crossings and uncontrolled intersections. Agencies should use materials such as inlay or thermoplastic tape, instead of paint or brick, for highly reflective crosswalk markings.

Improved Lighting

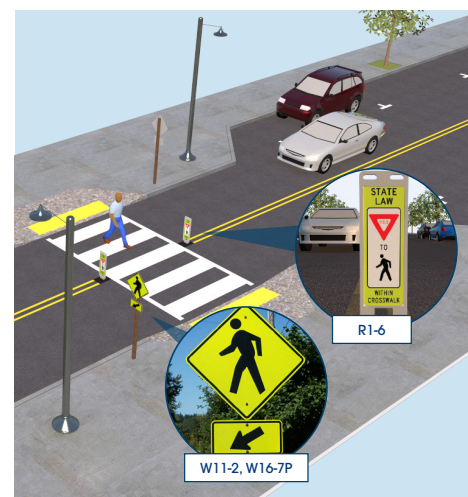
The goal of crosswalk lighting should be to illuminate with positive contrast to make it easier for a driver to visually identify the pedestrian. This involves carefully placing the luminaires in forward locations to avoid a silhouette effect of the pedestrian.

Enhanced Signing and Pavement Markings

On multilane roadways, agencies can use "YIELD Here to Pedestrians" or "STOP Here for Pedestrians" signs 20 to 50 feet in advance of

a marked crosswalk to indicate where a driver should stop or yield to pedestrians, depending on State law. To supplement the signing, agencies can also install a STOP or YIELD bar (commonly referred to as "shark's teeth") pavement markings.

In-street signing, such as "STOP Here for Pedestrians" or "YIELD Here to Pedestrians" may be appropriate on roads with two- or three-lane roads where speed limits are 30 miles per hour or less.



Source: FHWA

- 1 (CMF ID: 4123) Chen, L., C. Chen, and R. Ewing. The Relative Effectiveness of Pedestrian Safety Countermeasures at Urban Intersections - Lessons from a New York City Experience. (2012).
- 2 (CMF ID: 436) Elvik, R. and Vaa, T. Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).
- 3 (CMF ID: 9017) Zeeger et al. Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, FHWA, (2017).

Transportation agencies should refer to the Manual on Uniform Traffic Control Devices (MUTCD) for information on crosswalk markings (Chapter 3C) and in-street signing (Sections 2B.19 and 2B.20).



Safety Benefits:

RRFBs can reduce crashes up to:

47%

for pedestrian crashes.⁴

RRFBs can increase motorist yielding rates up to:

98%

(varies by speed limit, number of lanes, crossing distance, and time of day).³



RRFBs used at a trail crossing.
Source: LJB

For more information on this and other FHWA Proven Safety Countermeasures, please visit

<https://highways.dot.gov/safety/proven-safety-countermeasures> and https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/techSheet_RRFB_2018.pdf.

Rectangular Rapid Flashing Beacons (RRFB)

A marked crosswalk or pedestrian warning sign can improve safety for pedestrians crossing the road, but at times may not be sufficient for drivers to visibly locate crossing locations and yield to pedestrians. To enhance pedestrian conspicuity and increase driver awareness at uncontrolled, marked crosswalks, transportation agencies can install a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) to accompany a pedestrian warning sign. RRFBs consist of two, rectangular-shaped yellow indications, each with a light-emitting diode (LED)-array-based light source.¹ RRFBs flash with an alternating high frequency when activated to enhance conspicuity of pedestrians at the crossing to drivers.

Transportation agencies should refer to the *Manual on Uniform Traffic Control Devices (MUTCD)* for information on the application of RRFBs.¹

Applications

The RRFB is applicable to many types of pedestrian crossings but is particularly effective at multilane crossings with speed limits less than 40 miles per hour.² Research suggests RRFBs can result in motorist yielding rates as high as 98 percent at marked crosswalks, but varies depending on the location, posted speed limit, pedestrian crossing distance, one- versus two-way road, and the number of travel lanes.³ RRFBs can also accompany school or trail crossing warning signs.

RRFBs are placed on both sides of a crosswalk below the pedestrian crossing sign and above the diagonal downward arrow plaque pointing at the crossing.¹ The flashing pattern can be activated with pushbuttons or passive (e.g., video or infrared) pedestrian detection, and should be unlit when not activated.

Considerations

Agencies should:²

- Install RRFBs in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median.
- Use solar-power panels to eliminate the need for a power source.
- Reserve the use of RRFBs for locations with significant pedestrian safety issues, as over-use of RRFB treatments may diminish their effectiveness.

Agencies shall not:²

- Use RRFBs without the presence of a pedestrian, school or trail crossing warning sign.
- Use RRFBs for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons, except for the approach or egress from a roundabout.

¹ Manual on Uniform Traffic Control Devices (MUTCD), Chapter 4L. FHWA, (2023).

² "Rectangular Rapid Flash Beacon" in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. FHWA, (2013).

³ Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).

⁴ (CMF ID: 9024) NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).



Safety Benefits:

Median with
Marked Crosswalk

46%

reduction in
pedestrian crashes.²

Pedestrian Refuge
Island

56%

reduction in
pedestrian crashes.²

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-08/techSheetPedRefugeIsland2018.pdf>.

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.

A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.¹ For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.

Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane

roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.



Example of a road with a median and pedestrian refuge islands.
Source: City of Charlotte, NC



Median and pedestrian refuge island near a roundabout. Source: www.pedbikeimages.org / Dan Burden

¹ National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration
² (CMF ID: 175) Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.

Proven Safety Countermeasures



Safety Benefits:
Lighting can reduce
crashes up to:

42%

for nighttime injury pedestrian
crashes at intersections.¹

33-38%

for nighttime crashes at rural
and urban intersections.^{2,1}

28%

for nighttime injury crashes
on rural and urban
highways.¹



Source: FHWA

**For more information on this
and other FHWA Proven Safety
Countermeasures, please visit
[https://highways.dot.gov/
safety/proven-safety-counter
measures](https://highways.dot.gov/safety/proven-safety-countermeasures) and [https://
highways.dot.gov/safety/
other/visibility/roadway-
lighting-resources](https://highways.dot.gov/safety/other/visibility/roadway-lighting-resources).**

Lighting

The number of fatal crashes occurring in daylight is about the same as those that occur in darkness. However, the nighttime fatality rate is three times the daytime rate because only 25 percent of vehicle miles traveled (VMT) occur at night. At nighttime, vehicles traveling at higher speeds may not have the ability to stop once a hazard or change in the road ahead becomes visible by the headlights. Therefore, lighting can be applied continuously along segments and at spot locations such as intersections and pedestrian crossings in order to reduce the chances of a crash.

Adequate lighting (i.e., at or above minimum acceptable standards) is based on research recommending horizontal and vertical illuminance levels to provide safety benefits to all users of the roadway environment. Adequate lighting can also provide benefits in terms of personal security for pedestrians, wheelchair and other mobility device users, bicyclists, and transit users as they travel along and across roadways.

Applications

Roadway Segments

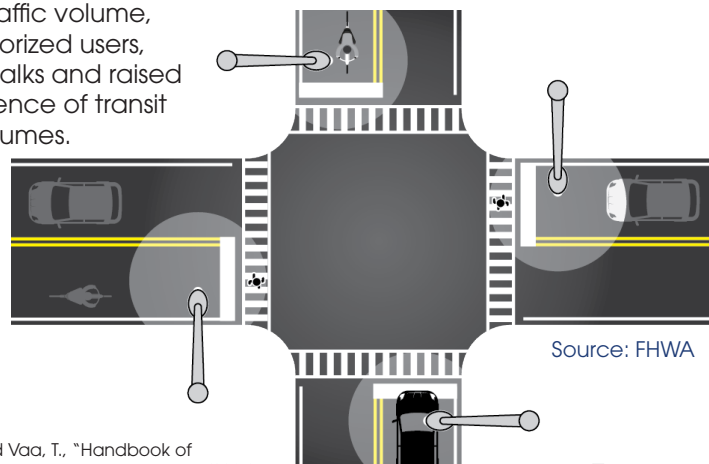
Research indicates that continuous lighting on both rural and urban highways (including freeways) has an established safety benefit for motorized vehicles.¹ Agencies can provide adequate visibility of the roadway and its users through the uniform application of lighting that provides full coverage along the roadway and the strategic placement of lighting where it is needed the most.

Intersections and Pedestrian Crossings

Increased visibility at intersections at nighttime is important since various modes of travel cross paths at these locations. Agencies should consider providing lighting to intersections based on factors such as a history of crashes at nighttime, traffic volume, the volume of non-motorized users, the presence of crosswalks and raised medians, and the presence of transit stops and boarding volumes.

Considerations

Most new lighting installations are made with breakaway features, shielded, or placed far enough from the roadway to reduce the probability and/or severity of fixed-object crashes. Modern lighting technology gives precise control with minimal excessive light affecting the nighttime sky or spilling over to adjacent properties. Agencies can equitably engage with underserved communities to determine where and how new and improved lighting can most benefit the community by considering their priorities, including eliminating crash disparities, connecting to essential neighborhood services, improving active transportation routes, and promoting personal safety.



Source: FHWA

¹ (CMF ID: [436.433.192](#)) Elvik, R. and Vaa, T., "Handbook of Road Safety Measures." Oxford, United Kingdom, Elsevier, (2004).

² (CMF ID: [2376](#)) Ye et al. A Simultaneous Equations Model of Crash Frequency By Collision Type for Rural Intersections, 87th Annual Meeting of the Transportation Research Board, (2008).



Safety Benefits:

Left-Turn Lanes

28-48%

reduction in total crashes.¹

Positive Offset Left-Turn Lanes

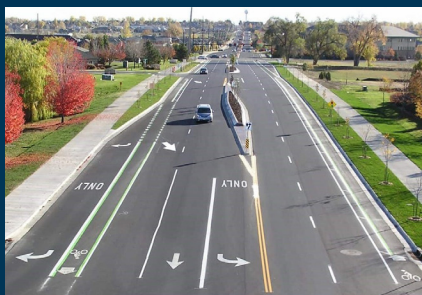
36%

reduction in fatal and injury crashes.²

Right-Turn Lanes

14-26%

reduction in total crashes.¹



Left- and right-turn lanes at a two-way stop-controlled intersection. Source: City of Greeley, CO

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://www.fhwa.dot.gov/publications/research/safety/02103/02103techbrief.pdf>.

Dedicated Left- and Right-Turn Lanes at Intersections

Auxiliary turn lanes—either for left turns or right turns—provide physical separation between turning traffic that is slowing or stopped and adjacent through traffic at approaches to intersections. Turn lanes can be designed to provide for deceleration prior to a turn, as well as for storage of vehicles that are stopped and waiting for the opportunity to complete a turn.

While turn lanes provide measurable safety and operational benefits at many types of intersections, they are particularly helpful at two-way stop-controlled intersections. Crashes occurring at these intersections are often related to turning maneuvers. Since the major route traffic is free flowing and typically travels at higher speeds, crashes that do occur are often severe. The main crash types include collisions of vehicles turning left across opposing through traffic and rear-end collisions of vehicles turning left or right with other vehicles following closely behind. Turn lanes reduce the potential for these types of crashes.

Installing left-turn lanes and/or right-turn lanes should be considered for the major road approaches for improving safety at both three- and four-leg intersections with stop control on the minor road, where significant turning volumes exist, or where there is a history of turn-related crashes. Pedestrian and bicyclist safety and convenience should also be considered when adding turn lanes at an intersection. Specifically, offset left- and right-turn

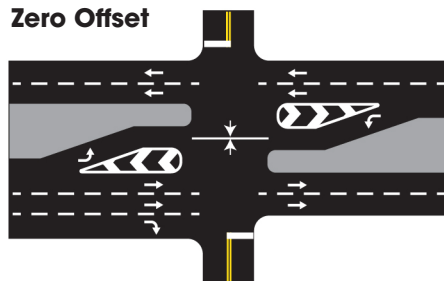
lanes will lengthen crossing distances for pedestrians.

Offset Turn Lanes

Providing offset of left- and right-turn lanes to increase visibility can provide added safety benefits, and is preferable in many situations, particularly at locations with higher speeds, or where free-flow or permissive movements are possible.

At turn lanes with zero or negative offset, turning vehicles can block sightlines. For left-turn lanes, this usually involves opposing left-turning vehicles occupying the turn lanes at the same time. For right-turn lanes, this typically involves right-turning vehicles from the major road and vehicles entering the intersection from the minor road. In both scenarios, adding positive offset to turn lanes enhances the sight distance to approaching vehicles that conflict with the turning movement. Offset turn lanes should be considered when there is a high frequency of these types of conflicts in order to reduce the likelihood of a severe crash.

Zero Offset



Positive Offset

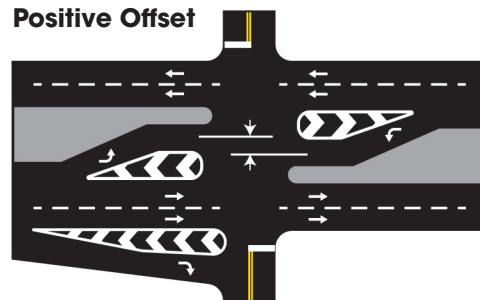


Illustration comparing zero offset to positive offset of left- and right-turn lanes. Source: FHWA

¹ (CMF ID: 260, 268, 285, 289) Harwood et al. Safety Effectiveness of Intersection Left- and Right-Turn Lanes. FHWA-HRD-02-089, (2002).

² (CMF ID: 6096) Persaud et al. Safety Evaluation of Offset Improvements for Left-Turn Lanes. FHWA-HRT-09-035, (2009).