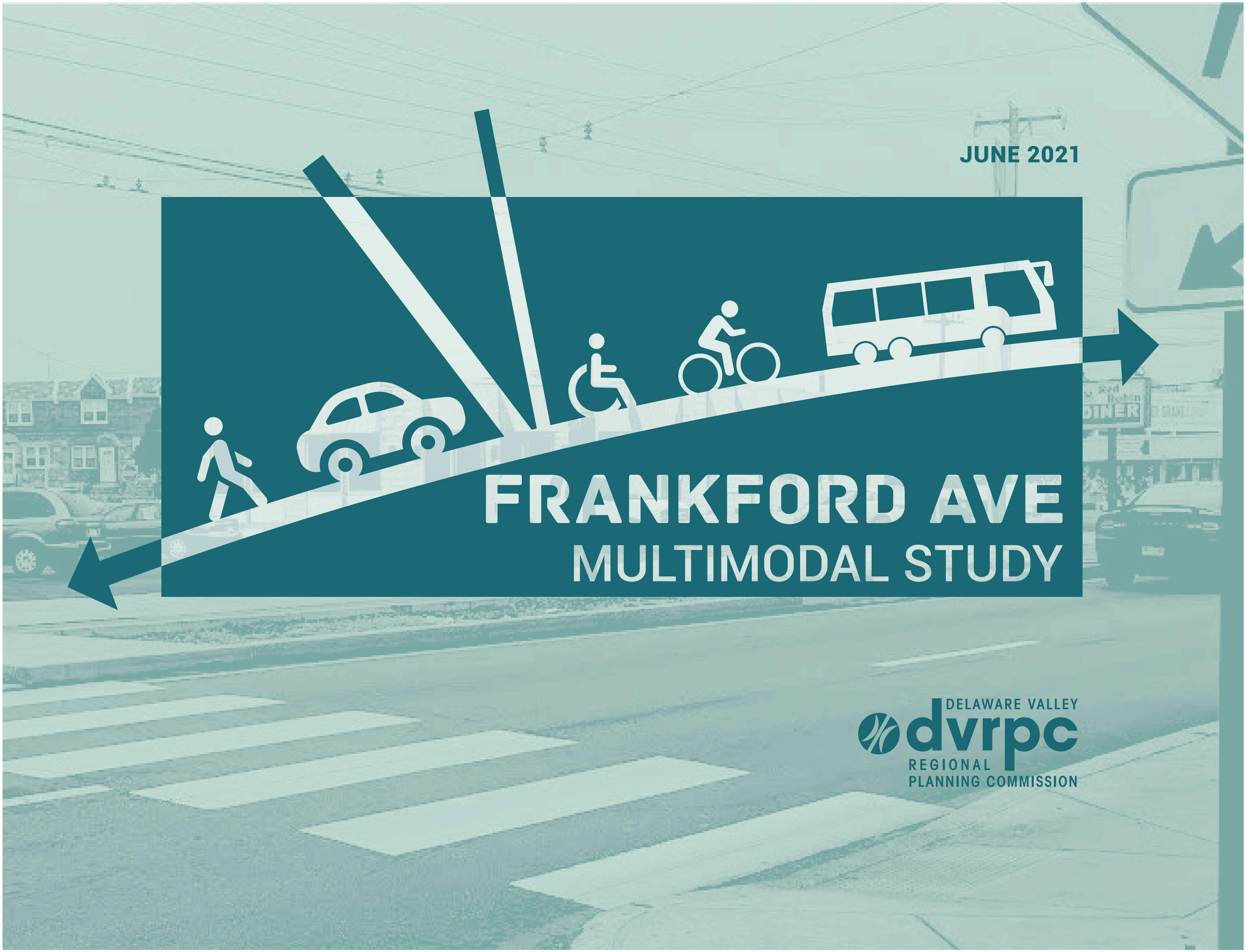

JUNE 2021

FRANKFORD AVE
MULTIMODAL STUDY

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

The Delaware Valley Regional Planning Commission

is the federally designated Metropolitan Planning Organization for a diverse nine-county region in two states: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

DVRPC's vision for the Greater Philadelphia Region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision-making. We are engaged across the region, and strive to be leaders and innovators, exploring new ideas and creating best practices.

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DVRPC is funded through a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for the findings and conclusions herein, which may not represent the official views or policies of the funding agencies.

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01

INTRODUCTION

FRANKFORD AVE MULTIMODAL STUDY

CHAPTER 1

INTRODUCTION

Frankford Avenue serves many roles for adjacent communities and for the City of Philadelphia. As a thriving commercial corridor, it provides space for family-owned businesses and anchors the local retail economy. As a high-frequency transit route, it provides essential trackless trolley service for riders in northeast Philadelphia. As a high-volume north-to-south arterial roadway paralleling the Delaware River, it connects freight to businesses and drivers of personal vehicles to the wider highway network between Center City and the Bucks County line. As a cultural center and destination, it famously hosts large pedestrian gatherings such as Cottman Triangle sports celebrations and an annual Thanksgiving parade.

These roles bring different roadway users and travel modes into close contact, and conflict, on a daily basis. High vehicle volumes and speeds create safety issues for pedestrians and bicyclists as well as drivers. Heavy traffic and congestion can impede transit service and restrict access to local businesses.

Bringing these travel modes into better balance would not only improve safety and mobility for the traveling public, but would also support the local business community as the corridor becomes safer and more pleasant to visit.

The purpose of the Frankford Avenue Multimodal Study is to identify traffic calming and roadway design strategies that better balance travel modes to serve all roadway users and the local community. Figure 1 outlines the goals of the study by travel mode.

Project Background

This report focuses on the section of Frankford Avenue from Cheltenham Avenue to Rhawn Street. This section of Frankford Avenue has been the subject of planning studies in the past several years (Figure 2).

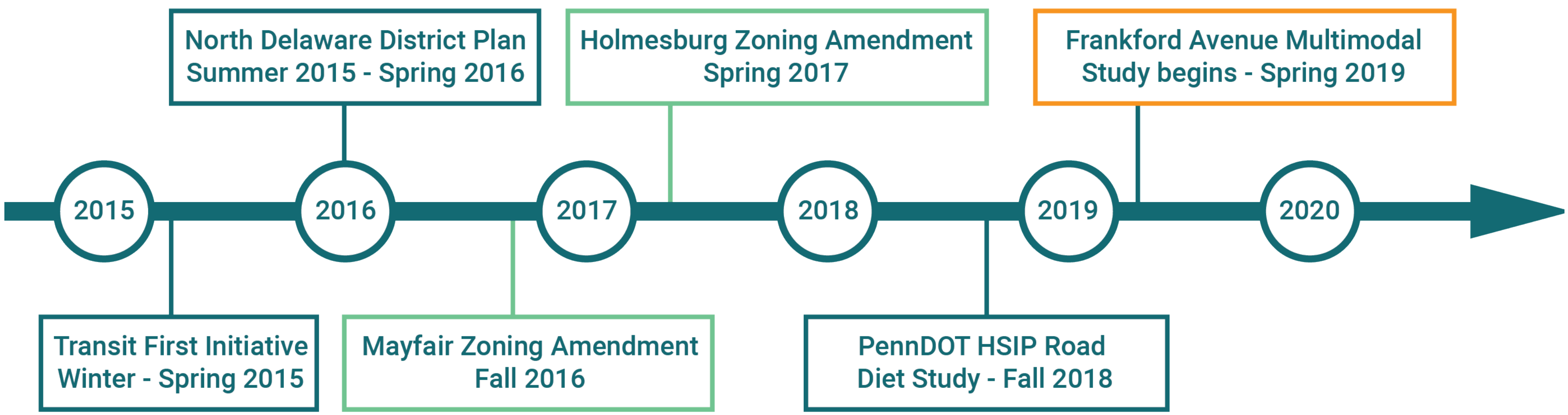
Transit First

In 2015, the corridor was studied as part of Transit First, an inter-agency initiative to enhance transit throughout Philadelphia. The study led to operational improvements to SEPTA's Route 66 Trackless Trolley, such as transit signal priority and stop consolidation.[1]

[1] A detailed list of improvements made as part of this initiative can be found at www.septa.org/notice/frankford-ave-corridor.html

Figure 1: Study Goals

Figure 2: Timeline of Previous Planning Work



North Delaware District Plan

In 2016, the Philadelphia City Planning Commission (PCPC) adopted the North Delaware District Plan, the culmination of a series of public and stakeholder workshops conducted to identify transportation and development goals for the communities that fall within the city's North Delaware planning district, including the neighborhoods of Holmesburg, Mayfair, Tacony, and Wissinoming. The North Delaware District Plan[2] included transportation recommendations for Frankford Avenue and intersecting roadways including:

- Identifying Complete Streets projects on wide, crash prone streets such as Frankford, Cottman, Torresdale, and Harbison Avenues;
- Improving safety for pedestrians and bicyclists across major streets such as Frankford Avenue;
- Identifying strategies to increase safety at priority intersections, including Frankford Avenue at Cottman Avenue, Tyson Avenue, and Harbison Avenue;
- Improving walkability along the Frankford Avenue corridor;
- Improving the overall commercial experience along Frankford Avenue; and
- Creating a gathering space at Frankford Avenue and Ryan Avenue.

The District Plan also led to a series of zoning amendments encouraging more residential and employment density, a more diverse mix of land uses, and safer pedestrian access within the existing commercial corridor.

Public workshop supporting the North Delaware District Plan. Source: Philadelphia City Planning Commission, 2015

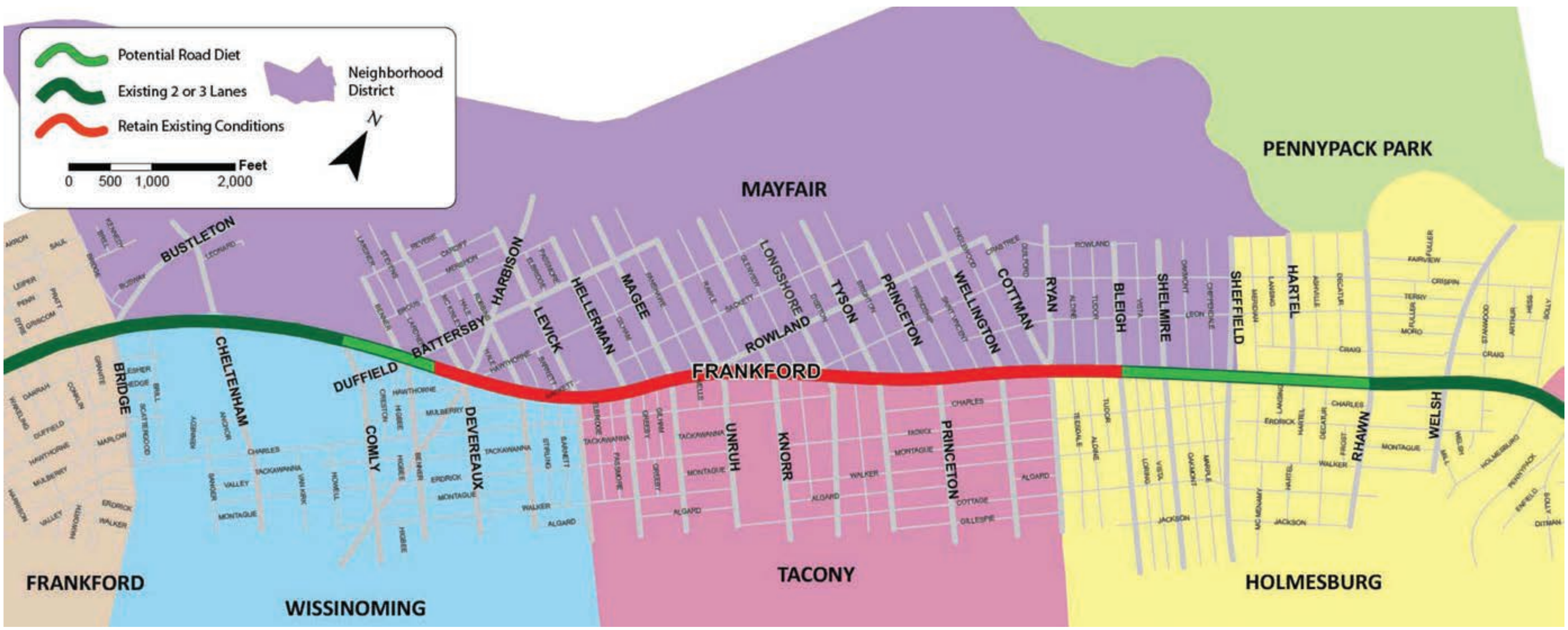
[2] North Delaware District Plan: www.phila2035.org/north-delaware

PennDOT Highway Safety Improvement Program (HSIP)

In 2018, the Pennsylvania Department of Transportation (PennDOT) identified Frankford Avenue as a priority corridor for safety improvements under its Highway Safety Improvement Program (HSIP).

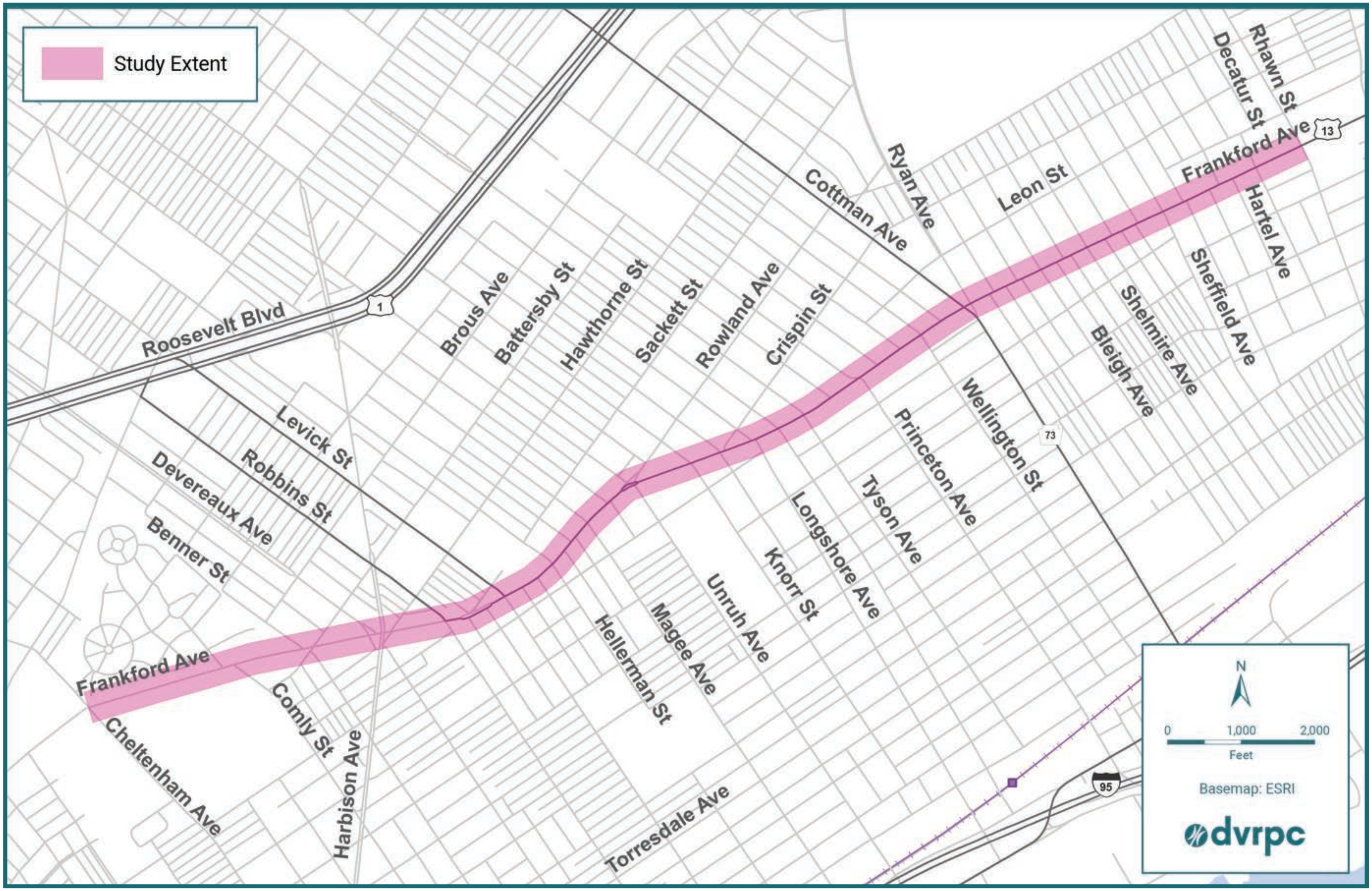
As part of this work, a study was conducted by HNTB to determine whether a road diet, or reallocation of vehicle travel lanes for other uses, was feasible. That study found that a three-lane configuration would create unstable traffic conditions between Harbison Avenue and Bleigh Avenue, but that three lanes could provide adequate capacity between Comly Avenue and Harbison Avenue, and between Bleigh Avenue and Rhawn Street (Figure 3).

Figure 3: Potential Road Diet Extent from PennDOT Study



Source: PennDOT, HNTB 2018

Figure 4: Study Area



Study Area Characteristics

The study area consists of Frankford Avenue from Cheltenham Avenue to Rhawn Street, a 2.75-mile segment in the North Delaware District (Figure 4). This section of Frankford Avenue travels through and between the Wissinoming, Tacony, Mayfair, and Holmesburg neighborhoods.

Land Use

Frankford Avenue is a vital commercial corridor for North Philadelphia, with retail and other commercial and mixed uses lining both sides of the roadway from Battersby Street to Rhawn Street (Figure 5). Storefront typologies vary along the corridor. Large chain retailers with ample off-street parking can be found south of Cottman Avenue, particularly on the west side of Frankford Avenue and in the Mayfair Shopping Center on Levick Street. Auto-oriented retailers such as car repair shops, car dealerships, and drive-through restaurants are concentrated south of Wellington Street and north of Shelmire Avenue. Smaller shops and restaurants are located throughout the study area, including a substantial cluster between Wellington Street and Bleigh Avenue. Shops in this area are more pedestrian-oriented, with storefronts fronting the sidewalk and fewer driveways and parking lots. Businesses between Harbison Avenue and Sheffield Avenue are served by the Mayfair Business Improvement District (BID).

Between Cheltenham Avenue and Battersby Street, land use is dominated by Wissinoming Park and three cemeteries. South of the study area, commercial activity picks back up near the Frankford Transportation Center, while the north end of the corridor connects to Pennypack Park. Land use east and west of the corridor is primarily residential, with mostly medium-density residential (row homes with rear driveway parking) to the west, and medium-density interspersed with single-family detached homes to the east.

Zoning

Prior to the 2016 North Delaware District Plan, most parcels along Frankford Avenue were zoned as either Auto-Oriented Commercial (CA-1, CA-2) or Neighborhood Commercial Mixed Use (CMX-1, CMX-2, CMX-2.5). The District Plan proposed zoning changes on a number of properties on Frankford Avenue in order to encourage new and different forms of development. Several auto-oriented parcels were to be changed to "mixed use" commercial zoning. A smaller number of parcels were designated to be rezoned for corrective reasons, to match the existing land use. The stated purpose for all rezoning was to "encourage residential density to support the commercial corridor and promote pedestrian-oriented scale."

Two rezoning bills were passed in 2016 (Comly Street to Sheffield Avenue) and 2018 (Sheffield Avenue to Rhawn Street) to implement the changes proposed in the District Plan (Figure 6).[3] The updated zoning specifications may promote changes to the built environment in the study area over the next five to ten years, including denser residential development and a shift from auto-oriented to compact walkable commercial uses. Many CMX parcels will no longer allow front loaded parking and, if redeveloped, will contribute to a more walkable corridor. This is particularly true where front loaded off-street parking is abundant, such as on the east side of Frankford Avenue between Harbison Avenue and Cottman Avenue. The transportation recommendations developed over the course of this study seek to support this transition by enhancing the pedestrian environment.

[3] See bills 160916 and 180173, phila.legistar.com/Legislation.aspx

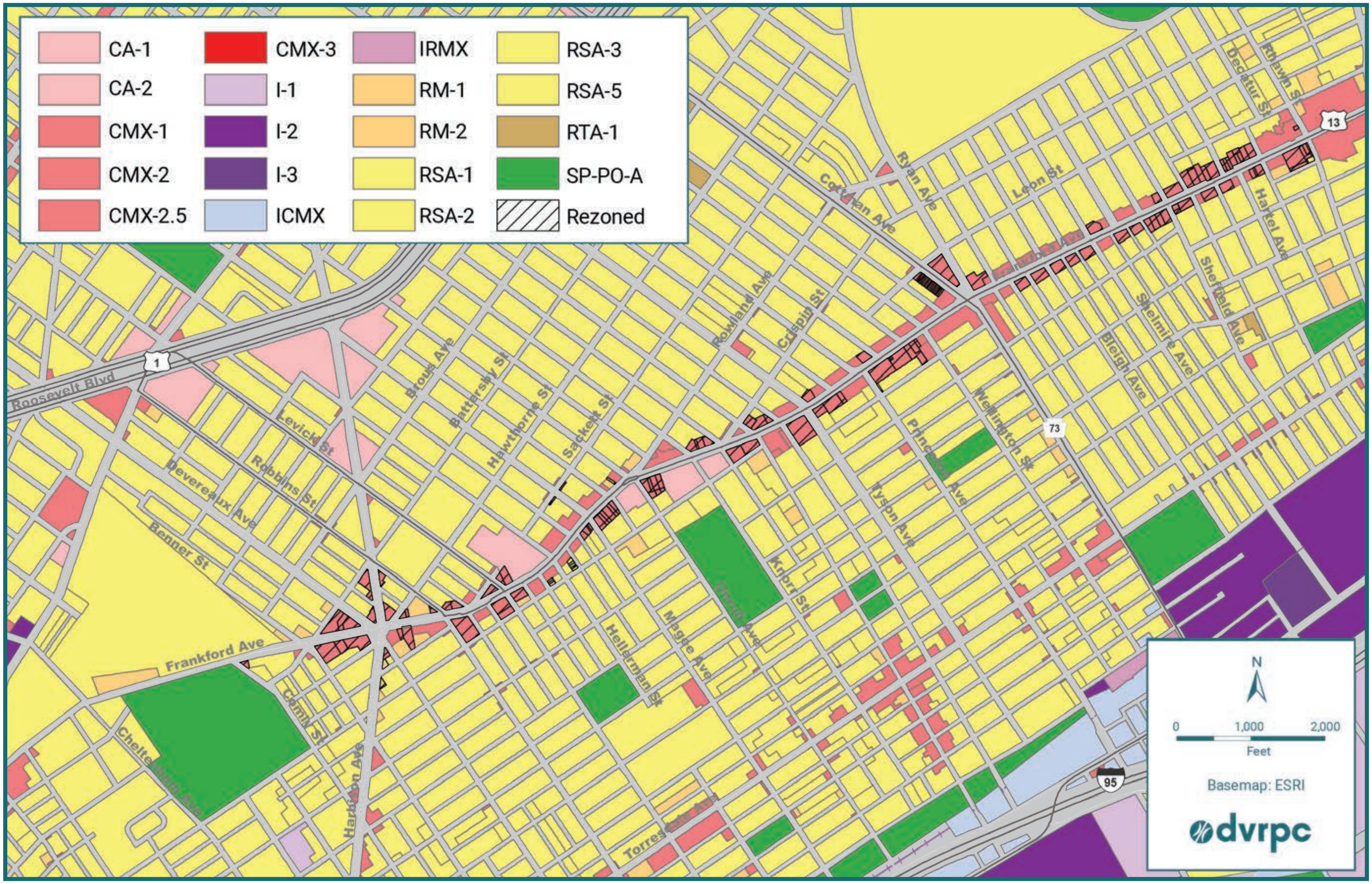
Population Characteristics

The total population of the study area, comprised of the census tracts that primarily overlap the neighborhood boundaries of Wissinoming, Mayfair, Tacony, and Holmesburg, is about 78,000 (U.S. Census Bureau, American Community Survey 2017 5-year estimates). About 20,000 residents, or 27 percent of the population, are under 18 years old, and over 8,500, or 11 percent, are 65 or older. Taken together, over a third of the population falls under these vulnerable age categories, underscoring the need for safe, accessible infrastructure. Fifteen percent of area residents have a disability. The unemployment rate is 12 percent, and the household poverty rate is 21 percent. Thirty-five percent of residents identify as a racial minority, and 19 percent are Hispanic. Transit is an essential resource in the study area, with 18 percent of residents commuting primarily by transit. Over 4,500 study area households, about 16 percent, do not have access to a personal vehicle.

Figure 5: Land Use

Source: Philadelphia City Planning Commission 2016

Figure 6: Zoning



Source: Philadelphia City Planning Commission 2019

02

TRANSPORTATION

FRANKFORD AVE MULTIMODAL STUDY

CHAPTER 2

TRANSPORTATION

Frankford Avenue is a priority transit corridor as well as a principal arterial serving high volumes of traffic. The Avenue features high pedestrian volumes, particularly in the walkable commercial corridor. Bicyclists and trucks also use the roadway. This mix of travel modes, common for an urban commercial corridor, creates conflict between roadway users.

Roadway Characteristics

Functional Classification (PennDOT)

Within the study area, Frankford Avenue is designated as a principal arterial in PennDOT's functional classification system (Figure 7). Arterials play an important role in connecting local roadways and land uses to the highway network, and often serve high volumes of truck traffic. From Robbins Street northward, Frankford Avenue is also designated as US Route 13, a major route that runs from Bucks County to Fayetteville, North Carolina.

Cross streets in the study area include:

- Four principal arterials: Harbison Avenue, Robbins Street, Levick Street, and Cottman Avenue;
- One minor arterial: Rhawn Street; and
- Two major collectors: Tyson Avenue and Princeton Avenue.

Roosevelt Boulevard (US Route 1), another principal arterial, runs parallel to Frankford Avenue about a mile to the west, and Interstate 95 runs parallel about a mile to the east. Cottman Avenue, Princeton Avenue, Longshore Avenue, and Harbison Avenue connect this section of Frankford Avenue to I-95 ramps, as does Bridge Street just south of the study area. In addition to feeding traffic to I-95 and Roosevelt Boulevard, Frankford Avenue serves as a reliever route to these two major roadways during peak hours.

Street Type Designation (Philadelphia)

The City of Philadelphia's street type designation (Figure 8) mirrors PennDOT's classification system. Frankford Avenue is designated as an urban arterial, as are many intersecting streets including Harbison, Rowland, Tyson, Cottman, and Ryan Avenues, and Robbins, Levick, and Rhawn Streets. Frankford Avenue is also designated as an urban arterial through most of the study area, except between Tyson Avenue and Chippendale Street where it is a walkable commercial corridor. Needs and priorities for traffic calming treatments differ between these street types.[4]

Traffic Control and Access

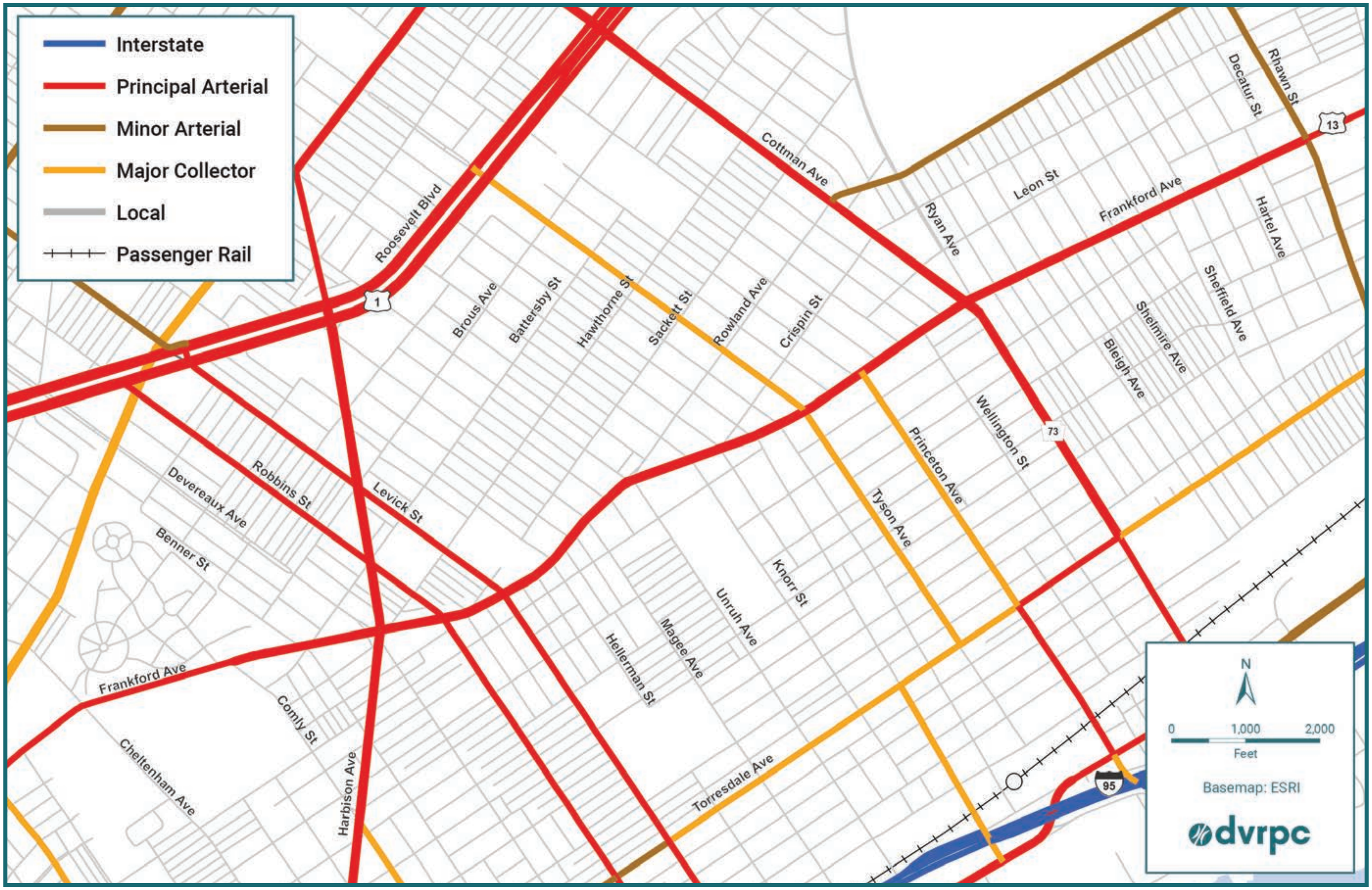
There are twenty signalized intersections on this segment of Frankford Avenue, including four intersections with more than four legs:

- Benner Street and Battersby Street;
- Harbison Avenue and Devereaux Avenue;
- Unruh Avenue and Rowland Avenue; and
- Ryan Avenue and Cottman Avenue.

From Robbins Street northward, every block between signalized intersections includes at least one intersecting stop-controlled side street, and many of these minor intersections are offset. Additionally, many blocks feature driveways to commercial parking lots.

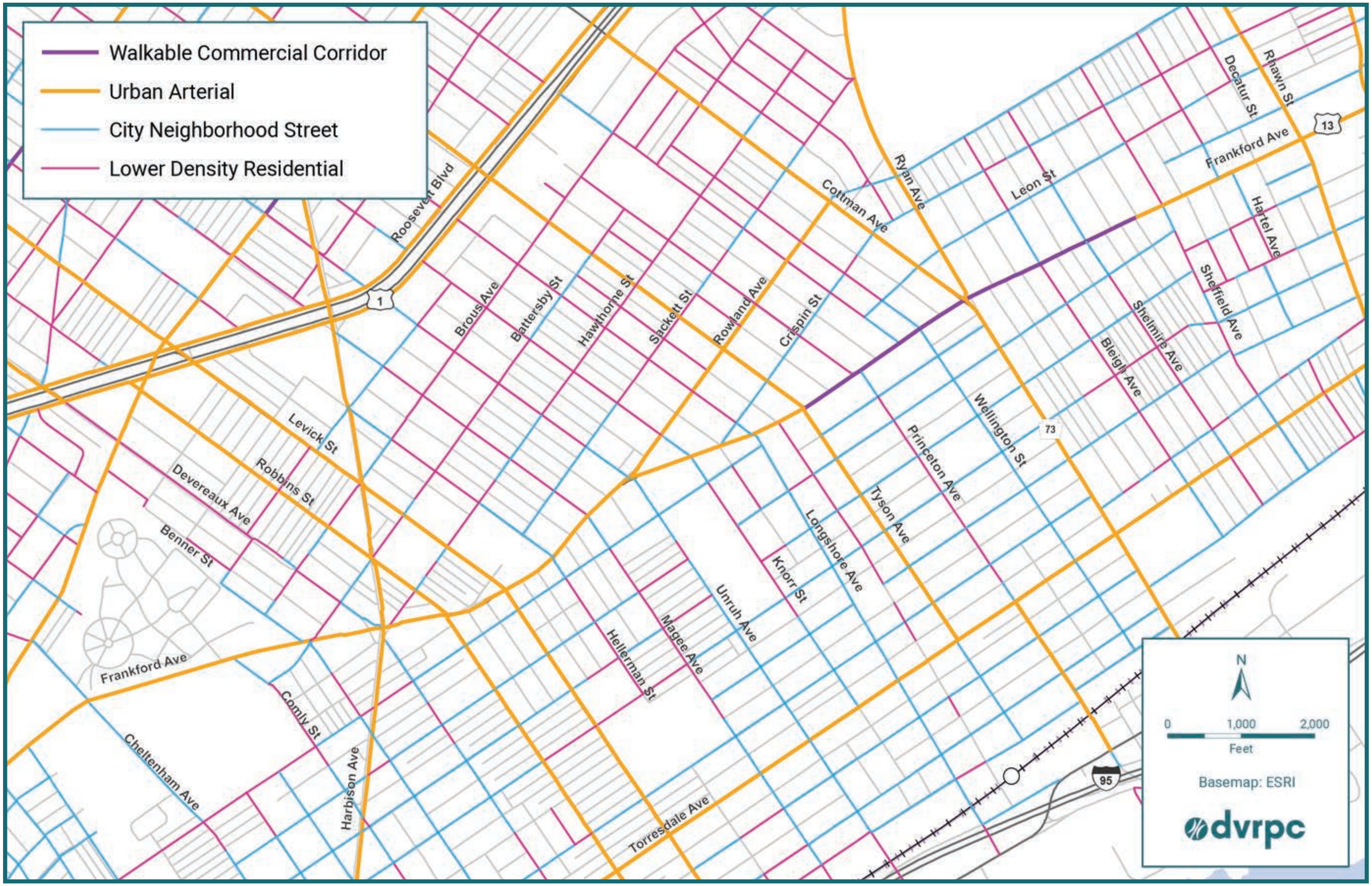
[4] Philadelphia Complete Streets Design Handbook, 2017: www.philadelphiastreets.com/complete-streets/the-handbook

Figure 7: Functional Class (PennDOT)



Source: PennDOT 2017

Figure 8: Street Type Designation (Philadelphia)



Source: City of Philadelphia 2017

Lane Configuration

South and north of the study area, Frankford Avenue is primarily a two-lane (one northbound and one southbound) or three-lane (one northbound, one southbound, and one two-way left turn) configuration. From Cheltenham Avenue to Comly Street, there are two lanes, and between Comly Street and Battersby Street there are four: one northbound, two southbound, and one two-way left turn. The majority of the study area, from Battersby Street to Rhawn Street, is a five-lane configuration: two northbound, two southbound, and one center lane that alternates uses between a painted median, a two-way left turn lane, and dedicated turning lanes approaching signals. North of Rhawn Street, the outer lanes drop and the roadway continues as a standard three-lane configuration.

Speed Limit

The posted speed limit on Frankford Avenue throughout the study area is 30 miles per hour (mph). Posted speed limits on cross streets are generally 30 mph for arterials and 25 mph for minor roads.

Traffic Volumes and Performance

Average daily traffic (ADT) volumes on Frankford Avenue vary along the corridor (Table 1). The lowest volumes occur in the southernmost portion of the study area, between Comly Street and Harbison Avenue. The highest volumes are between Levick Street and Unruh Avenue, with a smaller spike between Princeton Avenue and Cottman Avenue.

While traffic volumes are high and some delay occurs during peak hours, conditions are generally stable, with all intersections performing at a Level of Service C or better during both the AM and PM peaks. Average travel speeds range from 15 to 20 mph accounting for signal delay, which is typical for a heavily traveled urban commercial corridor. The average travel time index (TTI) on the corridor ranges from 0.98 to 1.34, indicating light to medium congestion during peak hours. This falls short of the TTI threshold of 1.5, which indicates a more serious congestion problem. Overall, although there is likely variation from day to day, the level of congestion faced by the average driver in the study area is appropriate for the roadway context.

Table 1: Average Daily Traffic (ADT) Volumes

Roadway Segment	Average Daily Traffic	Average Daily Transit Passenger Load
Comly Street to Harbison Avenue	10,800	7,800
Harbison Avenue to Robbins Street	16,500	7,500
Robbins Street to Levick Street	16,700	7,300
Levick Street to Unruh Avenue	26,600	6,800
Unruh Avenue to Princeton Avenue	16,800	6,700
Princeton Avenue to Cottman Avenue	17,500	6,200
Cottman Avenue to Rhawn Street	16,000	4,700

Locations listed from south to north. ADT values approximated based on traffic counts taken 2013-2017. Source: HNTB, SEPTA 2019

Figure 9: Transit Service

Source: SEPTA 2019

Transit

The SEPTA Route 66 trackless trolley operates on Frankford Avenue throughout the study area, providing critical service to commuters and other riders in the Wissinoming, Tacony, Mayfair, and Holmesburg communities as well as points northward. In total, the route serves 7.1 miles of Frankford Avenue, terminating at Knights Road to the north and at the Frankford Transportation Center one block south of Cheltenham Avenue. Between the Frankford Transportation Center and Cottman Avenue, an express route runs in addition to local service. At the Frankford Transportation Center, riders can transfer to a number of transit lines including the Market-Frankford Line connecting to Center City and points west.

WHAT'S A TRACKLESS TROLLEY?

Trackless trolleys, also known outside the Philadelphia region as trolley buses, are a transportation mode incorporating elements of trolleys and buses. Like a trolley or a light rail vehicle, a trackless trolley vehicle is propelled by electric power received from an overhead wire, not a battery, but like a bus it travels on rubber tires. SEPTA operates trackless trolleys on three routes, including Routes 59, 66, and 75. The Route 66 runs on Frankford Avenue from Frankford Transportation Center to the Philadelphia border with Bucks County. It is only one of five trackless trolley systems in the United States and the oldest.

Trackless trolleys have several unique features. They are quiet vehicles with zero source-point emissions. This makes them ideal for dense, urban communities by reducing noise and air pollution. While electric battery buses have the same qualities, this technology is still evolving. Trackless trolleys are a proven technology with a long record. Trackless trolleys also have a longer vehicle lifespan than either electric or hybrid buses. The fixed overhead power infrastructure can make detours and curbing difficult, but still allows for more flexibility to get around obstacles than a trolley or light rail vehicle. This fixed infrastructure also adds a level of "permanence" to the service that cannot be easily measured in community perception.

A route 66 trolley prepares to board at Cottman Avenue. Source: DVRPC

The 66 trackless trolley is one of SEPTA's highest-ridership routes, serving an average of 10,367 riders per weekday in 2018[5]. The line provides 24-hour service and is designated as a 15-Minute Route, arriving at least every 15 minutes for at least 15 hours a day, 5 days a week (Figure 9). During the morning and evening peak hours, trolleys arrive every eight minutes or less. The number of passengers served by the line ranges from one quarter to three quarters of the number of private vehicles served by a given roadway segment (Table 1). Transit service connecting to the 66 in the study area includes:

- The Route 70 bus on Cottman Avenue, also a 15-Minute Route, serving over 8,000 per day and connecting to the Roosevelt Boulevard Direct Bus and Route 56 (15-Minute) bus;
- The Route 26 bus on Harbison Avenue, a 30-Minute Route, serving over 11,000 riders per day and connecting to the Roosevelt Boulevard Direct Bus; and
- The Route 28 bus on Rhawn Street, serving about 2,000 riders per day and connecting to the Trenton Line regional rail at Holmesburg Junction.

[5] SEPTA Route Statistics 2018, SEPTA Service Planning Department

Table 2 describes Route 66 operations in the study area (between Bustleton Avenue and Rhawn Street, exclusive of operations north of Rhawn) during different parts of the day as well as over a 24-hour period. This data is reflective of a typical spring day in 2019. The PM rush hour period is the busiest time of day, with 119 trolley trips in the study area and nearly 4,000 passengers served. Moderate traffic congestion during the PM rush hour period contributes to slower trolley speeds at this time, with an average trolley speed just below 11 mph.[6]

Table 2: Route 66 Statistics, Bustleton Avenue to Rhawn Street, Spring 2019

	Trolley Trips	Average Trolley Speed (mph)	Passenger Load
Early AM: 12:00am-6:59am	65	13.4	1,409
AM Rush: 7:00am-10:59am:	89	11.0	2,763
Mid-Day: 11:00am-2:59pm	65	10.8	2,346
PM Rush: 3:00pm-8:59pm	119	10.9	3,898
Late PM: 9:00pm-11:59pm	18	13.2	459
24-Hour: 12:00am-11:59pm	356	11.5	10,875

Data reflects daily averages in spring 2019. Source: SEPTA Spring 2019 APC data, Philadelphia OTIS

[6] Average trolley speed is defined as the distance traveled divided by the time taken to travel. Like average speed for all vehicles, this measure includes time spent waiting at traffic signals and should typically be lower than the posted speed limit. Average trolley speeds also account for time spent boarding passengers, and is typically lower than average speed for all vehicles.

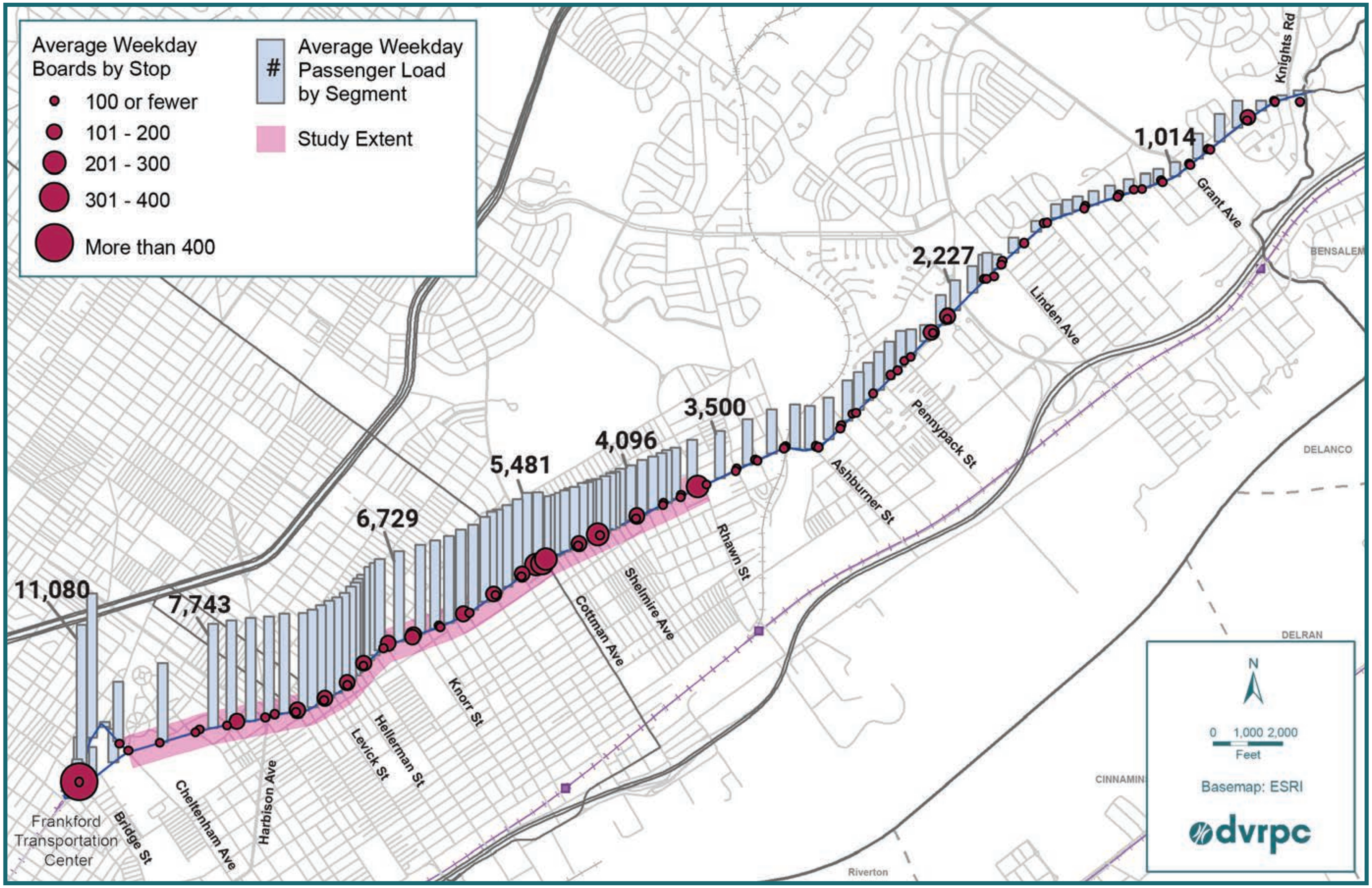
Due to its high frequency service, the role of Frankford Avenue as a long-standing commercial corridor, sufficient residential density, and the presence of supporting infrastructure including overhead catenary wires, the Route 66 trackless trolley is a well-established route that will continue to be a vital link in the transit network. Service improvements such as transit signal priority were implemented in 2015 as part of the Transit First initiative, and future improvements are being considered to continue to maximize performance.

The portion of Route 66 that falls within the study area is characterized by particularly high ridership, as shown in Figure 10. All of the stops with the largest number of weekday boards are located in the study area, with the exception of the Frankford Transportation Center. Based on combined northbound and southbound average weekday boards in 2018, the highest-ridership stops within the study area are:

- Cottman Avenue (741 average weekday boards)
- Rhawn Street (576)
- Knorr Street (507)
- Hellerman Street (455)
- Levick Street (415)
- Shelmire Avenue (408)

Figure 10 also shows average weekday passenger loads by segment. Passenger loads reflect the total number of people traveling on a given roadway segment by trolley, and are used to understand how many transit riders are being served on that roadway. Route 66 passenger loads range from 4,000 to 8,000 in the study area, increasing steadily with proximity to the Frankford Transportation Center. This indicates that many riders use the route to connect to other transit services at the transportation center. As a result, trolley operations in the study area impact passengers who board and alight within the study boundaries, but also those who board and alight at points northward to access the Frankford Transportation Center.

Figure 10: Route 66 Ridership



Source: SEPTA 2019

Pedestrians

Pedestrian activity in the study area is high, particularly in the walkable commercial corridor from Wellington Street to Sheffield Avenue. Businesses in this area are small and lack off-street parking, so most customers reach them on foot from homes, transit stops, or on-street parking nearby. Pedestrians also use the area to reach transit stops or transfer between lines, as well as to enjoy amenities such as the pedestrian plaza at Frankford Avenue and Cottman Avenue.

On a typical weekday between 4:45 and 5:45 pm, over 300 pedestrians were observed crossing the street at Frankford and Cottman, and about 150 were observed crossing the street at each of the Bleigh Avenue, Shelmire Avenue, and Sheffield Avenue intersections. Significant foot traffic occurs outside of the walkable commercial corridor near high-ridership trolley stops such as Harbison Avenue, and where students cross Frankford Avenue to reach nearby schools. Crossing guards are posted at Harbison Avenue and Hellerman Avenue during school opening and closing hours.

Crosswalks are marked at all signalized intersections in the study area, though some markings are faded. Marked crosswalks across Frankford Avenue and major cross streets are continental in style (with high-visibility white bars perpendicular to pedestrians crossing), with standard crosswalks (two stripes outlining the crosswalk) marked across some minor cross streets. Some cross streets with high pedestrian volumes within the BID service area are marked with a Mayfair-branded honeycomb pattern.

Although crosswalks at signalized intersections are generally well-marked, there are many unmarked locations where stop-controlled side streets intersect Frankford Avenue. The Pennsylvania vehicle code prohibits pedestrians from crossing outside of marked crosswalks between controlled intersections in an urban district,[7] but this type of crossing is common in walkable commercial corridors with unsignalized side streets and a high density of attractions, particularly when the distance between marked crosswalks is large enough to impede pedestrian mobility.

There is one marked crosswalk at an unsignalized location: the intersection of Frankford Avenue, Sackett Street, and Barnett Street. Installed to enhance safety and visibility near the historic Devon Theater, this crosswalk includes a landscaped median, a curb extension to reduce crossing distance, rectangular rapid flashing beacons (RRFBs), overhead flashing beacons, and advance warning signs to alert drivers to the crosswalk. The landscaped median is maintained by the Mayfair Community Development Corporation.

[7] Pennsylvania Vehicle Code 3543(c).

Figure 11: Bicycle Network

Source: City of Philadelphia 2019

Bicycle Network

There are conventional bicycle lanes[8] striped in both directions on Frankford Avenue between Cheltenham Avenue and Benner Street; these continue south of the study area to Bridge Street (Figure 11). South of the Comly intersection, there is a gap about 400 feet long in the southbound bike lane, with sharrows marked on a vehicle lane to accommodate a merge.

Facilities intersecting Frankford Avenue in the study area include:

- Buffered bicycle lanes on Devereaux Avenue in both directions from Frankford Avenue to Bustleton Avenue, interrupted by one block of sharrows from Brous Avenue to Revere Street where a landscaped median reduces the available roadway width;
- Buffered bicycle lanes on Tyson Avenue in both directions, connecting to bicycle facilities on Oxford Avenue to the west and Torresdale Avenue to the east;
- Conventional bicycle lanes in both directions on Princeton Avenue from Frankford Avenue east to James Street; and
- A westbound conventional bicycle lane on Ryan Avenue from Frankford Avenue to Leon Street. Continuing west, there are buffered lanes in both directions from Leon Street to Rowland Avenue, and a parking-protected two-way cycle track west of Rowland Avenue.

[8] Bicycle facility types are define on page 54.

Parking and Loading

On-street parking is available on Frankford Avenue throughout the study area (Figure 12). South of Tyson Avenue, most on-street parking is free, while north of Tyson it is mostly metered. On Ryan Avenue between Frankford Avenue and Leon Street, there is metered on-street angle parking on the south side of the street.

Free on-street parallel parking is included on most cross streets in the study area. Additionally, most nearby residences include rear driveways with a smaller number of front-access driveways for detached homes.

Many businesses, particularly the larger retail plazas and "big-box" stores south of Knorr Street, also have off-street parking lots. Trucks and other delivery vehicles largely utilize the same on-street and off-street parking spaces as non-delivery vehicles.

Figure 12: Parking

Source: DVRPC, Google Maps 2020

03 PUBLIC OUTREACH

FRANKFORD AVE MULTIMODAL STUDY

CHAPTER 3

PUBLIC OUTREACH

Public Open House #1

The first public open house was held on May 30, 2019 at the Mayfair Community Center. Attendees learned about planned changes to the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue under PennDOT's Highway Safety Improvement Program, and shared ideas for transportation improvements they would like to see in the rest of the corridor.

Seventeen community members attended this open house. Additionally, representatives from the offices of several elected officials were in attendance (State Representative Joseph Hohenstein, and aides from the offices of State Representative Kevin Boyle, State Representative Jared Solomon, and City Council Representative Bobby Henon).

Overall, responses to the changes presented for the intersection of Frankford, Ryan, and Cottman Avenues were positive. Attendees agreed that the current intersection configuration is problematic and that safety improvements are needed. Several expressed excitement that the issue will be addressed.

Responses to questions about transportation issues and potential solutions in the study area are summarized below.

- Many comments emphasized the need for traffic calming, improved pedestrian infrastructure, and sidewalk amenities (e.g., benches, trash receptacles, and landscaping).
- Improved traffic flow and the ability to bike along the corridor were also desired.
- Frequent and wide curb cuts pose challenges for pedestrians.
- Traffic calming was desired throughout the corridor, though different strategies were suggested for different contexts.
- Several respondents suggested a road diet to reduce speeding.
- Curb extensions,[9] or bumpouts, were suggested as a traffic-calming strategy that has a minimal impact to vehicle capacity.
- More placemaking such as signage and painted sidewalks could support the BID.
- Better pedestrian-scale lighting is needed, particularly from Harbison Avenue to Sheffield Avenue and near transit stops. Branded lighting would also help with placemaking.
- Parklets could provide a boost to local businesses.
- The abrupt end to the Frankford Avenue bicycle lanes at Comly Street creates an unsafe condition for cyclists.
- There is a need to connect existing bicycle facilities into a stronger bicycle network.
- The westbound bike lane on Ryan Avenue between Frankford Avenue and Leon Street needs an eastbound pair.
- Green stormwater infrastructure[10] was desired where possible throughout the corridor.
- Blocked traffic lanes due to truck parking and vehicle double parking is a problem.
- It is difficult to turn left off of Frankford Avenue at some intersections due to signal timing, leading drivers to make fast turns.
- A marked crosswalk is needed near the transit stop pair at Decatur Street, as many people cross here to reach the bus.

[9] Defined on page 42.
[10] Defined on pages 42-43.

Public Open House #2

The second public open house was held on March 4, 2020 at King's Highway Tavern. Twenty-eight participants signed in, though total attendance was somewhat higher. Attendees voted on strategies to calm traffic and improve safety of Frankford Avenue.

Activity A

In Activity A, twelve different multimodal and traffic calming treatments were presented, and respondents could choose up to five as their preferred strategies for the corridor. Results from this voting activity are presented in Table 3, and descriptions of each treatment are presented in Appendix A: Presentation Boards, Public Meeting #2.

In general, the most popular treatments were raised structures that control vehicle movements and reduce conflict exposure for pedestrians (curb extension, pedestrian refuge island, and raised median). Transit stop improvements and mid-block crossings were also popular, though there was some concern about blocking the visibility of businesses.

Finally, raised crosswalks were not presented during the open house because they would impact SEPTA operations on Frankford Avenue. However, they were mentioned by one or more participants and may be appropriate on some side streets.

Table 3: Results from Open House Activity A

Treatment	Number of Votes
Curb extension (bumpout)	17
Pedestrian refuge island	15
Raised median	13
Transit stop improvements	11
Mid-block crossing	10
Leading pedestrian interval (LPI)	8
Hardened centerline	7
Parking and loading improvements	7
New and improved bicycle lanes	7
Parklets and pedestrian plazas	5
Bicycle intersection improvements	2
Business access and transit (BAT) lanes	2

Activity B

In Activity B, five different roadway configurations were presented to evaluate public response to a potential road diet where feasible. The five options are described below and presented in greater detail in Appendix A: Presentation Boards, Public Meeting #2.

- Option A was a "no change" scenario maintaining five travel lanes.
- Option B removed two vehicle lanes and added two Business Access and Transit (BAT) lanes, which would prioritize the trackless trolley.
- Option C removed two vehicle lanes and added parking-protected bicycle lanes in both directions.
- Option D removed two vehicle lanes and added buffered bicycle lanes in both directions.
- Option E removed two vehicle lanes and added back-in angle parking on one side of the street, and a mix of parklets and widened sidewalks on the other side of the street.

Results from this voting activity are presented in Table 4.

The most popular road diet scenario was Option E: Pedestrian and Parking Improvements. While many participants expressed skepticism or dislike of existing bicycle facilities, the two bike lane scenarios combined received as many votes as the Pedestrian and Parking Improvements. While several participants discussed concerns about the impact of a road diet on traffic, only one participant voted for no road diet. Several attendees did not vote in the road diet activity and may have been undecided or felt they needed more information.

Table 4: Results from Open House Activity B

Road Diet Option	Number of Votes
Option E: Pedestrian and parking improvements	7
Option D: Buffered bicycle lanes	5
Option B: Business access and transit (BAT) lanes	3
Option C: Parking-protected bicycle lanes	2
Option A: No road diet	1

Additional Public Review

The recommendations presented in this report were informed by results from the two public meetings described above. In addition, a draft report was posted on the project website for a 30-day public comment period promoted by steering committee organizations. The results of the public comment period are presented in Appendix B.

04

ISSUES

FRANKFORD AVE MULTIMODAL STUDY

CHAPTER 4

ISSUES

Prior plans have identified the need to create a Frankford Avenue corridor that is safer, more visually appealing, and more pedestrian-friendly. Through existing conditions analysis and stakeholder outreach, this study identified specific issues related to crash trends and multimodal access.

Vehicle Speeding and Crash History

Portions of Frankford Avenue are on the High Injury Network, a City of Philadelphia Vision Zero effort to identify corridors with the highest rates of fatalities and severe injuries per mile. In the study area, Frankford Avenue is a high injury corridor south of Comly Street and between Disston Street and Meridian Street (Figure 13). Intersecting Frankford Avenue in the study area, Cheltenham Avenue, Levick Street, Tyson Avenue, St. Vincent Street, and Cottman Avenue are also on the High Injury Network.

Between 2014 and 2018, there were 287 crashes on or approaching Frankford Avenue between Cheltenham Avenue and Rhawn Street. Three of these crashes resulted in a fatality, and five resulted in a severe injury. The number of crashes per year trended slightly upward during this period, with some variation (Table 5).

The intersections with the highest number of total crashes over this period were Harbison Avenue and Devereaux Avenue (33 total crashes), Cottman Avenue and Ryan Avenue (21), and Levick Street (18).

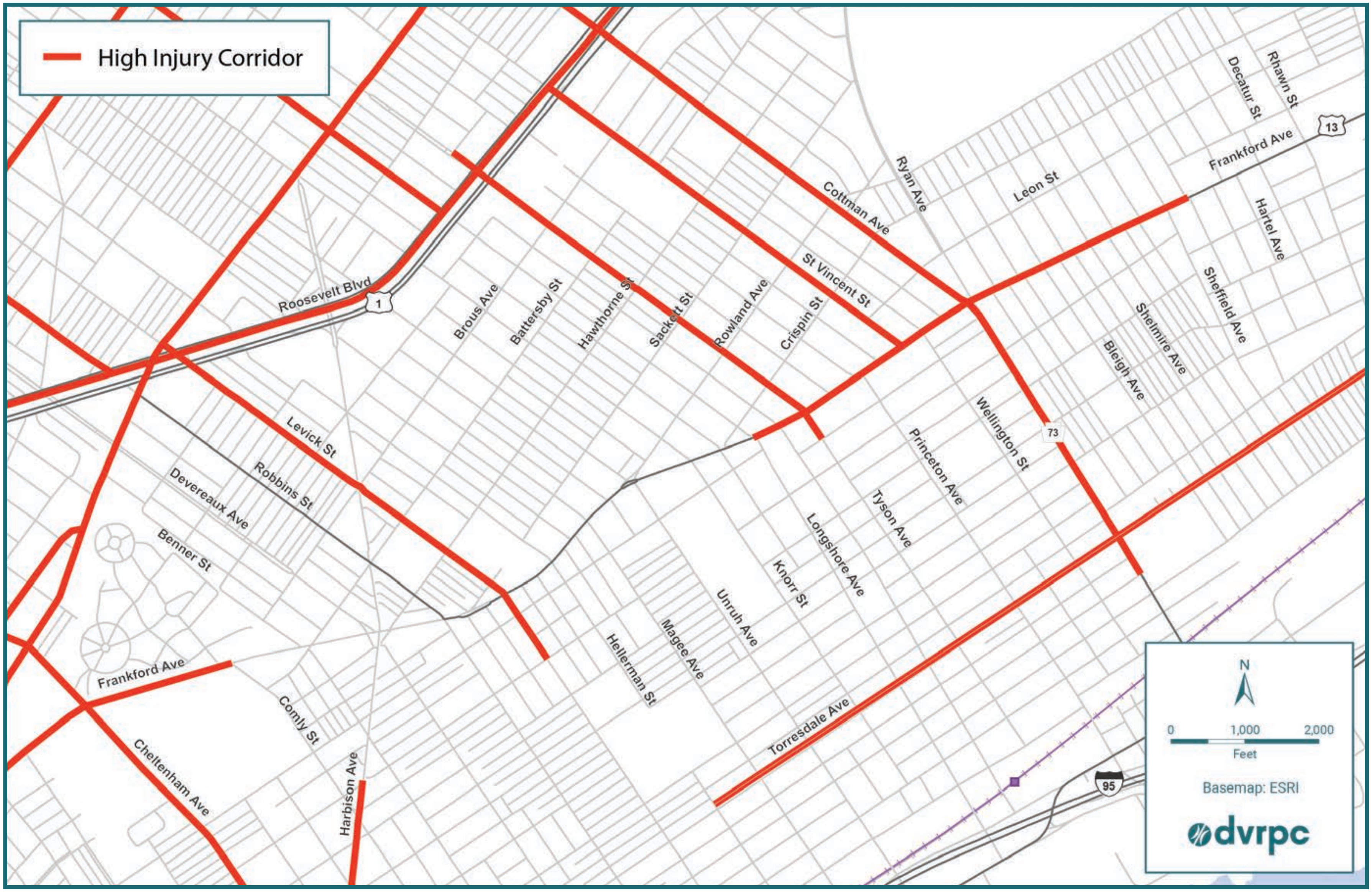
Table 6 shows the percentage of crashes by type in the study area, compared to the crash type breakdown in the City of Philadelphia as a whole. Angle crashes were the most common, which is typical of Philadelphia crashes. Almost a quarter of all study area crashes involved a hit pedestrian, substantially higher than the citywide average of 14 percent.

Table 5: Frankford Avenue Crashes by Year

Year	Number of Crashes
2014	41
2015	54
2016	53
2017	72
2018	67

Source: PennDOT 2019

Figure 13: High Injury Network



Source: City of Philadelphia 2020

High vehicle travel speeds are likely a contributor to study area crashes, particularly those that result in fatality or severe injury. To determine whether speeding occurs on the corridor, travel speeds were measured by radar at mid-block locations during off-peak hours. These sample measurements were averaged to estimate **free-flow operating speeds–** the speed at which a typical driver will travel if there are no impediments, such as traffic congestion or red lights. The analysis found that the average free-flow operating speed is 35.1 mph (+/- 4.5), and the 85th percentile free-flow operating speed is 39.0 mph.

This indicates that outside of peak hour traffic conditions, a substantial number of drivers are traveling at least 5–10 mph faster than the posted speed limit of 30 mph. Several factors can contribute to speeding, including a wide roadway design, wide turning radii, and lack of pedestrian-scale amenities that alert drivers to the presence of vulnerable users. Field observation and stakeholder comments indicate that poor sight lines, difficulties in finding gaps to make turns, and illegal or erratic driving behavior also contribute to roadway safety issues.

Table 6: Frankford Avenue Crashes by Type

Crash Type	% of Study Area Crashes	% of Philadelphia Crashes
Angle	39%	34%
Hit pedestrian	24%	14%
Rear end	17%	23%
Sideswipe (same direction)	9%	11%
Hit fixed object	6%	12%
Hit bicyclist	2%	2%
Sideswipe (opposite direction)	1%	2%
Head-on	1%	2%

Study area crashes include crashes occurring on or approaching Frankford Avenue between Cheltenham Avenue and Rhawn Street. Source: PennDOT 2019, 2014-2018 crash dataset.

Below: Higher vehicle travel speeds lead increase the risk that a pedestrian crash will result in a fatality. Source: City of Philadelphia

Pedestrian Crashes

Pedestrian crashes on this segment of Frankford Avenue are a serious concern. Twenty-four percent of study area crashes from 2014 to 2018 involved a hit pedestrian (72 in total), higher than the citywide average of 14 percent. Two of the three fatalities on the corridor were a hit pedestrian (the third was a hit bicyclist), and three pedestrian crashes resulted in a severe injury. Long crossing distances, speeding, and aggressive driving behavior all contribute to safety issues for pedestrians in the corridor.

Figure 14 shows the locations of crashes involving a hit pedestrian, as well as hit bicyclists. Rhawn Street had the highest number of hit pedestrian crashes (8), followed by Tyson Avenue (5), Robbins Street (5), Cottman and Ryan Avenues (4), and Harbison and Devereaux Avenues (3). Two of the pedestrian crashes at Tyson Avenue resulted in fatalities. All of these intersecting roadways are high-volume urban arterials, most with wide roadway designs and heavy turning volumes that create crash risks at the intersection. Redesigning these intersections to discourage speeding, encourage yielding to pedestrians, and reduce pedestrian exposure to vehicles could help address crash-prone locations.

Pedestrian crashes also occured outside of signalized intersections, including three that resulted in a severe injury at St. Vincent Street, Aldine Street, and Hartel Avenue. The safest way for pedestrians to cross any street is in a marked crosswalk. However, crossing outside of marked intersections is a common behavior in walkable commercial corridors with mid-block destinations, and suggests a demand for additional crossing facilities to support pedestrian safety and mobility. This is a particular problem in the walkable commercial corridor section of Frankford Avenue between Princeton Avenue and Oakmont Street (Figure 15). Providing crossing facilities and encouraging drivers to watch for and yield to pedestrians could help address this crash issue.

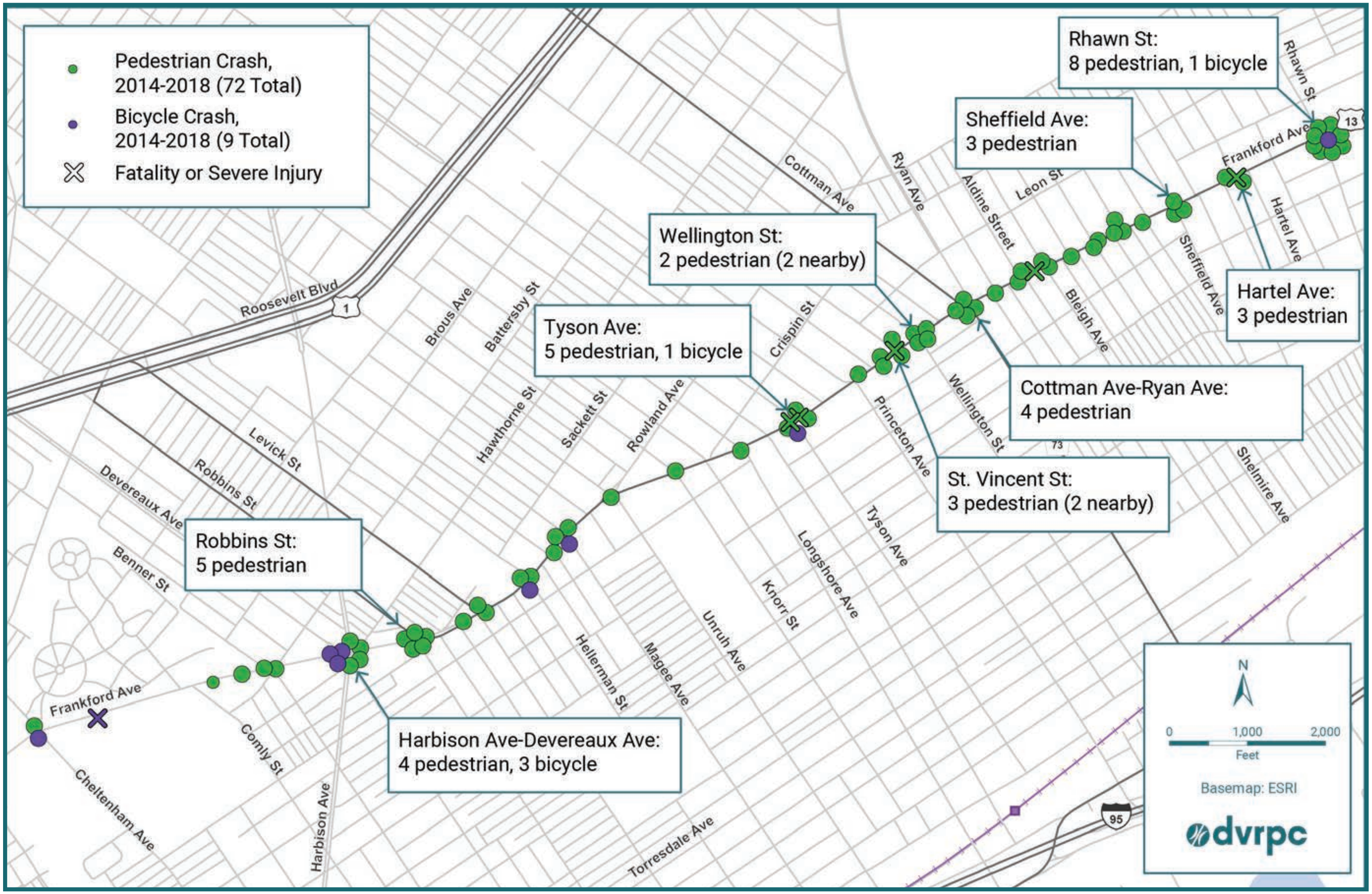
Bicycle Crashes

There were nine bicyclists hit in the study area from 2014 to 2018, including three at Devereaux Avenue. North of Benner Street, there are no bicycle facilities on Frankford Avenue, and bicyclists were observed using the sidewalk, travel lanes, shoulders and parking lanes to travel along the avenue. Many bicyclists alternate between the roadway and sidewalk based on traffic and pedestrian conditions and parking saturation. This results in bicyclists weaving in and out of driver sight lines, creating a crash risk.

Bicyclists are also exposed to crash risks while crossing Frankford Avenue from intersecting bicycle facilities. For example, at Tyson Avenue in both directions, the buffered bicycle lane merges with a vehicle lane approaching the intersection. Bicyclists moving straight through the intersection share a green phase with drivers turning onto Frankford Avenue, and drivers may not see or yield to approaching bicyclists.

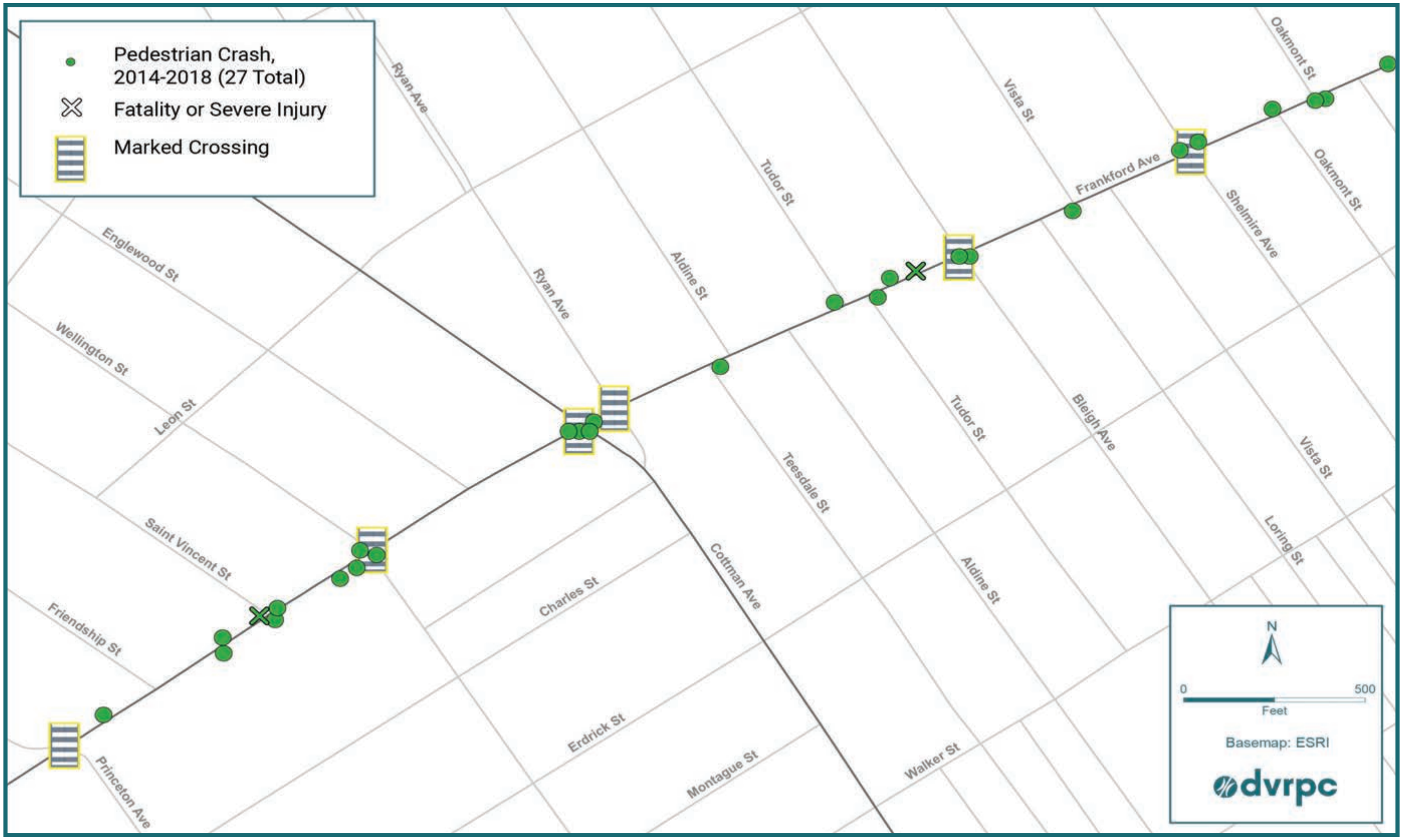
In general, connectivity between bicycle facilities is an issue in and near the study area. The City of Philadelphia is developing a High Quality Bike Network (forthcoming) to guide future development of bicycle facilities. Where possible, improvements to Frankford Avenue should support this network by connecting and enhancing existing facilities.

Figure 14: Bicycle and Pedestrian Crashes



Source: PennDOT 2019

Figure 15: Pedestrian Crashes in Walkable Commercial Corridor



Source: PennDOT 2019

Transit Issues

Several issues related to transit were documented from stakeholder conversations, public meetings, and observation of the study area. First, because most transit riders access transit stops by foot, the connectivity issues and crash risks described for pedestrians also create challenges for transit access. Additionally, there are few transit shelters in the study area: one at Knorr Street, one at Wellington Street, and three at Cottman Avenue. Outside of these stops, many riders do not have seating or shelter while waiting for the Route 66 trackless trolley or connecting buses.

There are also issues with the Route 66 trackless trolley related to boarding. Trolley operators typically avoid clearing the travel lane to board, as maneuvering back into traffic can be difficult and lead to delay. Boarding from the travel lane is more efficient for transit operations and reduces strain on the overhead catenary wires, but creates a challenge for riders with ambulatory disabilities and others who need to board from the curb level. Further, the designated trolley loading areas are frequently blocked by parked or standing vehicles.

A trackless trolley boards from the travel lane at Levick Street. Source: DVRPC

Traffic Flow Issues

Traffic flow in the study area is generally stable and appropriate for the roadway context. All intersections have a level of service (LOS) A, B, or C during both the AM and PM peaks. During the AM peak hour, the eastbound left turn from Cottman Avenue onto Frankford Avenue operates at LOS E, considered to be an unstable level of delay. During the PM peak, the northbound left from Frankford Avenue onto Rowland Avenue operates at LOS E. All other turning movements operate at LOS D or higher.

In general, left turns from Frankford Avenue pose challenges for drivers that in some cases create crash risks. While all study area intersections provide northbound and southbound left turn lanes, many intersections do not have a protected phase for left turns. As a result, some drivers have difficulty in finding an appropriate gap in oncoming traffic to turn. This condition can lead to risky movements as drivers try to complete left turns during the permitted green phase.

Another left-turn issue is at the intersection of Frankford, Cottman, and Ryan Avenues. There is significant demand for the southbound left turn from Frankford Avenue to Cottman Avenue, toward the I-95 on-ramps east of the study area. However, there is no left turn lane to accommodate this movement, and these drivers must compete with the northbound left turn onto Ryan Avenue.

Parking and Loading Issues

Demand for on-street parking varies throughout the study area. In the southern section, where off-street parking is abundant, parallel parking lanes are underutilized, which can encourage speeding. In contrast, in the walkable commercial corridor there is excess demand for parking to access local businesses. Complicating the issue in this section, trucks and delivery vehicles compete for the same parking spaces as drivers of personal vehicles. As a result, parking and loading often takes place in the center median, or in clear zones near the intersection. This behavior is dangerous for drivers exiting their vehicles, and for other drivers and pedestrians as sight lines are obstructed.

Additionally, the parallel parking lanes are about 7 feet wide in most of the study area, narrower than the 8 feet recommended in Philadelphia's Complete Streets guidelines.[11] This also creates a risk for drivers existing their vehicles as they step into a travel lane. Wider vehicles such as trucks may also block a portion of the travel lane for this reason.

A delivery truck parked in the median near Tyson Avenue. Source: DVRPC

[11] Philadelphia Complete Streets Design Handbook, 2013: www.philadelphiastreets.com/images/uploads/resource_library/cs-handbook.pdf

Constraints

The recommendations presented in Chapter 5 are conceptual, and require further engineering-level design and feasibility analysis. However, several high-level feasibility constraints were considered when developing recommendations, to avoid major obstacles to implementation.

Route 66 Trackless Trolley

Frankford Avenue is an important transit corridor, and the Route 66 trackless trolley is a critical, high-ridership, and high-frequency transit route. Therefore, care was taken to avoid any roadway designs that would negatively affect trolley service.

A key constraint related to the trackless trolley is the system of overhead catenary wires that supports it. Between Comly Street and Cottman Avenue, there are two sets of catenary wires in each direction: one northbound and one southbound set in the outer travel lanes for the local trolleys, and one northbound and one southbound set in the inner travel lanes for the express trolleys. This configuration allows express trolleys to pass local trolleys, and to move riders quickly to the Frankford Transportation Center for transfers. It is not possible to preserve this kind of express service with a three-lane roadway configuration. Therefore, a road diet south of Harbison Avenue is not recommended due to the detrimental impact it would have on transit operations.

Other design considerations involving the trolley include maintaining adequate lane widths and avoiding traffic calming treatments not appropriate for a high-frequency transit route, such as speed bumps or raised crosswalks on Frankford Avenue.

Traffic Performance

The focus of this study as it relates to traffic is on reducing speeding and crashes. However, Frankford Avenue plays an important role in the roadway network as an urban arterial, connecting to and absorbing traffic from major parallel facilities such as Roosevelt Boulevard and I-95. Additionally, because the Route 66 trackless trolley shares roadway space with general traffic, significant congestion can lead to delays in trolley service. Therefore, recommendations were developed that avoid deteriorating traffic operations to unstable conditions, generally corresponding to LOS E or LOS F at signalized intersections.

Parking and Truck Access

The recommendations in this report enhance facilities for walking, biking, and taking transit. Still, many customers reach businesses in the study area by personal vehicle. In the walkable commercial corridor, there is little off-street parking available for customers, who rely instead on in-street parallel parking lanes. Trucks and delivery vehicles also use these lanes for loading purposes. Business owners and residents have expressed a strong desire to preserve the number of parking spots in this section of the study area.

05

RECOMMENDATIONS

FRANKFORD AVE MULTIMODAL STUDY

CHAPTER 5

RECOMMENDATIONS

The recommendations presented in this chapter reflect the study area context, issues and constraints, public and stakeholder input, and local and national best practices. Proposed designs are conceptual and require engineering design and feasibility analysis.

Recommended Improvements

This section will define the traffic calming and multimodal improvements recommended in different parts of the study area. Figure 16 illustrates the location(s) for each improvement. Proposed intersection and roadway designs for select locations will be presented in greater detail in the next section of this chapter.

Road Diet

A road diet refers to removing one or more travel lanes from a road, and redesigning the space for other uses and travel modes. For example, a five-lane road like Frankford Avenue could be redesigned as a three-lane road by closing the two outer lanes to general traffic. The space can then be used for transit lanes, bicycle lanes, parklets, wider sidewalks, parking and loading, or other uses.

This study recommends a road diet for the portion of Frankford Avenue from Bleigh Avenue to Rhawn Street. Under the proposed road diet, two vehicle travel lanes would be removed. In their place, the sidewalk would be widened on the east side of Frankford Avenue, and back-in angle parking would be striped on the west side.

Back-in angle parking on 11th Street in South Philadelphia. Source: Google Maps 2021

Back-In Angle Parking

This option for on-street parking provides more parking spaces per foot of curb space, and can improve safety and traffic flow. Back-in angle parking is recommended on the north side of Frankford Avenue between Bleigh and Rhawn, and would replace an existing parallel parking lane and vehicle travel lane. The new parking lane should be designed with a 60-degree stall angle and a nineteen-foot offset from the curb, leaving a buffer in front of the parking stalls for drivers to clear the travel lane before parking if needed.[12]

[12] These suggested dimensions are based on guidance from the Philadelphia Streets Department and discussion with steering committee representatives from PennDOT. However, final dimensions are subject to engineering judgment.

Figure 16: Recommended Improvements

Curb Extension

Sometimes referred to as a "bumpout," this treatment extends the raised concrete curb into the parking lane, typically near an intersection. By narrowing the roadway, curb extensions can encourage drivers to slow down, especially those making right turns. They also provide a protected space for pedestrians to wait before crossing the street, decreasing their total crossing distance and increasing their visibility. Curb extensions are recommended for intersections with high pedestrian volumes, long pedestrian crossing distances, vehicle speeding, or a history of pedestrian crashes.

Variation: Green Stormwater Infrastructure (GSI) Curb Extension

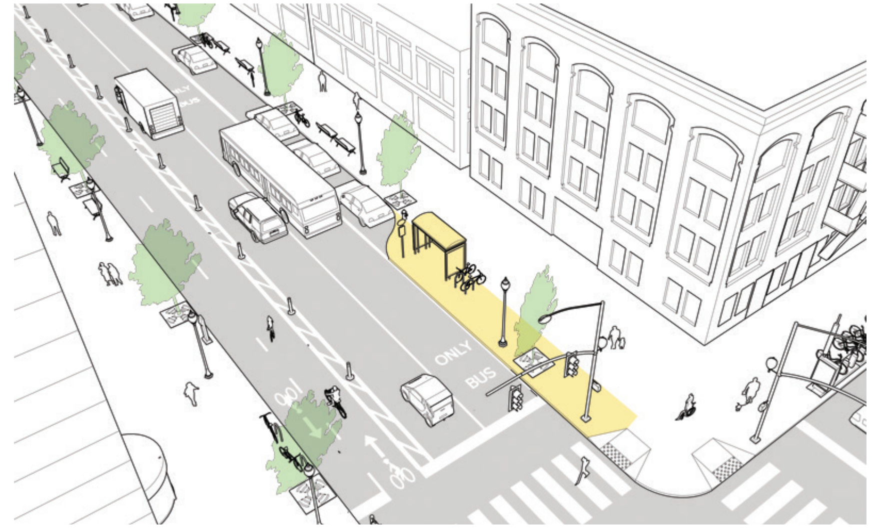
Curb extensions can also include green stormwater infrastructure to improve drainage and beautify the area. Not all locations are feasible for GSI due to drainage patterns and existing infrastructure, but GSI elements are recommended for all curb extensions where they are feasible. The Philadelphia Water Department would be responsible for maintenance of a GSI curb extensions.

Variation: Trackless Trolley Stop Curb Extension

A trackless trolley stop curb extension provides extra space for riders to wait for their trackless trolley. It also allows trolleys to stop in-lane, reducing the strain on catenary wires and improving transit operations. This variation is recommended for high-ridership trolley stops and should be placed consistently so that the in-lane stops are predictable for drivers.

Floating Boarding Island

Similar to a trackless trolley curb extension, a floating boarding island extends the curb into the roadway to enable in-lane boarding. However, this design also features a bicycle lane placed between the boarding platform and the curb, offering protection for cyclists, and reducing transit/bicycle conflicts.



Above: A curb extension can also facilitate in-lane bus or trackless trolley boarding, speeding transit operations, and maximizing sidewalk space. Source: National Association of Transportation Officials (NACTO)

Below: A floating boarding island functions similarly to a trackless trolley curb extension, but accommodates a curbside bicycle lane. Source: San Francisco Bicycle Coalition

Transit Shelters

Shelters should be installed at high-ridership locations where they are feasible, beginning with highest-ridership stops that currently lack shelters (Rhawn Street, Knorr Street, Hellerman Street, Levick Avenue, and Shelmire Avenue). Intersections where trolley stop curb extensions are installed should also be prioritized due to the availability of extra sidewalk space and potential cost savings from bundling the installations together.

Queue Jump

A queue jump consists of a short dedicated transit facility and a leading transit interval signal that gives transit vehicles such as trackless trolleys a head start at the beginning of a green phase. This treatment prioritizes trackless trolleys and improves their performance by reducing delay. On a corridor with transit signal priority infrastructure, queue jumps can be actuated to reduce the impact on general traffic flow.

Raised Median

A raised median divides traffic lanes by vertical separation, commonly a raised concrete barrier. Medians can reduce some types of crashes, including pedestrian crashes and head-on collisions between vehicles, and can reduce vehicle speeds by visually narrowing the roadway. They can also include landscaping for neighborhood beautification; however, a maintenance plan should be developed for landscaped medians as debris accumulation can be an issue.

Variation: Green Stormwater Infrastructure Median

Where feasible, raised medians can include GSI for improved drainage. A GSI median is recommended for Frankford Avenue between Magee Avenue and Princeton Avenue. The median would be located in the existing two-way center turn lane and would include breaks for access to driveways and side streets. Additional analysis is needed to verify the feasibility of this location. The Philadelphia Water Department would be responsible for maintenance of a GSI median.

Above: A raised median with green stormwater infrastructure on North American Street in Philadelphia. Source: DVRPC

Below: A hardened centerline on Broad Street at Tioga Street. Source: City of Philadelphia.

Hardened Centerline

A hardened centerline is a low-cost alternative to a raised median, and can be implemented where there is not adequate roadway width for a raised median. Hardened centerlines usually consist of a rubber curb and bollards installed on the centerline, typically approaching an intersection. They are recommended at locations with excessive turning radii that encourage fast turns, or where a specific unsafe vehicle movement should be blocked.

Pedestrian Refuge Island

This is a protected area between traffic lanes dedicated to pedestrians crossing the roadway. Pedestrians can stop and wait in the island if they are unable to complete the crossing during one green phase. They can also reduce vehicle turning speeds as drivers navigate around the island. Islands are recommended at locations where high traffic volumes and speeds inhibit crossing. They can be added at signalized as well as unsignalized locations. Many signalized intersections in the study area have limited space to add islands due to the presence of left turn lanes.

Marked Crossing at Unsignalized Intersection

Pedestrians frequently cross Frankford Avenue at unsignalized intersections that lack crossing facilities. Crossing treatments are recommended for locations with high pedestrian volumes, a history of pedestrian crashes, or a significant destination on one or both sides of the street. Treatments should include a high-visibility crosswalk, a pedestrian refuge island, overhead and advance warning signage, curb extensions, and rectangular rapid flashing beacons. The existing unsignalized crossing at Frankford Avenue and Sackett Street provides an example of these elements.

Raised Crosswalk

This treatment elevates the crosswalk to be flush with the sidewalk, improving accessibility for pedestrians. The roadway is gently ramped up to meet the elevated crosswalk, encouraging drivers to slow down. Raised crosswalks been found to significantly reduce pedestrian crashes. They are not generally used on high-frequency transit routes, but are recommended for cross streets with speeding and crash issues such as Robbins Street and Levick Street.

Above: A pedestrian island on Benjamin Franklin Parkway in Center City, Philadelphia. Source: DVRPC

Below: A marked crossing at an unsignalized intersection near the historic Devon Theater on Frankford Avenue. Source: DVRPC

Pedestrian-Scale Lighting

The streetlights in the study area are designed to allow adequate lighting for drivers to maneuver safely. However, this design is not optimal for pedestrians and can be dim or patchy at the sidewalk level. Areas with high pedestrian volumes should also feature smaller streetlights specifically designed to light up the sidewalk. These make a walkable commercial corridor safer and more visually appealing.

New or Enhanced Bicycle Facilities

Neighborhood Greenway

Neighborhood greenways are shared roads that utilize a variety of tools to reduce vehicle speeds and create a low-stress environment for bicyclists. These tools may include signs, pavement markings, traffic calming elements such as speed bumps, and intersection treatments. They are appropriate on lower-volume roads with low posted speed limits and without transit service. As such, they would not be considered for Frankford Avenue, but could be applied to some side streets.

Buffered Bicycle Lanes

Adding a painted buffer, ideally three feet wide, to a conventional bicycle lane increases the space between drivers and bicyclists and enhances comfort and safety. A buffered lane is preferred over a conventional lane on a high-volume roadway.

Protected Bicycle Lanes

The ideal in-street bicycle facility for a high-volume roadway is a protected bicycle lane. This lane includes a painted buffer and vertical separation from moving traffic. Examples of vertical separation include parked vehicles and flexible bollards.

A protected bicycle lane including a painted buffer and vertical flexposts. Source: Megan Kanagy, District Department of Transportation

Bicycle Intersection Improvements

As bicyclists approach high-volume intersections, they come into conflict with turning vehicles. Pavement marking that create horizontal and vertical separation from vehicles can increase bicyclist visibility and encourage yielding by slowing turning vehicles down. Conflict markings though intersections and bike boxes approaching intersections can also enhance visibility and encourage yielding to bicyclists.

Leading Pedestrian Interval (LPI)

This signal timing strategy provides a head start for pedestrians, allowing them to begin crossing the street before turning vehicles. By increasing pedestrian visibility and encouraging drivers to yield, LPIs have proven effective in reducing pedestrian crash rates.

The duration of an LPI is subject to engineering judgment, depending on roadway conditions. In some instances, three seconds is considered an adequate head start. Longer LPIs provide greater protection for pedestrians while adding delay for vehicles. The LPIs proposed in this report were modeled as five seconds long and do not overly disrupt traffic flow.

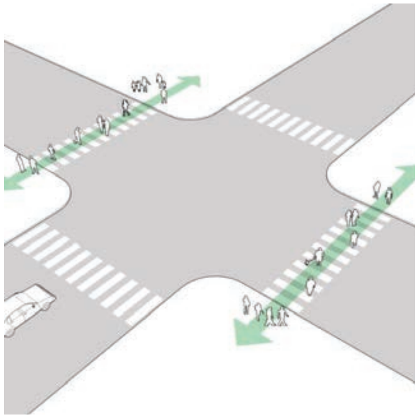
Leading Left Turn Phase (Protected/Permitted)

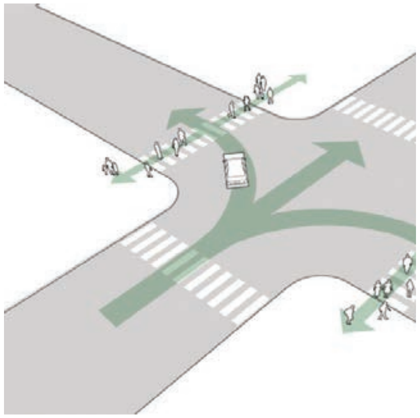
At intersections with a dedicated left turn lane, a leading left turn phase gives left-turning drivers a head start, allowing them to turn before oncoming traffic creates a conflict. This reduces the number of vehicles who may make risky left turns because they cannot find a suitable gap.

This phase is also known as a protected/permitted left turn phase. During the protected portion, indicated by a green arrow, left-turning drivers are signal-separated from oncoming through traffic. During the permitted portion, indicated by a green ball, left turns are allowed, but drivers must yield to oncoming through traffic as both movements share a green signal.

Above: High-visibility pavement markings and a bike box approaching an intersection. Source: Toole Design Group

Below left: A leading pedestrian interval allows pedestrians to cross a street before turning vehicles are allowed. Below right: The LPI is followed by a traditional crossing phase where drivers must yield to pedestrians in the crosswalk. Source: NACTO





Conceptual Designs for Select Locations

Planning-level design concepts were prepared for select locations to illustrate recommendations in greater detail. These are presented in order from south to north.

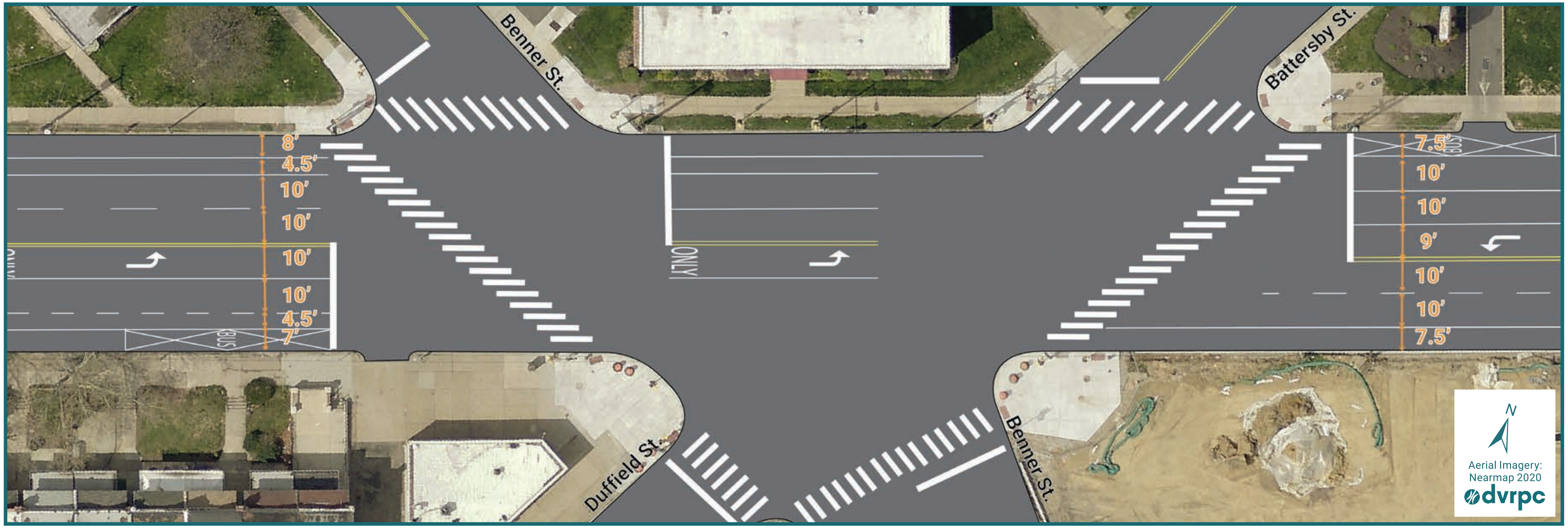
Frankford Avenue from Benner Street to Harbison Avenue

Conventional bicycle lanes are currently striped on Frankford Avenue in both directions from Benner Street to Bridge Street near the Frankford Transportation Center. Additional bi-directional bicycle facilities on Devereaux Avenue and Brous Street provide an opportunity to connect area bicyclists to the Frankford Transportation Center.

However, there is a gap in the bicycle network between Benner Street and Devereaux Avenue. While a road diet is not feasible on this block due to trackless trolley operations and infrastructure, the outer parking lanes are not frequently utilized, as adjacent properties have large off-street parking lots.

The proposed design removes the on-street parking lanes between Benner Street and Devereaux Avenue and replaces them with flexpost protected bicycle lanes in both directions, closing the gap in the bicycle network. Additional safety improvements are recommended at the Benner/Battersby and Harbison/Deveraux intersections.

Figure 17: Frankford Avenue, Benner Street, and Battersby Street, Existing

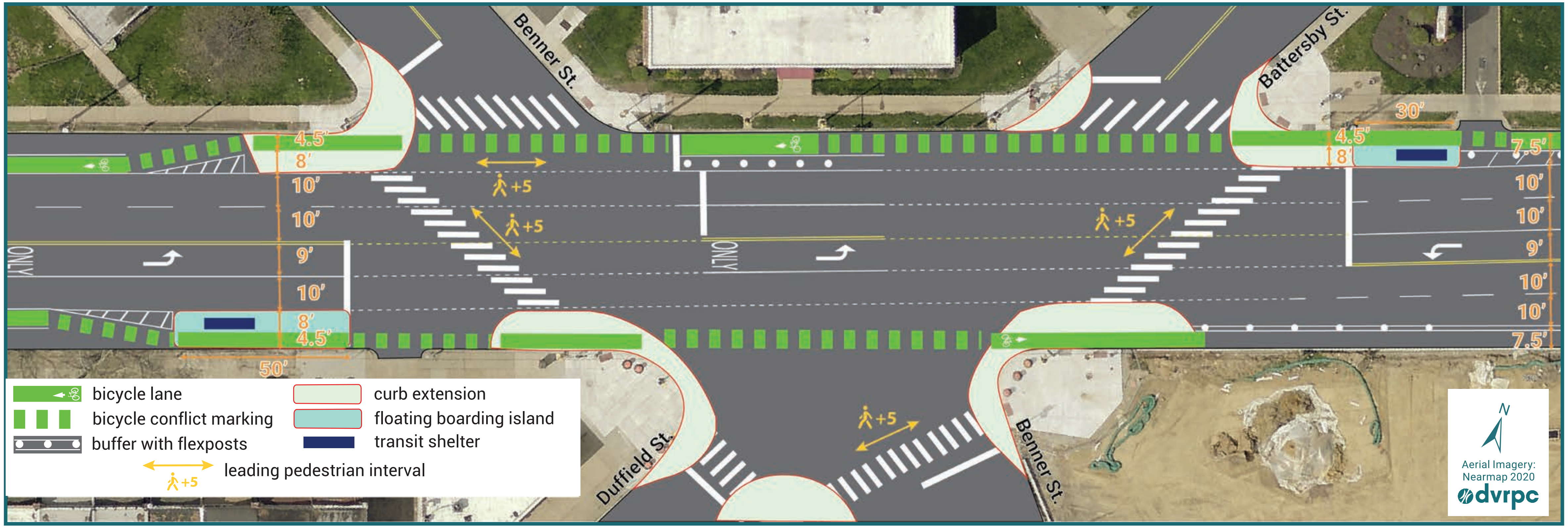


Frankford Avenue, Benner Street, and Battersby Street

The proposed design for this intersection includes new transit shelters and floating boarding islands to enable accessible and efficient in-lane boarding, and shorten crossing distances for pedestrians (Figure 18). These boarding islands should ideally be 40 to 50 feet long at minimum beginning from the stop bar, but are 30 feet long in some cases as required by existing driveways or other obstacles. They must be 8 feet wide at minimum to comply with the Americans with Disabilities Act. The existing conventional bicycle lanes south of Benner Street would bend to curbside and continue through the intersection. Curb extensions would include a mountable entrance and pathway for bicyclists. The bicycle lane narrows to 4.5 feet on the curb extensions and behind boarding islands. This narrowing, as well as the slope, signal to bicyclists to slow down and yield to pedestrians.

Conflict markings in the intersection and across driveways enhance bicyclist visibility, and curb extensions and buffers with flexposts provide vertical separation between bicyclists and drivers outside of the intersection. Finally, LPIs give pedestrians a head start while crossing both Frankford Avenue and Battersby Street.

Figure 18: Frankford Avenue, Benner Street, and Battersby Street, Proposed

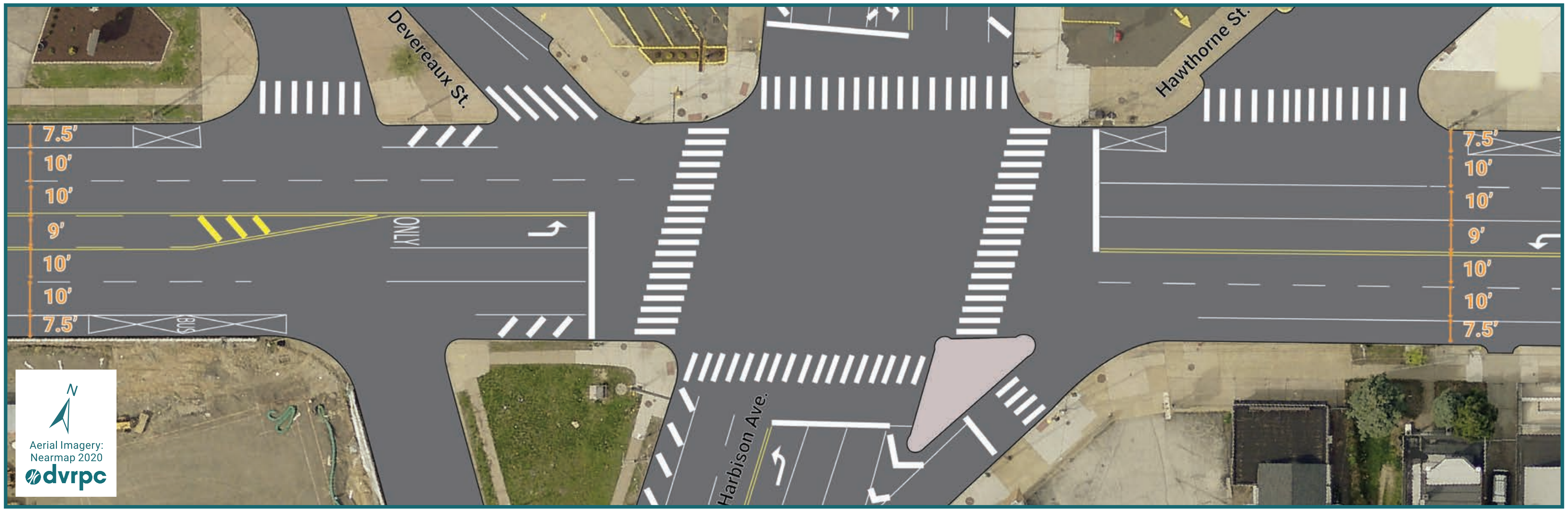


Frankford Avenue, Harbison Avenue, and Devereaux Avenue

The proposed design for this intersection includes trackless trolley curb extensions and transit shelters, and additional curb extensions to reduce pedestrians crossing distances and slow turns (Figure 20).

The flexpost-protected bicycle lanes continue north from Benner Street and terminate at Harbison Avenue, where they connect to the Devereux Avenue lanes Wayfinding signs signal the end of the Frankford Avenue bicycle lane and the option to turn onto Devereaux Avenue. To accommodate the northbound trolley curb extension (which should be 8 feet wide for accessibility purposes), the northbound bicycle lane ramps up to the sidewalk level approaching the intersection. Hardened centerlines on both Frankford Avenue approaches encourage slower turns and provide protection to pedestrians crossing Frankford Avenue. These also prevent dangerous vehicle movements associated with prior crashes, such as drivers on eastbound Devereux Avenue cutting across Frankford Avenue outside of the signalized intersection. This reduces vehicle access somewhat, as Devereaux Avenue becomes a right-in, right-out only street, and drivers on westbound Harbison Avenue lose a direct connection to Hawthorne Street. However, these tradeoffs are recommended due to the safety benefits gained.

Figure 19: Frankford Avenue, Harbison Avenue, and Devereaux Avenue, Existing

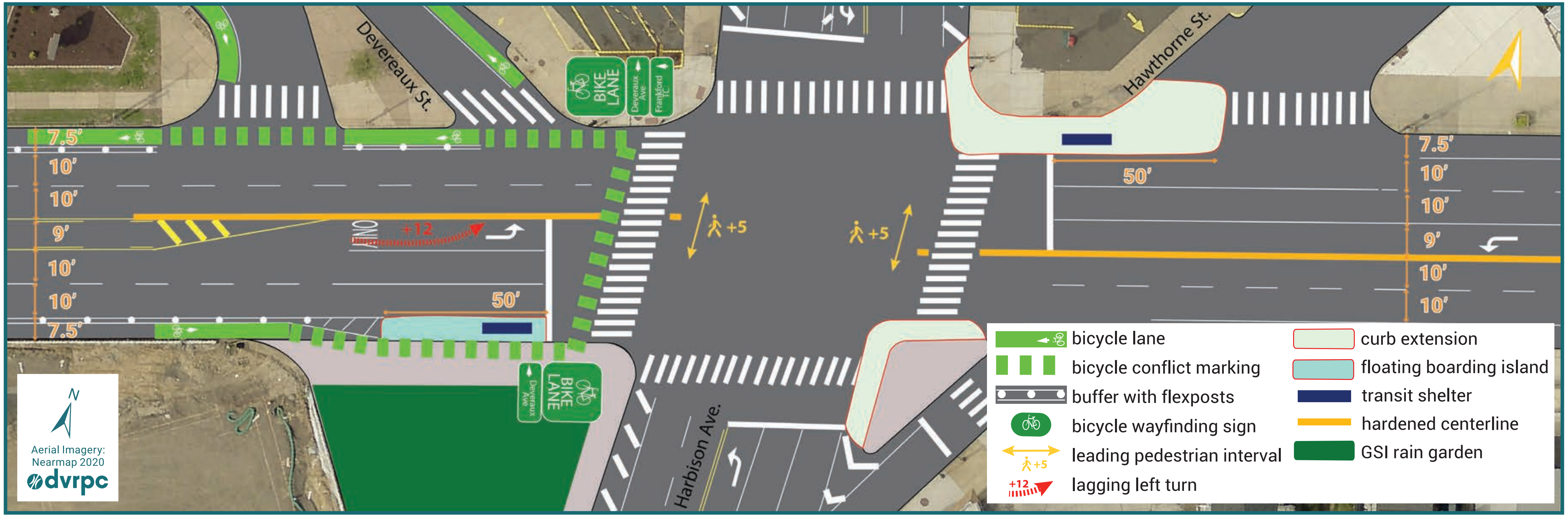


The existing option to turn right before Harbison Avenue is closed, eliminating an uncontrolled pedestrian crossing with a wide turning radius. Pending feasibility, a GSI rain garden or other public amenity could be built in its place. LPIs give pedestrians a head start across Frankford Avenue, and a northbound leading left turn phase provides a safe way for drivers to turn left onto westbound Harbison Avenue[13] (existing signal timing already provides a southbound leading left phase)

Frankford Avenue from Robbins Street to Levick Street

Robbins Street and Levick Street pair as major arterials in the eastbound and westbound directions, and are designated as US 13 between Roosevelt Boulevard and Frankford Avenue. They are among the most significant cross streets in the study area in terms of traffic volume and crash history. Crash patterns appear to be partly attributable to speeding and red light running across Frankford Avenue, and risky left turns from Frankford Avenue.The proposed design addresses these concerns by adding raised crosswalks to the eastbound approach from Robbins and the westbound approach from Levick, as well as 10-second leading left turn phase at each intersection. Curb extensions (with trolley shelters and GSI if feasible), pedestrian refuge islands, and LPIs provide addition protection for pedestrians (Figures 21-22).

Figure 20: Frankford Avenue, Harbison Avenue, and Devereaux Avenue, Proposed



[13] A warrant analysis was completed for the proposed permitted/protected northbound left based on PennDOT Publication 149. According to this guidance, the phase is not warranted based on volume or conflict factor. However, the phase is recommended based on engineering judgement, as the presence of an existing southbound left phase makes the proposed condition the most safe and efficient operation.

Figure 21: Frankford Avenue and Robbins Street, Proposed

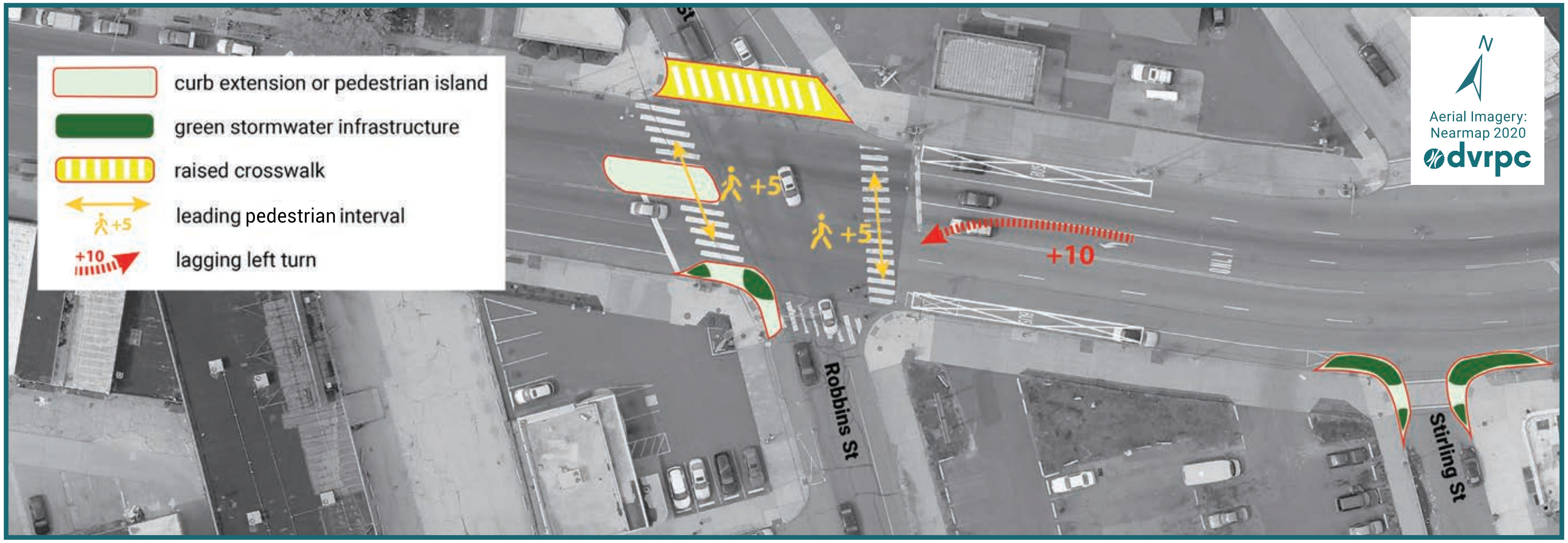
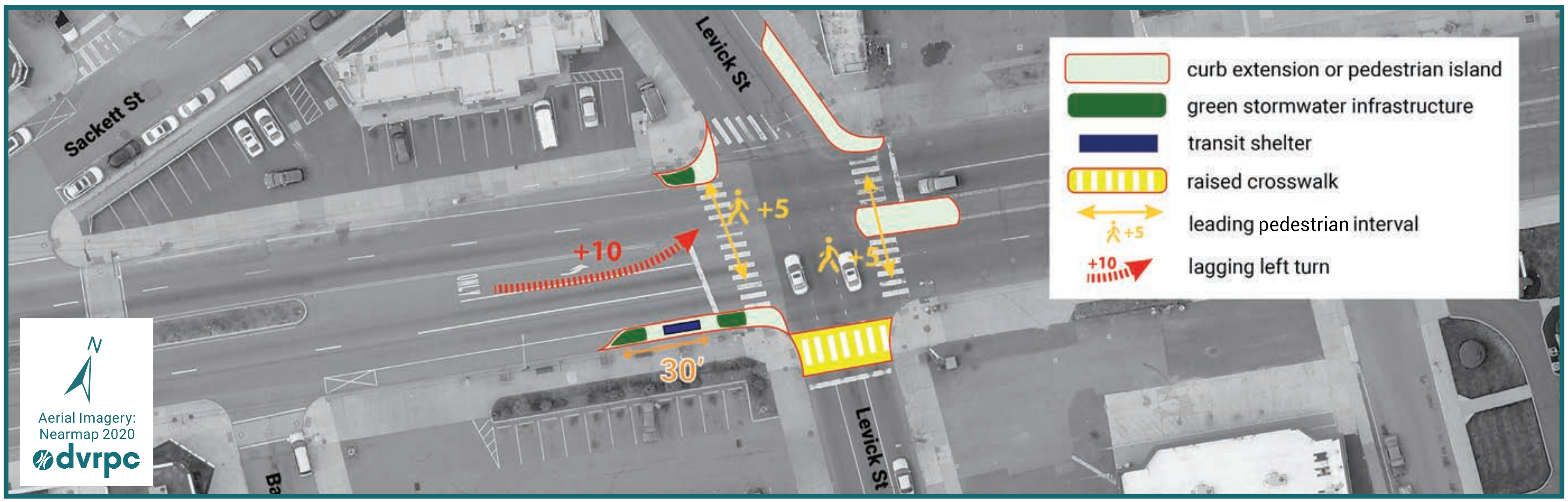


Figure 22: Frankford Avenue and Levick Street, Proposed



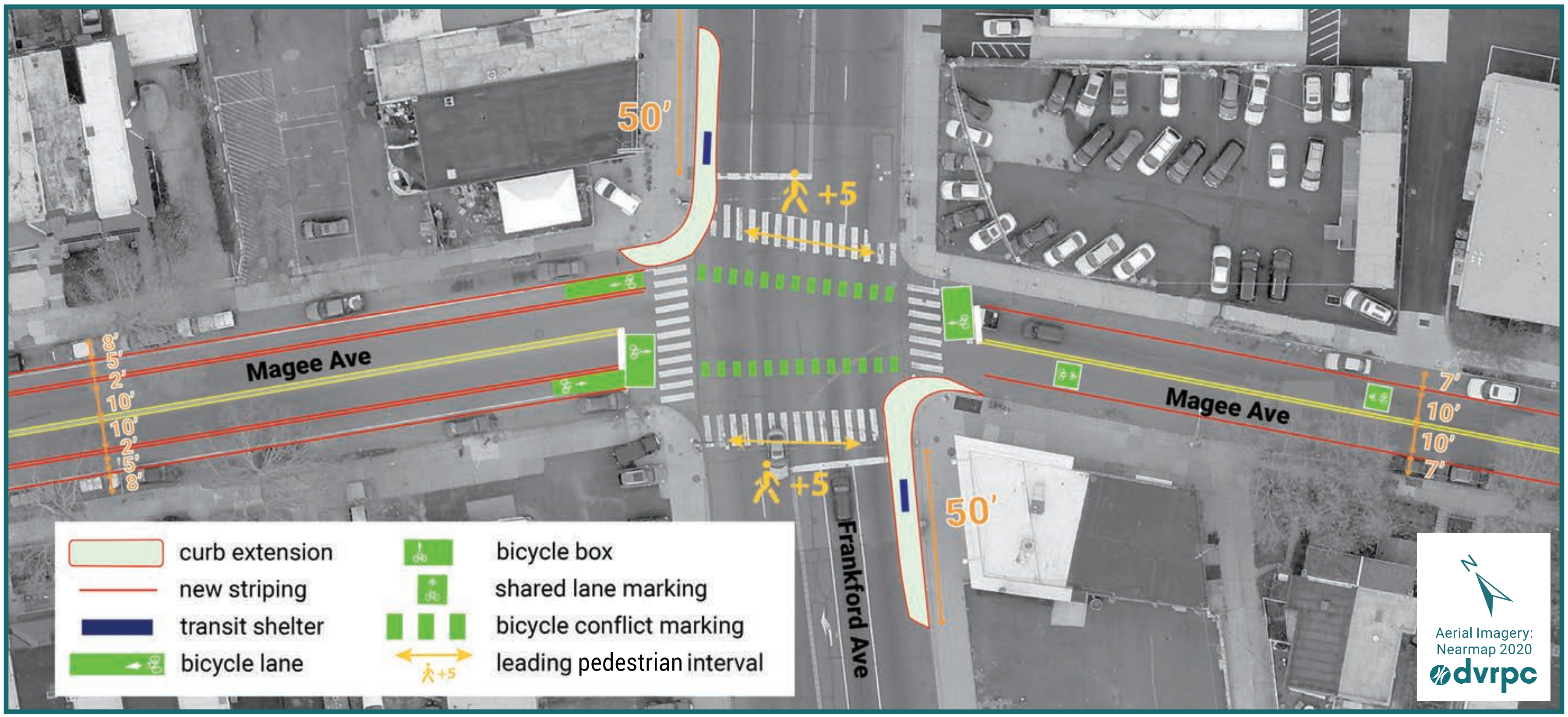
Frankford Avenue and Magee Avenue

Magee Avenue has been identified in several studies as a potential bicycle and pedestrian connection to the Delaware River waterfront. However, there are currently no bicycle facilities on Magee Avenue in the vicinity of the study area.

West of Frankford Avenue, there is enough roadway width to add a buffered bicycle lane without removing any travel or parking lane capacity (Figure 23). East of Frankford Avenue, the roadway is narrower, but the 25 mph speed limit, relatively low traffic volumes, and mostly residential character make it a strong candidate for neighborhood greenway improvements.

The proposed design includes adding these facilities to Magee Avenue, along with intersection improvements for pedestrians and bicyclists. These include bike boxes, conflict markings, and an LPI across Frankford Avenue, as well as trolley curb extensions with trolley shelters.

Figure 23: Frankford Avenue and Magee Avenue, Proposed

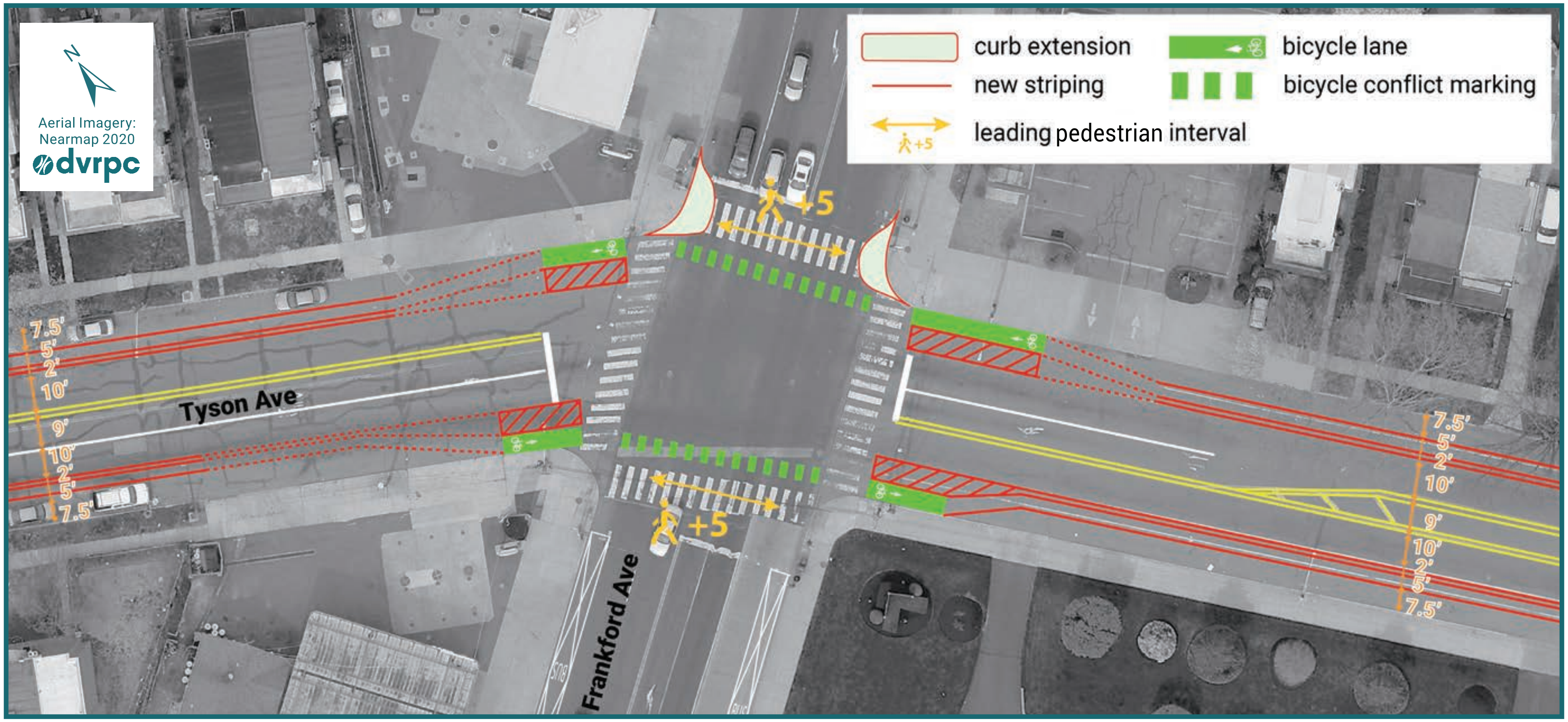


Frankford Avenue and Tyson Avenue

Tyson Avenue currently features buffered bicycle lanes on both sides of Frankford Avenue, connecting to bicycle facilities on Torresdale Avenue and Brous Avenue. However, its crash history indicates risks for bicyclists and pedestrians at the intersection with Frankford Avenue.

The proposed design includes intersection treatments for the bicycle lanes, including bending them out with flexpost-protected buffers at the intersection approach, and adding conflict markings through the intersection. Curb extensions on the north side of Tyson Avenue reduce the Frankford Avenue crossing distance for pedestrians, and an LPI provides a head start for both pedestrians and bicyclists, limiting exposure to turning vehicles (Figure 24).

Figure 24: Frankford Avenue and Tyson Avenue, Proposed

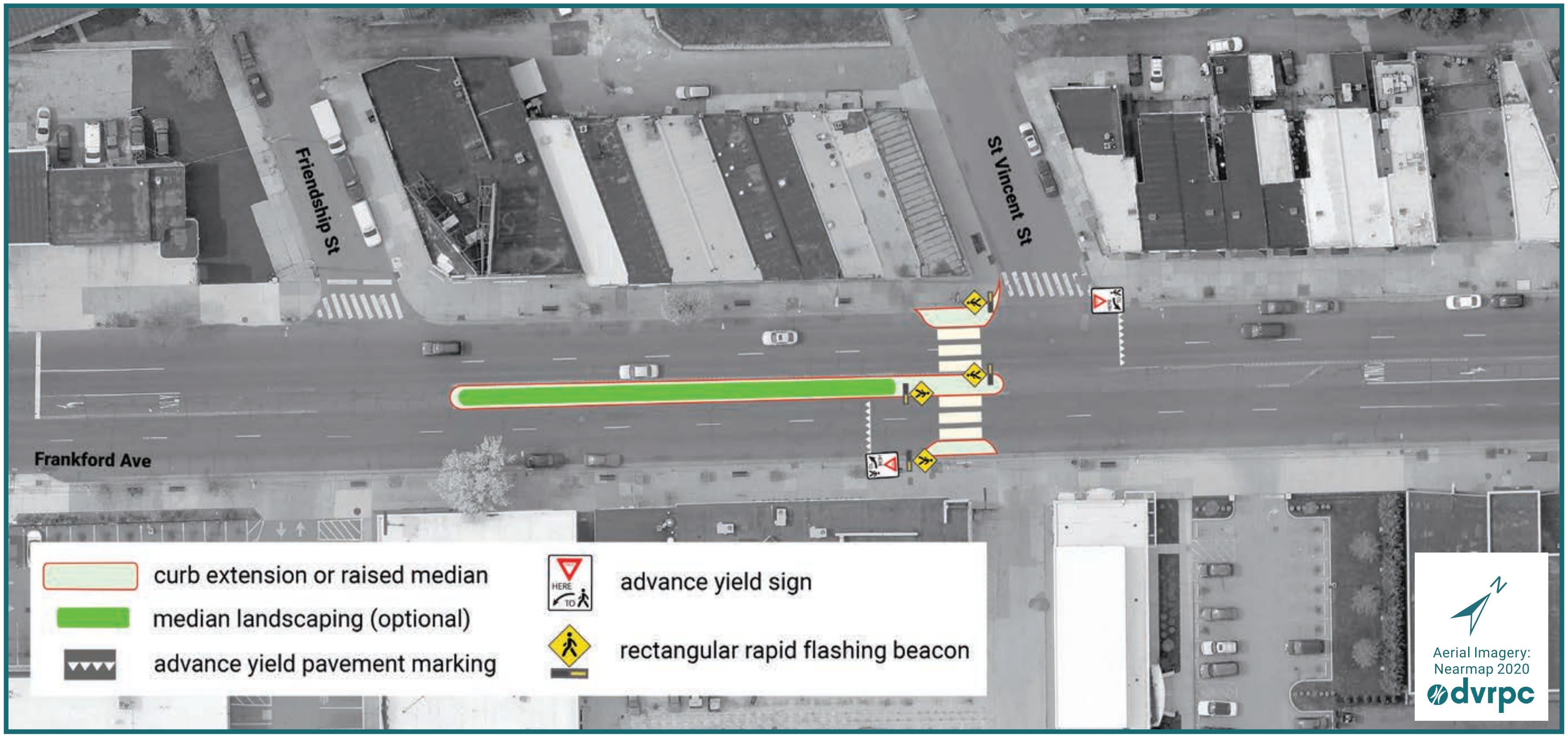


Frankford Avenue and St. Vincent Street

Observations and crash history in the walkable commercial corridor suggest a high demand for crossing facilities outside of signalized intersections. The proposed design at St. Vincent Street includes an unsignalized crossing facility to accommodate this demand, similar in style to the existing unsignalized crossing at Sackett Street.

The facility includes a marked crosswalk, pedestrian refuge island, rectangular rapid flashing beacons (or if possible, overhead beacons), and advance warning signs and pavement markings. Curb extensions, along with a raised median extending to Friendship Street, narrow the roadway and signal drivers entering the walkable commercial corridor to reduce speeds and look out for pedestrians (Figure 25). If the median includes landscaping, a maintenance plan must be developed that does not overly burden community partners.

Figure 25: Frankford Avenue and St. Vincent Street, Proposed



Frankford Avenue, Cottman Avenue, and Ryan Avenue

The proposed design for the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue was developed in partnership with PennDOT, SEPTA, and the City of Philadelphia, and most elements of the design will be implemented in the near term under PennDOT's Highway Safety Improvement Program (HSIP).

The organizing principle of the design is a reconfiguration of Ryan Avenue, which will change direction between Frankford Avenue and Leon Street (Figure 27). This change enables several improvements, including the addition of a southbound left turn lane and removal of the northbound left turn lane onto Ryan Avenue, currently located in the center of the intersection. The new design clarifies vehicle movements and separates northbound and southbound left turns through signal phasing, reducing the risk of angle, head-on, and hit-pedestrian crashes.

Reversing the direction of Ryan Avenue also eliminates the need for the existing channelized lane from westbound Cottman Avenue onto Ryan Avenue. This lane is replaced by a curb extension that increases pedestrian space and reduces the total crossing distance across Cottman Avenue. The design also features trolley curb extensions serving the two southbound and one northbound trolley stop at this intersection, and additional curb extensions to slow turning vehicles and reduce pedestrian crossing distances.

The Ryan Avenue reversal will alter express operations for Route 66. Currently, northbound express trackless trolleys turn left onto Ryan Avenue, left onto Leon Street, left onto Cottman Avenue, and right onto Frankford Avenue to turn around and begin southbound service toward the Frankford Transportation Center. In the proposed design, northbound trolleys turn left onto Cottman Avenue, right onto Leon Street, right onto Ryan Avenue, and right onto Frankford Avenue for the same purpose. These movements have been field-tested, and trolley turning radii will be incorporated in the final design.

Ryan Avenue from Frankford to Leon Street

The proposed design for the block of Ryan Avenue between Frankford Avenue and Leon Street replaces the existing westbound conventional bicycle lane with a two-way parking-protected bike lane. In the short term, this bicycle facility will terminate at Frankford Avenue. Potential future expansion of the facility across Frankford Avenue would require additional intersection protections such as conflict markings and a bicycle light.

Back-in angle parking is striped in place of the existing front-angle parking, and space is set aside for a future expansion of the existing pedestrian plaza, as well as a trolley layover area.

Frankford Avenue, Aldine Street, and Tudor Street

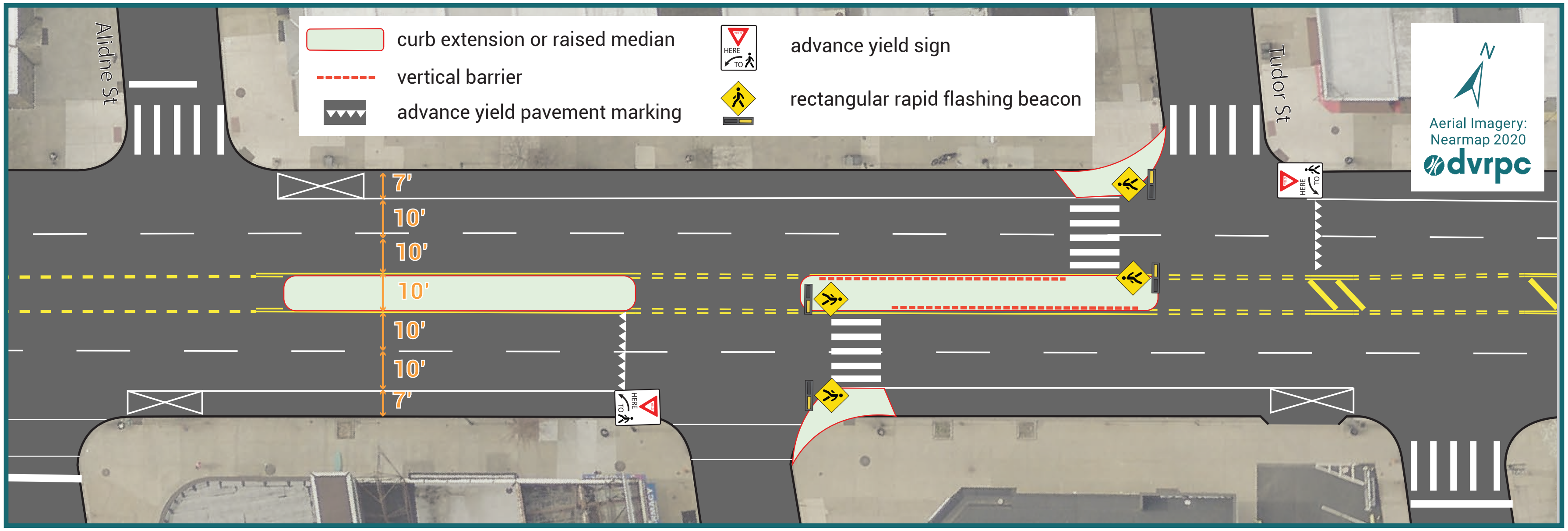
Like St. Vincent Street, the proposed design includes a new unsignalized crossing facility between Aldine Street and Tudor Street (Figure 29). This crossing features the same protections as the St. Vincent Street and Sackett Street facilities, but due to the staggering of cross streets in this segment of Frankford Avenue, the crossing here is staggered, connecting Tudor Street on the west side to Aldine Street on the east side. A raised barrier is recommended to guide pedestrians to the marked crosswalks. A second raised median and curb extensions are shown to encourage drivers to slow down approaching the crossing.

Figure 26: Frankford, Cottman, and Ryan Avenues, Existing

Figure 27: Frankford, Cottman, and Ryan Avenues, Proposed

Figure 28: Frankford Avenue, Aldine Street, and Tudor Street, Existing

Figure 29: Frankford Avenue, Aldine Street, and Tudor Street, Proposed



Frankford Avenue from Bleigh Avenue to Rhawn Street

The proposed design from Bleigh Avenue to Rhawn Street features a road diet, converting the two outer vehicle travel lanes to back-in angle parking on the north side of the street, and widened sidewalks on the south side. The road diet concept was chosen to reduce vehicle speeding and crash risk while producing a more pedestrian-friendly environment. Back-in angle parking was the preferred replacement for travel lanes based on community feedback, and widened sidewalks provide more space for placemaking efforts while reducing pedestrian crossing distances. Example designs for key locations are illustrated in Figures 30-35.

Frankford Avenue and Sheffield Avenue

Figure 31 illustrates the proposed road diet design at Sheffield Avenue, a fairly representative intersection for the road diet extent. Back-in angle parking stalls are marked on the west side of Frankford Avenue, with a 19-foot offset from the curb. This offset provides a buffer that allows vehicles to partially or fully exit the travel lane while maneuvering into a parking space.[14] On the east side, sidewalks are widened by seven feet, and the existing seven-foot parallel parking lane is widened to eight feet, leaving space for drivers to safely exit their vehicles and minimizing travel lane blockage from wider parked vehicles.

At the southeast and northwest corners, trackless trolley stops are marked at 10 feet wide and 90 feet long. This leaves adequate space for trolleys to maneuver back into and out of traffic for boarding. Queue jump signals work with the existing transit signal priority infrastructure to give trolleys an actuated head start after a red phase. Trolley curb extensions with shelters provide a comfortable area for riders to wait. Unlike the trolley curb extensions between Benner Street and Cottman Avenue, however, trolleys exit the travel lane to board at these extensions, minimizing travel lane blocking in the three-lane configuration.

[14] The final offset distance is subject to engineering judgment. A wider offset can provide better maneuverability and minimize traffic impact; however, it can encourage double parking if the buffer is overly wide.

Also to prevent travel lane blocking, a loading zone is designated north of Sheffield Avenue, where trucks frequently park to serve the nearby Wawa and other businesses.

Frankford Avenue and Decatur Street

The proposed design at Decatur Street includes many of the same features as Sheffield Avenue (Figure 33). In addition, Decatur Street is the final proposed location for an unsignalized crossing facility, as it hosts the only pair of trolley stops outside of a signalized intersection. This facility includes the same basic features as the others, but a more compact design, as pedestrians only need to cross one lane of traffic at a time.

Frankford Avenue and Rhawn Street

Currently, Rhawn Street is the end of the five-lane configuration of Frankford Avenue, and the beginning of a three-lane configuration that continues north of the intersection (Figure 34). The crash history at this intersection suggests visibility issues for turning vehicles, due in part to deep setbacks of Rhawn Street crosswalks and stop bars. Introducing a three-lane configuration south of Rhawn Street allows the crosswalks and stop bars to be brought in closer to the intersection, improving visibility (Figure 35).

Sight lines may also be blocked by northbound trolleys stopping in the narrow parking lane, which also impedes traffic flow. In the proposed design, the northbound trolley stop is moved to the south side of Rhawn Street, where there is room to fully clear the travel lane. This near-side configuration also creates the opportunity for a northbound actuated queue jump. Finally, trackless trolley curb extensions create a more balanced shape to the intersection, improving sight lines and reducing the distance to cross Frankford Avenue on the south side.

Figure 30: Frankford Avenue and Sheffield Avenue, Existing

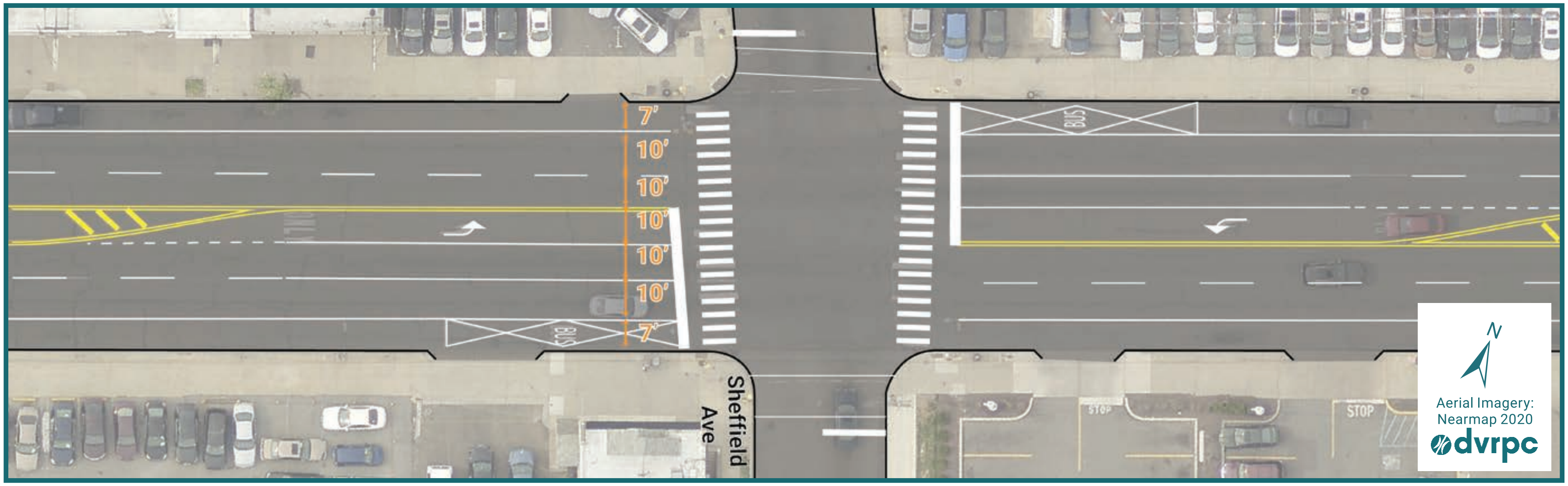


Figure 31: Frankford Avenue and Sheffield Avenue, Proposed

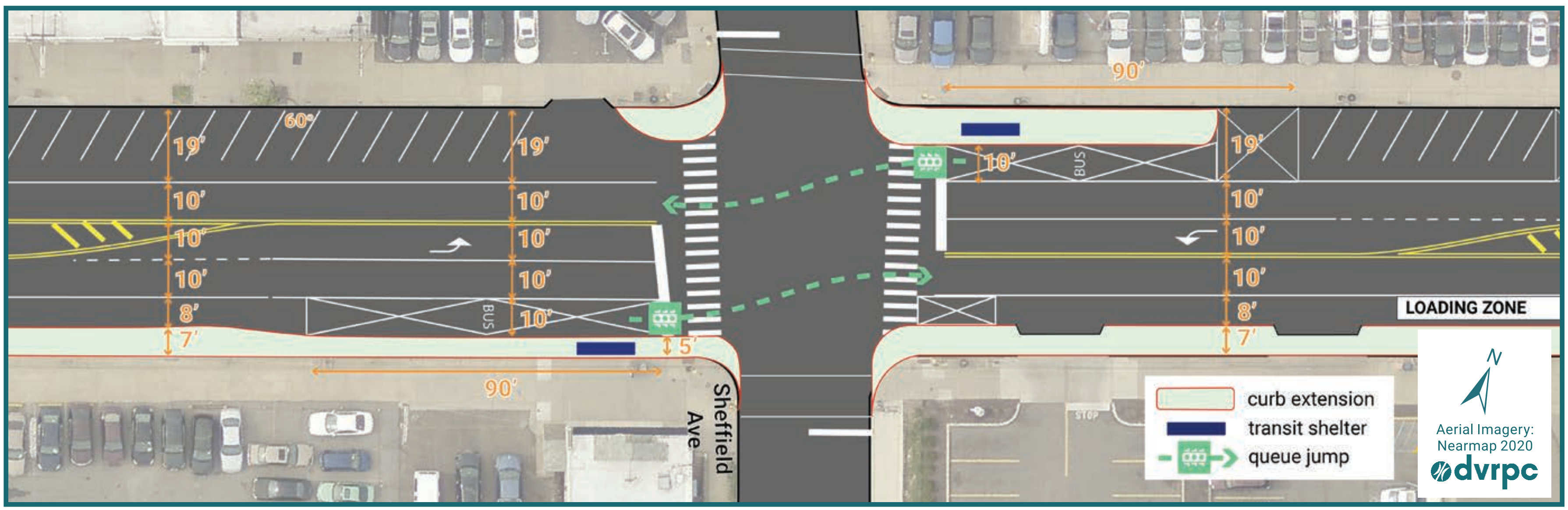


Figure 32: Frankford Avenue and Decatur Street, Existing

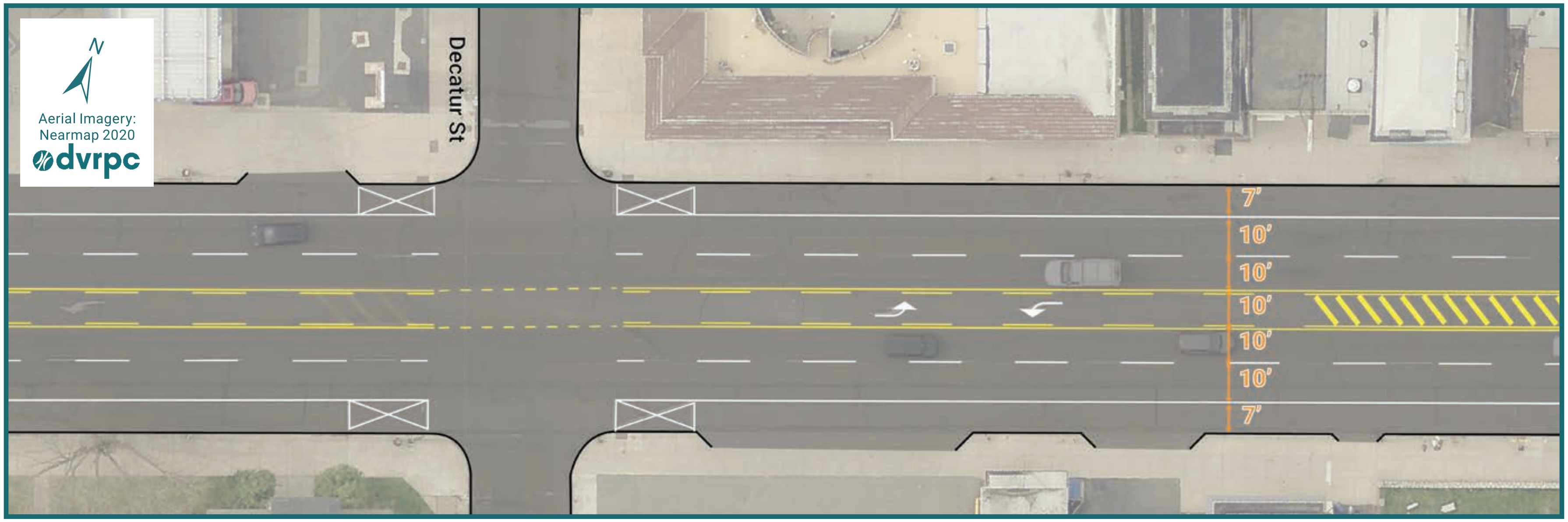


Figure 33: Frankford Avenue and Decatur Street, Proposed

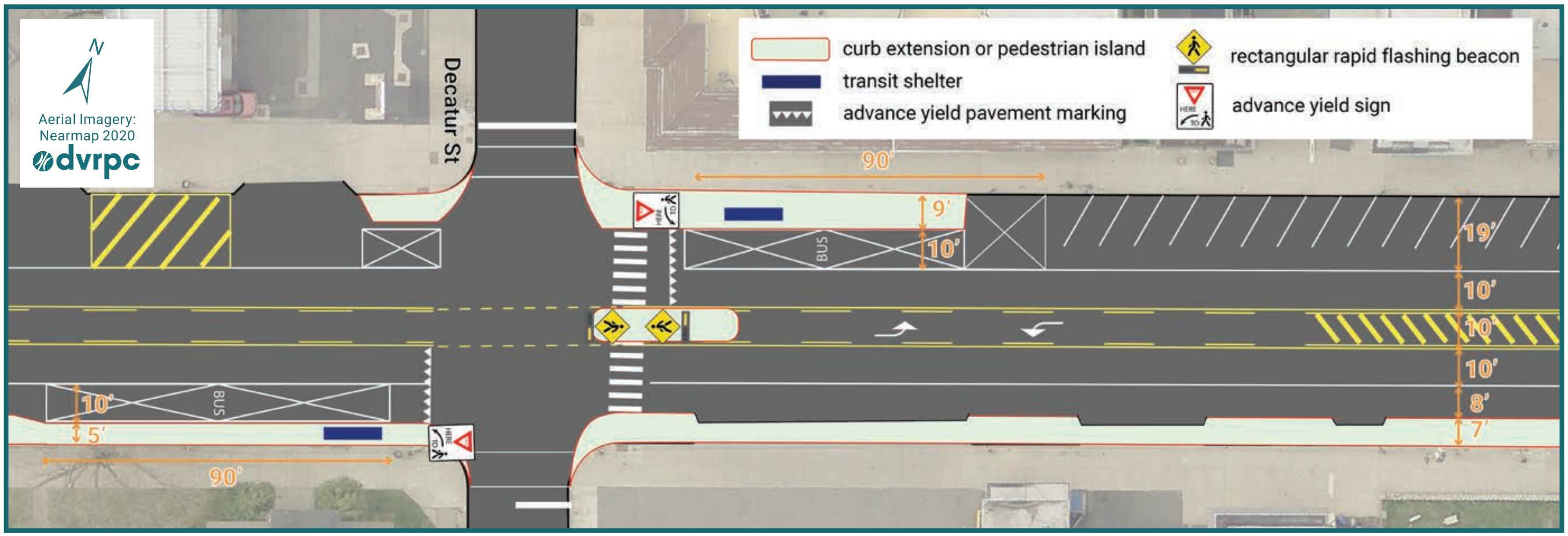


Figure 34: Frankford Avenue and Rhawn Street, Existing

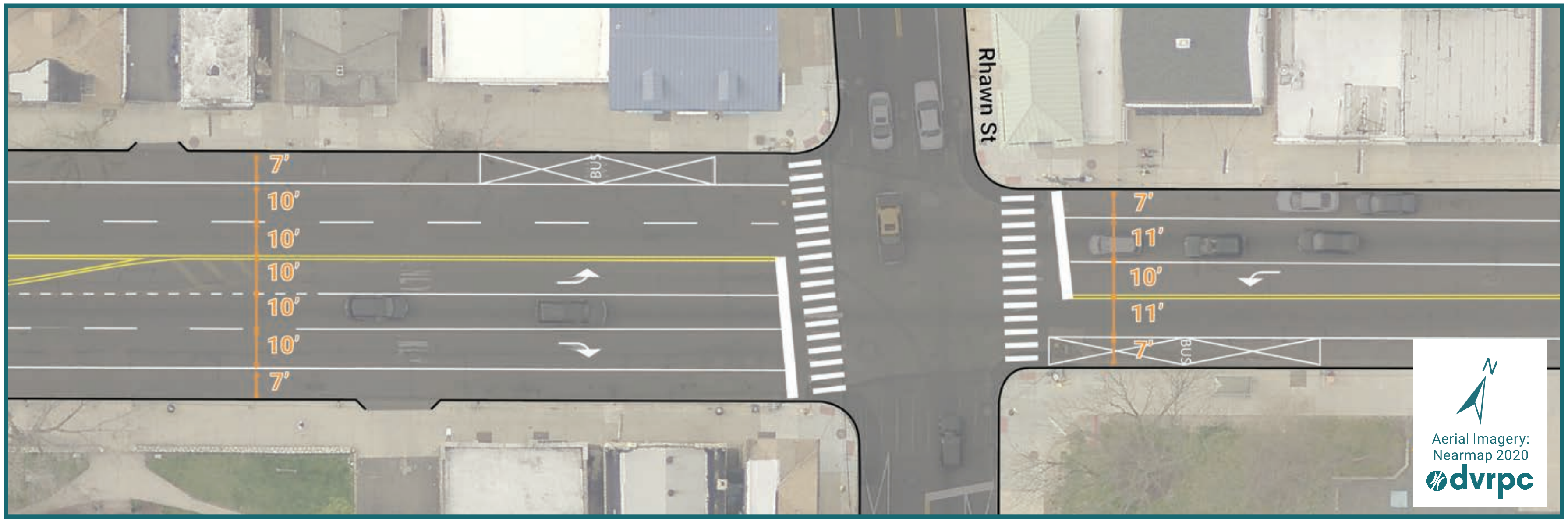
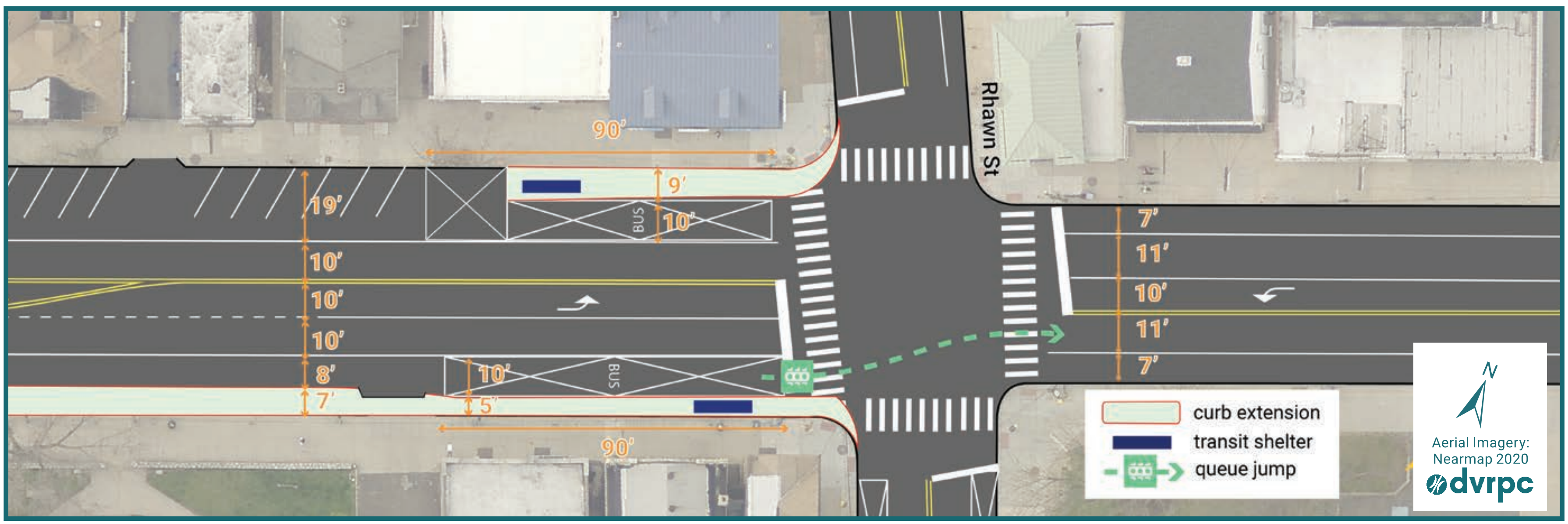


Figure 35: Frankford Avenue and Rhawn Street, Proposed



Traffic Performance

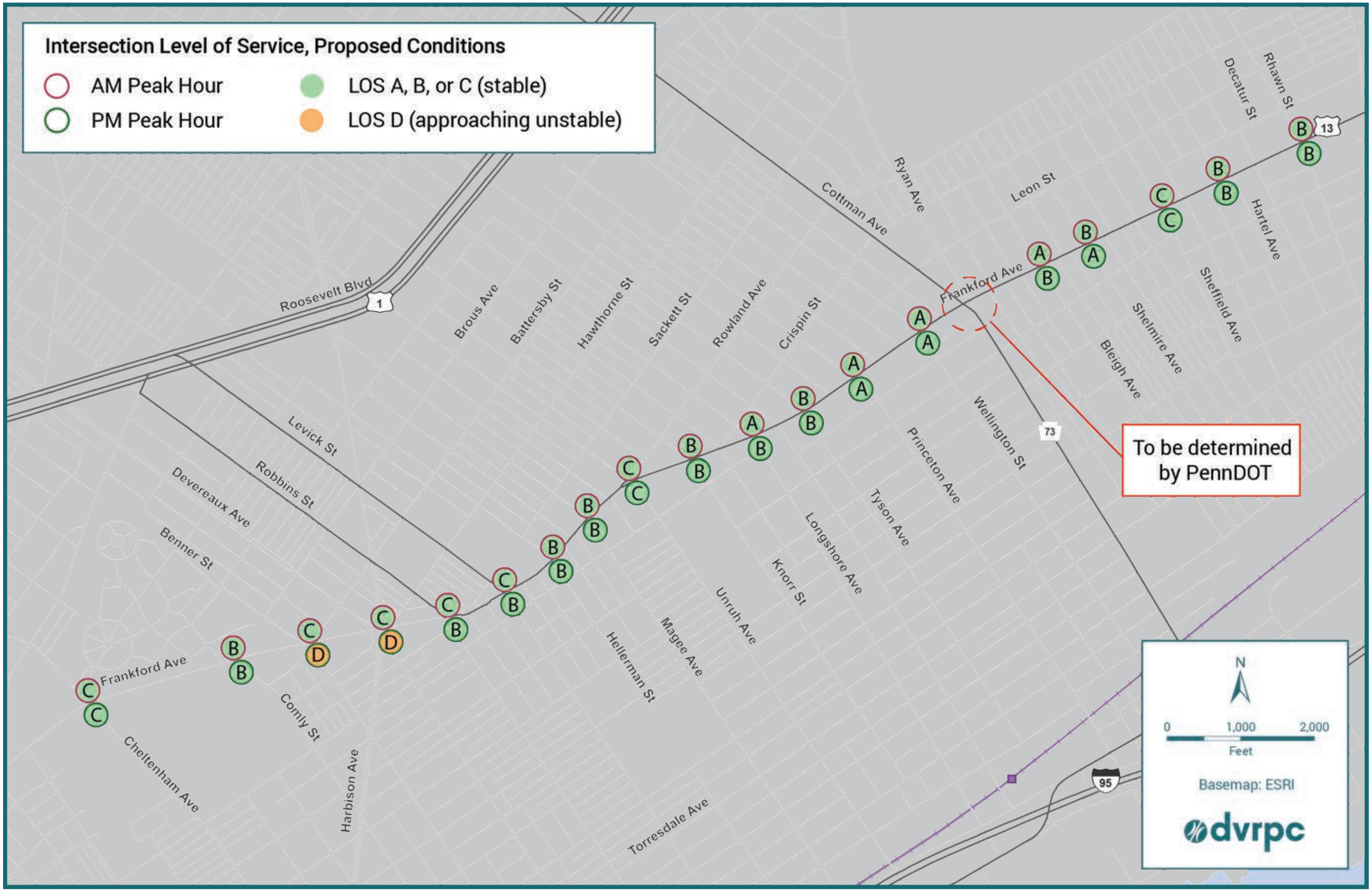
All traffic-related recommendations (lane reconfiguration, protected/permitted left turn phases, and LPIs) were evaluated in Synchro to determine their impact to traffic performance, with the exception of the proposed changes to the intersection of Frankford, Cottman, and Ryan Avenues. The signal timing for that intersection is currently being finalized by PennDOT, so the intersection was left out of this analysis.

Detailed results, including LOS at the movement and approach level, are presented in Appendix C. These results were calculated using Highway Capacity Manual (HCM) 6th edition methodology, except for intersections with more than four approaches, where HCM 2000 methodology was used.

Intersection level of service (LOS) during the AM and PM peak hours under the proposed design are shown in Figure 36. During the AM peak, all intersections operate at LOS C or better, reflecting stable conditions.

During the PM peak, two intersections operate at LOS D: the intersection of Frankford, Benner, and Battersby, and the intersection of Frankford, Harbison, and Devereaux. Both of these intersections perform at LOS C during the PM peak hour under existing conditions. The Benner and Battersby intersection accrues an additional 13.7 seconds of average delay due to the recommended traffic calming improvements, and the Harbison and Devereaux intersection accrues an additional 3.0 seconds of delay. At both intersections, LPIs slightly decrease the amount of time available for vehicles, and at Harbison Avenue, a new northbound leading left turn phase reduces the amount of time for other vehicle movements. However, the moderate amount of delay introduced is a recommended tradeoff for the safety benefits gained.

Figure 36: Intersection Level of Service (LOS), Proposed



Implementation Considerations

The reconfiguration of the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue will be funded and implemented by PennDOT as part of its HSIP. The design and timeline are being finalized, but current plans include roadway restriping and related traffic signal timing changes, and installation of curb extensions, including trackless trolley curb extensions. The HSIP project will set aside space for the expansion of the pedestrian plaza, but will not program this space. Programming the expanded plaza would be the responsibility of the Business Improvement District.

Funding should be identified for the remaining recommendations in this report. Potential funding sources include:

- People for Bikes Community Grants: peopleforbikes.org
- Community Transportation Association of America Grant Programs: www.ctaa.org
- Pennsylvania Infrastructure Bank: www.penndot.gov
- Surface Transportation Block Grant Program: www.fhwa.dot.gov
- Transit Research and Demonstration Program: www.penndot.gov
- Transit Revitalization Investment District: dced.pa.gov
- Transportation Alternatives Program: www.dvrpc.org/tap
- Congestion Mitigation and Air Quality Program (CMAQ): www.dvrpc.org/cmaq
- Infrastructure for Rebuilding American Grant Program (INFRA): www.transportation.gov/buildamerica/infragrants
- Better Utilizing Investments to Leverage Development (BUILD): www.transportation.gov

In addition to funding, some recommendations will require further feasibility analysis and design. For example, locations with potential for green stormwater infrastructure must be vetted for feasibility. Curb extensions and other roadway improvements must be designed with adequate turning radii and dimensions that support trolley and large truck movements where appropriate. Catenary wire infrastructure will need to be moved to implement the road diet as proposed. Additional details about the road design will need to be finalized to meet engineering standards. The northbound lane removal could be extended to begin at Cottman Avenue, but this option was left out of the analysis for this report until the HSIP improvements are finalized.

In some cases, community and stakeholder outreach may be needed to finalize designs. For example, one concern expressed by the steering committee was that the proposed raised median would interfere with the long-standing Thanksgiving parade on Frankford Avenue. Community groups should be engaged to better understand how to mitigate this potential impact. Long-term maintenance of new facilities should also be considered, particularly where community partners are expected to play a role.

Finally, opportunities to build on the recommendations in this report may arise as the corridor continues to develop and change. Recommendations presented here represent what is possible under current conditions. However, due to recent rezonings, changes in land use, business activity, parking, and the volume of pedestrians, bicyclists, and transit riders are likely to occur over time, particularly in the southern half of the corridor. For example, in some cases, trolley curb extensions are not currently feasible because stops are located in front of or near a driveway. However, recent rezonings aim to reduce front-loaded parking from Frankford Avenue, and the number of driveways can be expected to decrease over time. As parcels are redeveloped along the trackless trolley route, opportunities to incorporate trolley facilities should be revisited.

APPENDICES

A: March 2020 Open House Posters

B: Public Comments on Draft Report

C: Detailed Traffic Performance Results

APPENDIX A

MARCH 2020 PUBLIC OPEN HOUSE POSTERS

The following posters were presented at the public open house held on March 4, 2020 at King's Highway Tavern. Posters #1-3 outline the study background and objectives. Posters #4-7 provide information about initial treatment ideas, and Poster #8 was used to collect feedback on these ideas. Posters #9-11 provide information about road diets and potential cross-section options for the study area, and Poster #12 was used to collect feedback on these options.

#1 PROJECT STUDY AREA

FRANKFORD AVE
MULTIMODAL STUDY

About the Frankford Avenue Multimodal Study

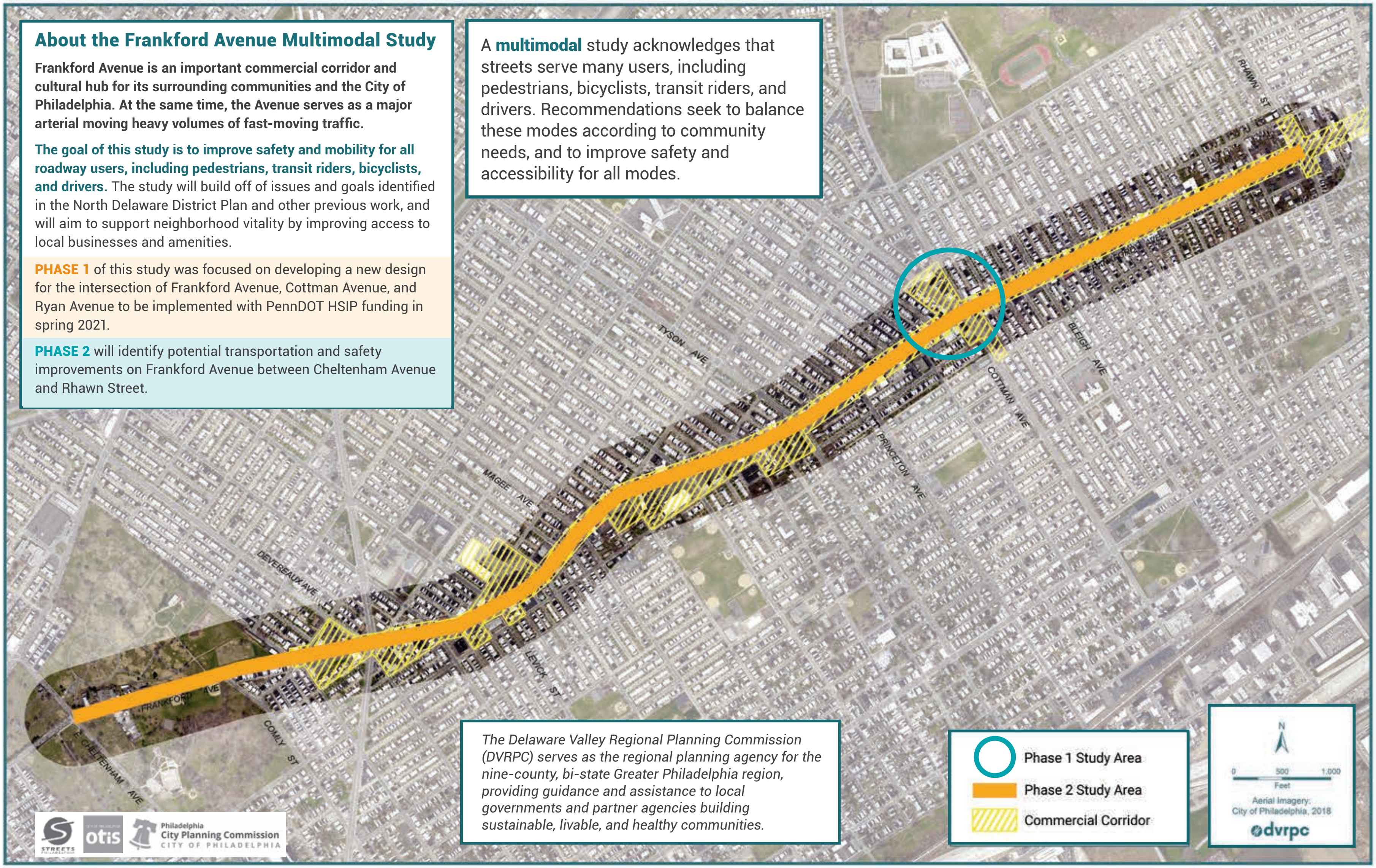
Frankford Avenue is an important commercial corridor and cultural hub for its surrounding communities and the City of Philadelphia. At the same time, the Avenue serves as a major arterial moving heavy volumes of fast-moving traffic.

The goal of this study is to improve safety and mobility for all roadway users, including pedestrians, transit riders, bicyclists, and drivers. The study will build off of issues and goals identified in the North Delaware District Plan and other previous work, and will aim to support neighborhood vitality by improving access to local businesses and amenities.

PHASE 1 of this study was focused on developing a new design for the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue to be implemented with PennDOT HSIP funding in spring 2021.

PHASE 2 will identify potential transportation and safety improvements on Frankford Avenue between Cheltenham Avenue and Rhawn Street.

A **multimodal** study acknowledges that streets serve many users, including pedestrians, bicyclists, transit riders, and drivers. Recommendations seek to balance these modes according to community needs, and to improve safety and accessibility for all modes.



The Delaware Valley Regional Planning Commission (DVRPC) serves as the regional planning agency for the nine-county, bi-state Greater Philadelphia region, providing guidance and assistance to local governments and partner agencies building sustainable, livable, and healthy communities.

#2 PROJECT CONTEXT

dvrpc FRANKFORD AVE MULTIMODAL STUDY

Transit First Initiative Winter-Spring 2015

Transit First is an interagency initiative to enhance transit in the City. In January 2015, recommendations were released for the Route 66 Trackless Trolley to improve service along Frankford Avenue. Many of these recommendations were implemented in spring 2015.

Mayfair Zoning Amendment

On October 20, 2016, Councilmember Henon introduced a bill encouraging a more pedestrian-friendly commercial corridor along Frankford Avenue between Comly Street and Sheffield Avenue, informed by the North Delaware District Plan.

PennDOT Road Diet Study Fall 2018

The Pennsylvania Department of Transportation (PennDOT) commissioned a study to determine whether a traffic lane could be removed along Frankford Ave. to calm traffic and make more space for other uses (a "road diet").

The study identified segments where a road diet would not overly disrupt traffic. This led to the Frankford Avenue Multimodal Study, which will develop a more detailed road diet design and identify other improvements.

PennDOT Highway Safety Improvement Program (HSIP) Spring 2019 to Spring 2021

Each year, PennDOT receives federal funding to implement low- to moderate-cost safety improvements on priority roadways.

Frankford Avenue will benefit from a number of safety improvements through this program, with construction expected in spring 2021.

2015 2016 2017 2018 2019 2020 2021

Public Meeting #1
August 13, 2015
Holmesburg Recreation Center

Public Meeting #2
October 22, 2015
Abraham Lincoln High School

Public Meeting #3
December 16, 2015
Holy Family University

North Delaware District Plan Fall 2015 to Spring 2016

Public outreach for the North Delaware District plan began with three meetings in fall 2015 and continued through the plan's adoption by the Philadelphia City Planning Commission (PCPC) in March 2016. See poster #3 for more information.

Holmesburg Zoning Amendment

On May 18, 2017, Councilmember Henon introduced a bill encouraging a more pedestrian-friendly commercial corridor along Frankford Avenue between Sheffield Avenue and Solly Avenue, informed by the North Delaware District Plan.

Public Meeting #1
May 30, 2019
Mayfair Community Center

Public Meeting #2 ★
March 4, 2020
King's Highway Tavern

Public Meeting #3
May 2020, location TBD

Frankford Avenue Multimodal Study Spring 2019 to Summer 2020

PHASE 1 of this study was focused on developing a new design for the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue to be implemented with PennDOT HSIP funding in spring 2021.

PHASE 2 will identify potential transportation and safety improvements on Frankford Avenue between Cheltenham Avenue and Rhawn Street.

Streets otis Philadelphia City Planning Commission CITY OF PHILADELPHIA

#3 SAFETY CONCERNS

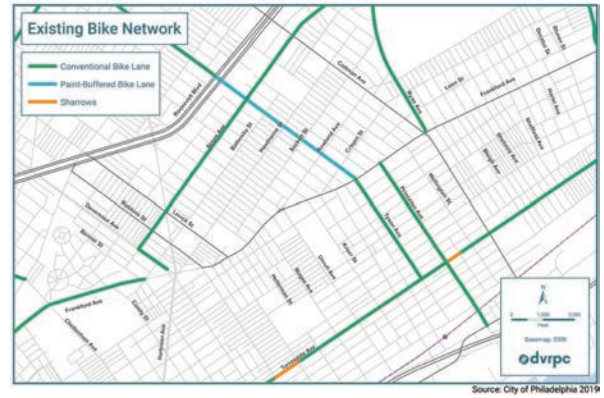
WHO USES FRANKFORD AVE?

All kinds of road users travel on Frankford Ave. Many people travel by car, bus, bike, or on foot. The Route 66 trackless trolley connects transit users on Frankford Ave to the Frankford Transportation Center. Bike lanes crisscross Frankford Ave, connecting bicyclists from the river to Pennypack Park and many other destinations. People on foot roam the business districts along Frankford Ave, where they must contend with heavy vehicle traffic.

WHAT ARE THE SAFETY CONCERNS?

There are many safety concerns on Frankford Ave. Frankford Ave is part of Philadelphia's "High Injury Network," which means it has been identified as one of the most dangerous streets in the city with a high number of serious crashes. Over the last five years, the number of crashes has fluctuated, but has increased overall, from 41 crashes in 2014 to 67 in 2018. Crashes involving pedestrians are more common on Frankford Ave than the rest of the city and are generally more severe than other types of crashes. Traffic calming improvements can slow traffic and make Frankford Ave a safer place for everyone that travels along it.

Source: SEPTA 2017

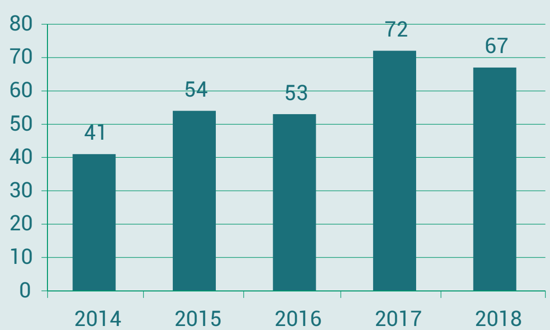


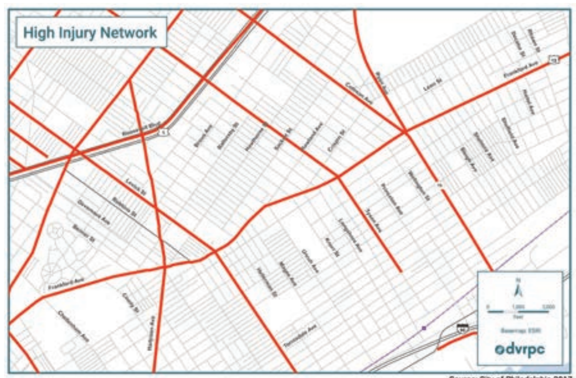
Source: City of Philadelphia 2019

(Left to right) Frankford Ave and Barnett St mid-block crossing; Frankford Ave and Cottman Ave.

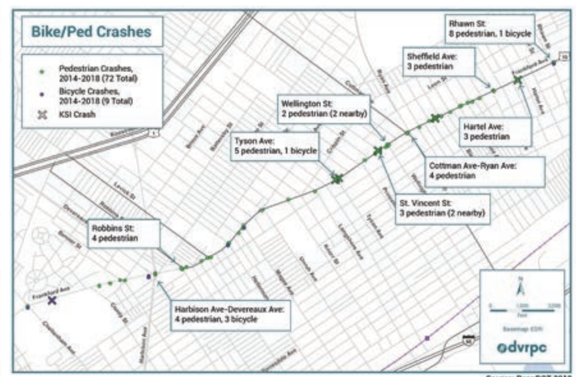
Credit: DVRPC

CRASH TREND





Source: City of Philadelphia 2017



Source: PennDOT 2019

(Left to right) Frankford Ave and Sheffield Ave; Frankford Ave and Chippendale St; Frankford Ave and Bleigh Ave.

Credit: DVRPC

Philadelphia City Planning Commission CITY OF PHILADELPHIA

#4 MULTIMODAL TREATMENTS

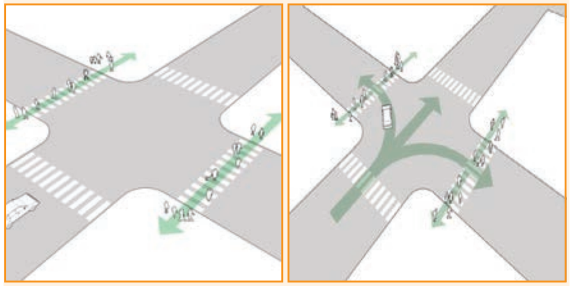
Pedestrian Head Start / Leading Pedestrian Interval

WHAT? A head start for pedestrians that allows them to begin crossing the street before turning vehicles.

WHY?

- Reduces pedestrian crashes (60% in case studies)
- Increases pedestrian visibility and reduces traffic exposure
- Encourages drivers to yield to pedestrians in crosswalk

WHERE? Intersections with high pedestrian volumes, poor pedestrian visibility, a history of pedestrian crashes or failure to yield.



A leading pedestrian interval (LPI) provides time for pedestrians to cross while vehicles wait, reducing crash risk. Source: NACTO

Hardened Centerline

WHAT? Rubber curb and bollards installed on the centerlineon either side of a crosswalk.

WHY?

- Reduces left turning speeds, creating safer crossings for pedestrians
- Decreases pedestrian conflict zone

WHERE? Intersections with wide turning radii, fast turning speeds, illegal movements, or a history of pedestrian and left-turn crashes.

A hardened centerline on Broad Street at Tioga Street. Source: City of Philadelphia

Parking and Loading Improvements

WHAT? Strategies to create and clarify space for trucks andpersonal drivers parking or standing in the study area.

WHY?

- Increase access to businesses and other destinations
- Reduce unsafe and traffic-disruptive behaviors such as double parking and median parking

WHERE? Intersections with wide turning radii, fast turning speeds, illegal movements, or a history of pedestrian and left-turn crashes.

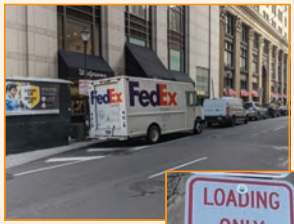
Back-in Angle Parking

An alternative to parallel parking that can improve safety and traffic flow, and may increase the number of parking spots on a block if there is available width.

Back-in angle parking on 2nd Avenue and Poplar Street, Philadelphia. Source: DVRPC

Dedicated Loading Zones

Curbside space that is set aside for short-term parking or standing (for example, 20 minutes). Loading zones may be in effect all day or may be used for parking overnight. They allow vehicles to make deliveries or drop off passengers without blocking traffic flow.



A van and delivery truck use a dedicated loading zone on Chestnut Street, leaving the roadway clear. Source: DVRPC

A sign for a dedicated loading zone on Spring Garden Street. Source: DVRPC

#5 MULTIMODAL TREATMENTS

FRANKFORD AVE
MULTIMODAL STUDY
dvrpc

Parklets and Pedestrian Plazas

WHAT? Small curbside parks that may include seating, landscaping, or other elements. Usually maintained by a business or community organization.

WHY?
- Provides additional space for pedestrians
- Decreases pedestrian conflict zone

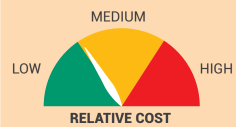
WHERE? Intersections with heavy pedestrian volumes, commercial uses and high demand for more pedestrian amenities. Can be placed in a parking lane or unused roadway space where conditions are safe.



Curbside parklets can provide seating and activities, slowing down traffic while making a business corridor more attractive.

Photos by Ryan Collerd, courtesy University City District

Bicycle Intersection Improvements



WHAT? Strategies to clarify and direct bicycle movements through intersections.

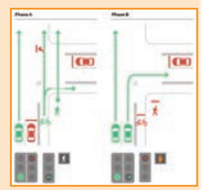
WHY?
- Improve bicyclist visibility and safety
- Increase predictability for bicyclists, drivers, and pedestrians moving through intersections

WHERE? Intersections with high volumes of bicyclists and vehicles, particularly signalized intersections that connect existing or proposed bicycle lanes.

Protected Bike Phase and Signal

A dedicated bike signal phase, indicated by a bike signal, that protects bicyclists from turning vehicles.

Source: DVRPC



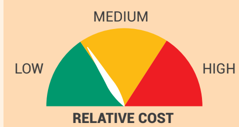
Source: NACTO


Bicycle Pavement Markings

Pavement markings at intersections can clarify the path of travel for cyclists and reduce the risk of vehicle-bicycle crashes. Examples include dashed striping across conflict zones, bike boxes for queuing at intersections, and bike boxes for cyclists making left turns.

Left:: Striping across an intersection, and a bike box for cyclists to queue at a red light. Right: A two-stage left turn box provides a space for bicyclists to wait while safely making a left turn with traffic. Source: DVRPC

New and Improved Bicycle Lanes



WHAT? Strategies to improve the safety and comfort of existing bicycle lanes, or create new lanes that are appropriate for the traffic context.

WHY?
- Close gaps in the bicycle network to increase bicycle connections and mobility
- Increase safety and predictability for bicyclists, drivers, and pedestrians traveling along a roadway

WHERE? New bicycle lanes should be considered where there is high demand or a gap in the larger bicycle network. Improvements to existing lanes should be considered on roadways with high vehicle speeds and volumes.

Conventional Lane

Designated lane that is delineated by pavement markings and signs, ideally five feet wide or wider.

Source:NACTO

Buffered Lane

Designated lane that is physically separated from adjacent travel lanes by a painted buffer area. May also include vertical barriers.

Source:NACTO

Parking-Protected Lane

Exclusive lane that is physically separated from adjacent travel lanes by an on-street parking lane and painted buffer. May also include vertical barriers.

Source:NACTO

#6 MULTIMODAL TREATMENTS

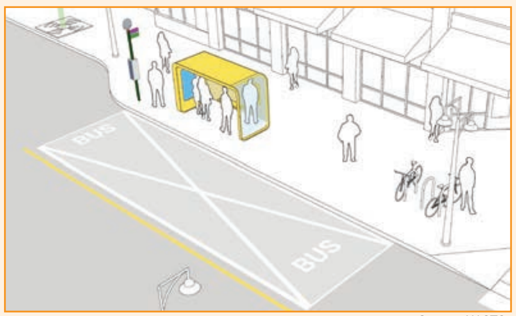
FRANKFORD AVE
MULTIMODAL STUDY
dvrpc

Bus Stop Improvements

WHAT? New bus shelters, clear posted schedules and waiting areas, sufficient lighting, and other improvements.

WHY? Improves the comfort and safety of transit riders

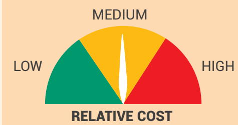
WHERE? Prioritize at high-volume bus stops.



Source: NACTO

Source: City of Philadelphia

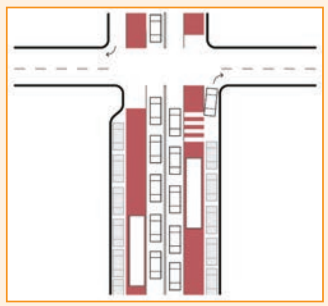
Business Access and Transit (BAT) Lanes



WHAT? The right-most lane is set aside for buses and trackless trolleys, but other vehicles can still cross it to park or turn into side streets and driveways.

WHY? Improves bus travel times and reliability

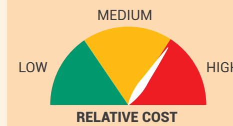
WHERE? Multilane roadways with on-street parking, retail, and frequent transit.



BAT lanes can be located between a parking lane and a travel lane.
Source: NACTO

Source: SFMTA

Pedestrian Refuge Island



WHAT? A raised island between traffic lanes dedicated to pedestrians crossing the roadway. Can be implemented as part of a larger raised median or separately.

WHY?

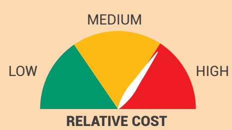
- Reduces pedestrian exposure to vehicles
- Divides crossing distance into shorter segments
- Allows pedestrians to cross in two phases
- Encourages drivers to slow down when making turns

WHERE? Locations where high traffic volumes and speeds inhibit crossing, especially on roadways with three or more lanes. Can be installed at intersections or mid-block crossings.

A pedestrian island provides a safe space for pedestrians to wait if the crossing distance is too long.
Source: DVRPC

#7 MULTIMODAL TREATMENTS

Curb Extension (Bumpout)



WHAT? Extended curbs "bump out" the sidewalk into the parking lane at the end of a block.

WHY?
- Increase pedestrian visibility
- Decrease pedestrian crossing distance
- Signal to drivers they are entering a neighborhood
- Encourage slower vehicle turning speeds

WHERE? Intersections with high pedestrian volumes, long crossings, wide turning radii and/or a history of pedestrian crashes.

Bumpouts on Frankford Avenue and Princeton. Source: DVRPC

Source: NACTO

Source: NACTO

Variation: Bus Stop Curb Extension

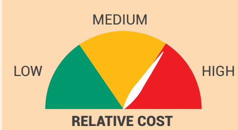
A bus stop curb extension provides extra space for riders to wait and then board. These also allow buses to stop in-lane, improving transit operations.

Variation: GSI Curb Extension

Curb extensions can also include green stormwater infrastructure (GSI) to improve drainage and beautify the area.

Source: Philadelphia Water Department

Mid-Block Crossing



WHAT? Marked crossings at non-intersection locations, often paired with overhead signage, beacons, curb extensions, and pedestrian refuge islands.

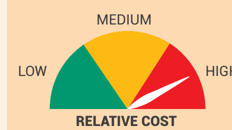
WHY?
- Provides a safe, convenient crossing where pedestrian activity is high
- Visually cues drivers to slow down and watch for pedestrians

WHERE? Non-intersection locations where informal crossings occur frequently.

A mid-block crossing on Frankford Avenue and Sackett Street. This crossing features a landscaped median with pedestrian refuge, flashing beacons, and adjacent curb extensions. Source: DVRPC

Source: NACTO

Raised Median



WHAT? Traffic lanes are divided by vertical separation, commonly a raised concrete barrier. Medians can include landscaping and pedestrian refuge islands.

WHY?
- Reduces pedestrian crashes (46% in case studies)
- Reduces head-on and cross-median vehicle crashes
- Reduces vehicle speeds and can beautify a corridor

WHERE? Two-way multilane streets, especially where pedestrian volumes and vehicle travel speeds are high.

Left: A median divides traffic on a busy portion of Broad Street. Right: A new landscaped median is being constructed on 2nd Street. Source: DVRPC

Variation: GSI Median

Raised medians can also include green stormwater infrastructure (GSI) to improve drainage and beautify the area.

Cross section of a raised median with landscaping and an underground drainage system. Source: Philadelphia Water Department

#8 VOTE: TREATMENTS

Pick your favorite (5) multimodal and traffic calming treatments!

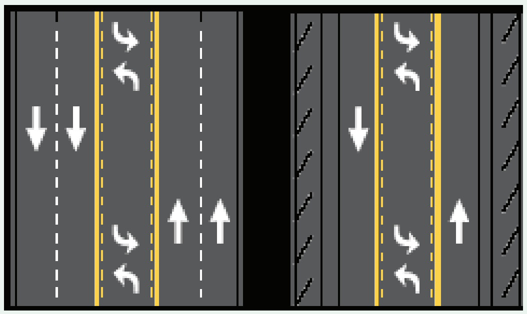
Board	Treatment	Votes	Comments
BOARD #4	Pedestrian Head Start/ Leading Ped. Interval		
	Hardened Centerline		
	Parking and Loading Improvements		
BOARD #5	Parklets		
	Bicycle Intersection Improvements		
	New and Improved Bicycle Lanes		
BOARD #6	Business Access and Transit (BAT) Lanes		
	Bus Stop Improvements		
	Pedestrian Refuge Island		
BOARD #7	Curb Extension (Bumpout)		
	Mid-Block Crossing		
	Raised Median		

#9 ROAD DIET INTRO

FRANKFORD AVE MULTIMODAL STUDY

WHAT is a road diet?

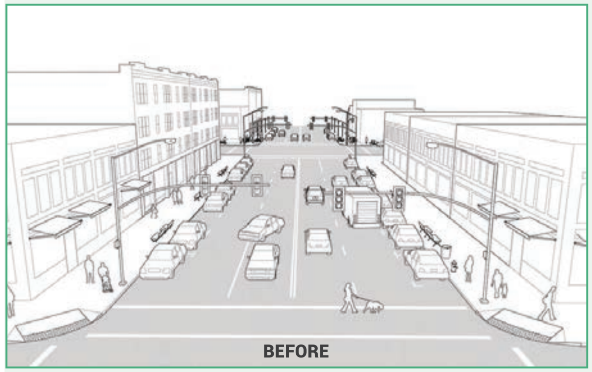
A **ROAD DIET** refers to removing one or more travel lanes from a road, and redesigning the space for other uses and travel modes. For example, a five-lane road like Frankford Avenue could be redesigned as a three-lane road by removing the two outer lanes. The space could the be used for transit lanes, bicycle lanes,parklets, wider sidewalks, parking and loading, or other uses.

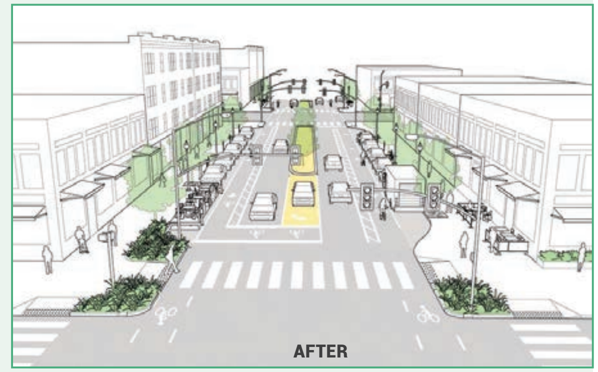


A five-lane road can be redesigned with three lanes.
Source: Federal Highway Administration

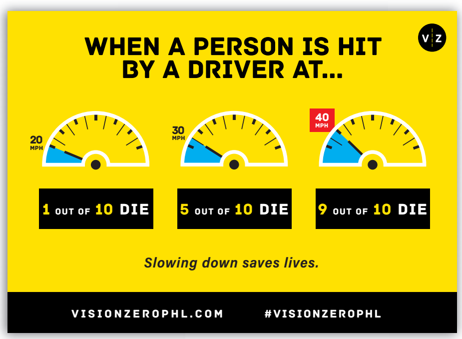
WHY reduce the number of lanes?

- **IMPROVE SAFETY** by reducing vehicle speeds and decreasing the number of conflict points.
- **REDUCE CROSSING DISTANCES** for pedestrians.
- **INCREASE TRANSPORTATION CHOICES** by making the roadway more comfortable for walking, bicycling, transit, and other modes.
- **SUPPORT LOCAL BUSINESSES AND COMMUNITY SPACES** by creating an attractive, "neighborhood main street" environment.





Neighborhood main street before and after road diet. Travel lanes are redesigned to make space for a landscaped median, buffered bicycle lanes, and in-street parklets. Source: NACTO



Source: City of Philadelphia

Philadelphia City Planning Commission CITY OF PHILADELPHIA

WHERE could it be implemented?

A recent penndot study found that a road diet is feasible on Frankford Avenue between Comly Street and Devereaux Avenue, and between Bleigh Avenue and Rhawn Street.

Do road diets **increase traffic?**

A well-designed road diet balances different travel modes based on community needs and the function of the roadway. As a state maintained arterial, it will be important to maintain a stable traffic flow for motor vehicles, including buses. DVRPC will use traffic modeling software to develop a design that meets this criteria.

4 LANE → 3 LANE
Road Diet Conversions =
19-47% DROP
in TOTAL CRASHES!

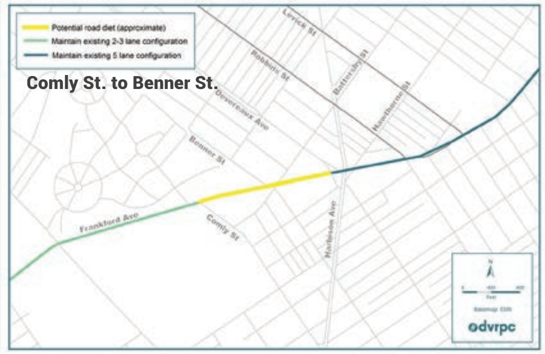
Source: FHWA

#10 ROAD DIET OPTIONS

FRANKFORD AVE
MULTIMODAL STUDY

What would **YOU** like to see?

When travel lanes are removed from a roadway, the space is available for other uses. If a road diet is implemented on Frankford Avenue, there are a number of ways the roadway could be redesigned. There are two separate segments where a road diet is possible, and they likely will have different designs. **Overall, how would you like to see space prioritized on Frankford Avenue?**



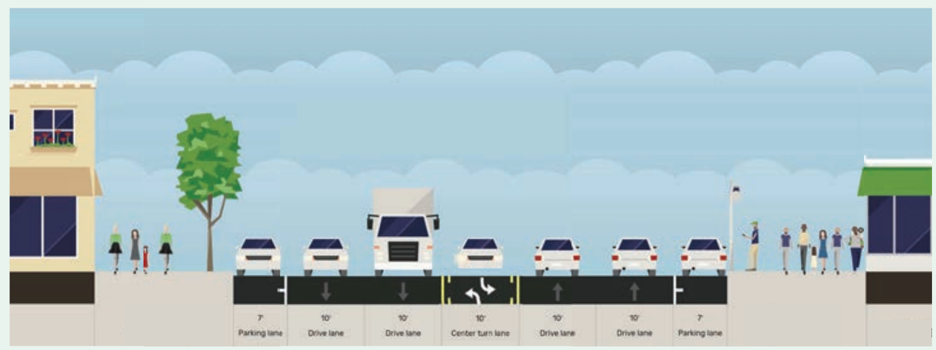
OPTION A
No Road Diet

Features (will vary along corridor):

- Maintains existing 5-lane configuration
- Other multimodal improvements

Does this road diet option...

- ☒ Reduce pedestrian crossing distance?
- ☒ Enhance transit service?
- ☒ Create dedicated space for bicyclists?
- ☒ Improve parking and loading?



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OPTION B
Business Access and Transit (BAT) Lanes

Features (will vary along corridor):

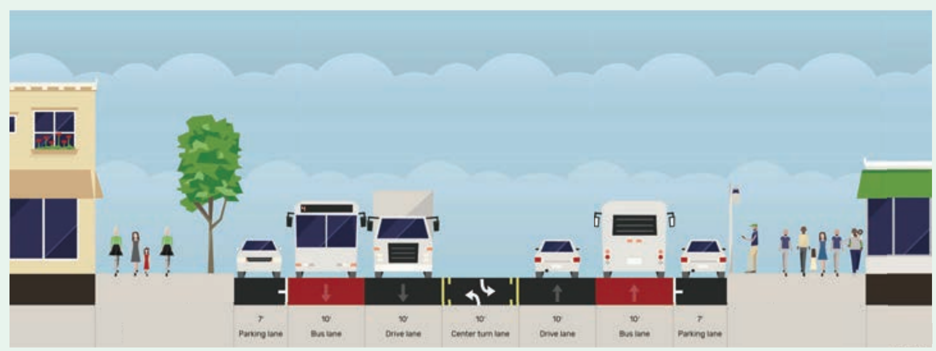
- New bus lanes in each direction
- Right-turn pockets in bus lane as needed
- Flexibility for vehicles to access driveways and parking
- Other multimodal improvements

Does this road diet option...

- ☒ Reduce pedestrian crossing distance?
- ☑ Enhance transit service?
- ☒ Create dedicated space for bicyclists?
- ☒ Improve parking and loading?

Considerations:

- Enforcement is key to success



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#11 ROAD DIET OPTIONS

OPTION C
Parking-Protected Bicycle Lanes

Features (will vary along corridor):

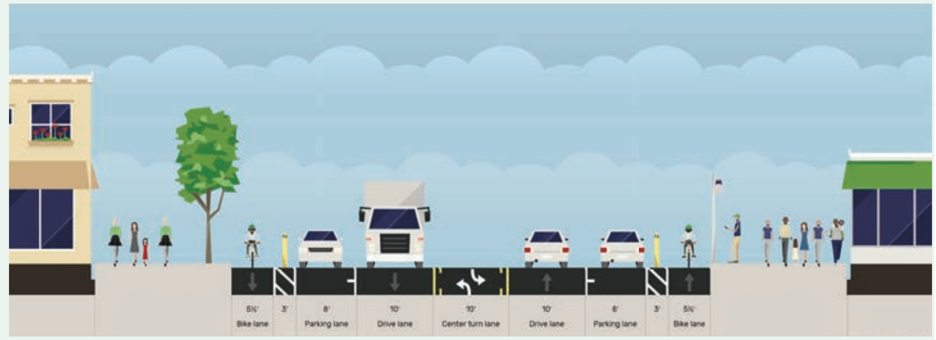
- New curbside bicycles lane in each direction
- Painted buffers with protective bollards
- Wider parallel parking lanes
- Other multimodal improvements

Does this road diet option...

- ✓ Reduce pedestrian crossing distance?
- ✗ Enhance transit service?
- ✓ Create dedicated space for bicyclists?
- ✗ Improve parking and loading?

Considerations:

- Continuity of bicycle facilities south of Bleigh Ave.



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OPTION D
Buffered Bicycle Lanes

Features (will vary along corridor):

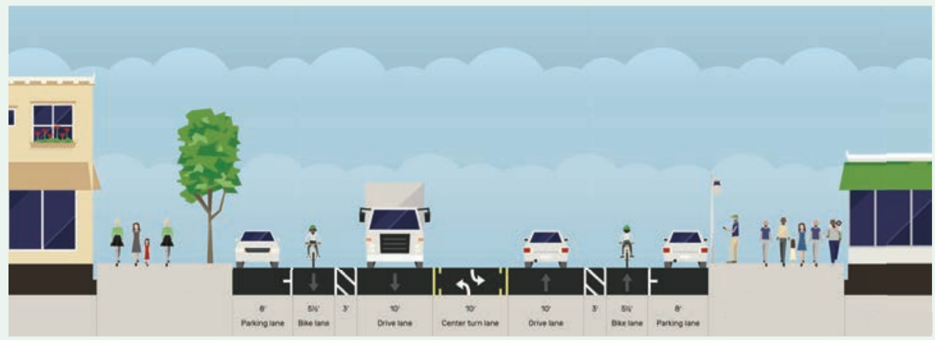
- New curbside bicycles lane in each direction
- Painted buffers
- Wider parallel parking lanes
- Other multimodal improvements

Does this road diet option...

- ✓ Reduce pedestrian crossing distance?
- ✗ Enhance transit service?
- ✓ Create dedicated space for bicyclists?
- ✗ Improve parking and loading?

Considerations:

- Continuity of bicycle facilities south of Bleigh Ave.
- Less protection for bicyclists compared to Option C



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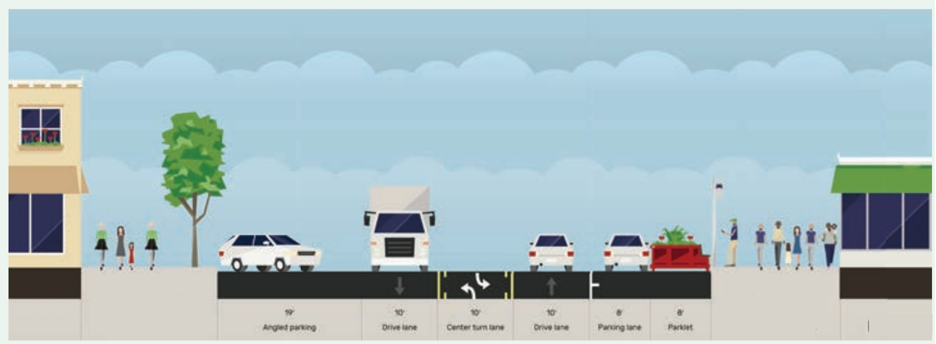
OPTION E
Pedestrian and Parking Improvements

Features (will vary along corridor):

- Wider sidewalks
- In-street pedestrian plazas or “parklets”
- Back-in angle parking and loading areas
- Wider parallel parking lanes
- Other multimodal improvements

Does this road diet option...

- ✓ Reduce pedestrian crossing distance?
- ✗ Enhance transit service?
- ✗ Create dedicated space for bicyclists?
- ✓ Improve parking and loading?



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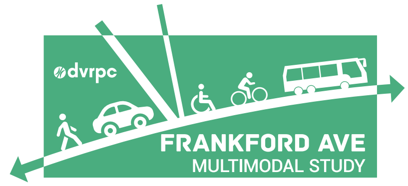
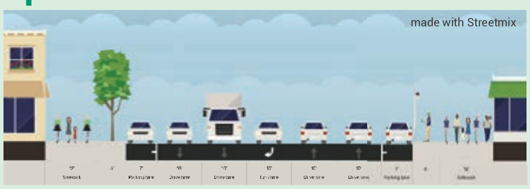
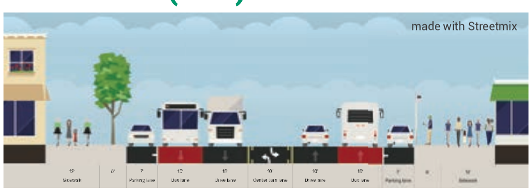
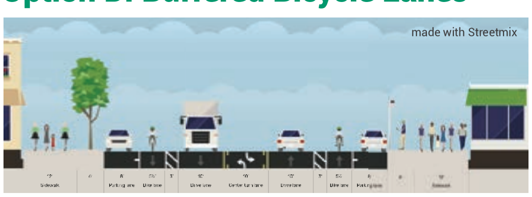
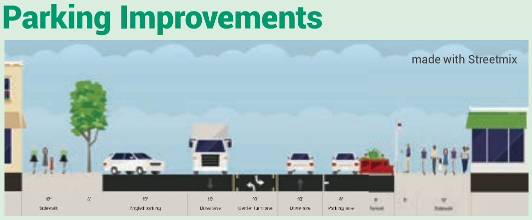
#12 VOTE: ROAD DIET

Pick your favorite (1) road diet option!



	Votes	Comments
Option A: No Road Diet 		
Option B: Business Access and Transit (BAT) Lanes 		
Option C: Parking-Protected Bicycle Lanes 		
Option D: Buffered Bicycle Lanes 		
Option E: Pedestrian and Parking Improvements 		

APPENDIX B

PUBLIC COMMENTS ON DRAFT REPORT

A draft version of this report was posted on the project website for a thirty-day public comment period beginning in March 2021. The following comments were received:

- I think there could be stronger recommendations for actively reducing vehicle dependency by creating better options for non-car modes, and incorporating continuous dedicated bus only lanes, continuous protected bike lanes, and wide sidewalks with vegetation and short crossings throughout the entire corridor, rather than just portions. Additionally, connector streets to the Delaware Riverfront as identified by the recent Riverfront North Master Plan should be included in addition to Magee with recommended bike/ped improvements (Princeton and Rhawn).
- The report states that removing travel lanes south of Bleigh would cause too much of a traffic impact but the proposed alternative has mostly LOS A/B - the traffic metrics should be provided for the road diet option so that they can be prepared.
- How can transit performance be out of scope for a corridor study on a popular transit route? In addition to specifically looking at transit performances/issues, should be thinking about the corridor overall in terms of person trips instead of traffic volumes.
- SEPTA Route 66 is used as an excuse to not pursue a road diet south of Bleigh but what about the BAT lane option? Keeping a 5-lane cross-section yields mostly LOS A or B which encourages the noted speeding (85th percentile is almost 40 mph). Having LOS at this level is actively anti-Vision Zero.
- The bike facilities terminate NB on Frankford at Harbison/Devereaux and SB on Ryan Ave at Frankford. These are both giant, dangerous intersections and the current design would strand riders at them with no connections. One minor improvement would just be to add a bike box on SB Ryan at Frankford. Consider 2-stage turn boxes and other improvements to help riders navigate to/from the bike facilities.
- In the road diet section north of Bleigh, LOS is mostly B with minimal queuing so are the queue jumps actually more beneficial to buses than staying in the travel lane with a bumpout/boarding island and active TSP? Also, proposed back-in angle parking would take up almost 50% of the road width. Is parking demand really that high? Perhaps a more comprehensive parking study (like what was done for Washington Ave) should be completed here. This excess width taken up by parking could be used in much better ways to truly make this a Complete Street.
- Need to mention the necessary SEPTA capital improvement for moving catenary wires that the lane drop will necessitate.
- Removal of a NB lane from Cottman to Bleigh should be evaluated (keeping two SB lanes) to make a safer condition when the lane drop occurs. A lane drop at Bleigh will cause cars in the drop lane to cut people off or drive in the shoulder.

APPENDIX C

DETAILED TRAFFIC PERFORMANCE RESULTS

Delay, level of service, and 95th percentile queue were calculated by movement, approach and intersection for existing conditions and for the proposed scenario. Detailed results are presented in this appendix.

Results were calculated using Synchro traffic simulation software and the 6th edition of the Highway Capacity Manual (HCM). This edition does not include methodology for intersections with more than 4 approaches; therefore, for intersections with 5 or more approaches HCM 2000 was used.

Table C-1: Level of Service Overview

	Intersection	Approach		Existing AM Peak Hour Approach Delay (s)	Existing AM Approach LOS	Existing AM Intersection Delay (s)	Existing AM Intersection LOS	Existing PM Peak Hour Approach Delay (s)	Existing PM Approach LOS	Existing PM Intersection Delay (s)	Existing PM Intersection LOS	Proposed AM Peak Hour Approach Delay (s)	Proposed AM Approach LOS	Proposed AM Intersection Delay (s)	Proposed AM Intersection LOS	Proposed PM Peak Hour Approach Delay (s)	Proposed PM Approach LOS	Proposed PM Intersection Delay (s)	Proposed PM Intersection LOS	Difference Delay (s) AM Peak Hour Approach	Difference AM Intersection	Difference PM Peak Hour Approach	Difference PM Intersection
1	Frankford Ave. & Bustleton Ave. / Bridge St.	Bustleton Ave.	EB	27.0	C	17.4	B	22.1	C	20.3	C	27.0	C	17.4	B	22.1	C	20.3	C	-	-	-	-
		Bridge St.	WB	24.9	C			22.6	C			24.9	C			22.6	C			-		-	
		Frankford Ave.	NB	9.8	A			14.2	B			9.8	A			14.2	B			-		-	
			SB	9.2	A			28.6	C			9.2	A			28.6	C			-		-	
2	Frankford Ave. & Cheltenham Ave.	Cheltenham Ave.	EB	17.3	B	21.5	C	16.5	B	21.1	C	17.3	B	21.5	C	16.5	B	21.1	C	-	-	-	-
			WB	33.8	C			34.0	C			33.8	C			34.0	C			-		-	
		Frankford Ave.	NB	14.3	B			21.8	C			14.3	B			21.8	C			-		-	
			SB	22.5	C			22.6	C			22.5	C			22.6	C			-		-	
3	Frankford Ave. & Comly St.	Comly St.	EB	23.2	C	3.9	A	26.7	C	7.5	A	23.2	C	11.2	B	26.7	C	10.8	B	-	7.3	-	3.3
		Frankford Ave.	NB	8.8	A			10.1	B			8.8	A			10.1	B			-		-	
			SB	0.3	A			0.5	A			11.6	B			8.8	A			11.3		8.3	
4	Frankford Ave. & Benner St. & Duffield St. / Battersby St.	Frankford Ave.	NB	12.8	B	12.6	B	35.4	D	26.8	C	18.1	B	26.3	C	69.7	E	48.2	D	5.3	13.7	34.3	21.4
			SB	5.0	A			10.5	B			27.6	C			25.5	C			22.6		15.0	
		Battersby St.	SEB	33.4	C			31.6	C			36.0	D			41.6	D			2.6		10.0	
		Duffield St.	NWB	30.2	C			27.9	C			32.0	C			33.7	C			1.8		5.8	
		Benner St.	NEB	33.9	C			33.3	C			32.9	C			33.3	C			-1.0		-	
			SWB	33.8	C			33.9	C			32.7	C			34.0	C			-1.1		0.1	
5	Frankford Ave. & Harbison Ave. & Devereaux Ave. & Hawthorne St.	Harbison Ave.	EB	29.5	C	30.3	C	19.4	B	26.9	C	29.5	C	33.3	C	21.1	C	37.6	D	-	3	1.7	10.7
			WB	47.7	D			42.5	D			45.5	D			51.1	D			-2.2		8.6	
		Frankford Ave.	NB	29.8	C			14.3	B			24.2	C			35.3	D			-5.6		21.0	
			SB	15.0	B			20.3	C			30.7	C			33.2	C			15.7		12.9	
6	Frankford Ave. & Robbins St.	Robbins Ave.	EB	22.2	C	15.7	B	31.4	C	22.1	C	31.3	C	20.3	C	41.5	D	28.1	C	9.1	4.6	10.1	6
		Frankford Ave.	NB	25.4	C			26.2	C			30.4	C			33.9	C			5.0		7.7	
			SB	5.2	A			6.1	A			5.2	A			5.1	A			-		-1.0	
7	Frankford Ave. & Levick St.	Levick St.	WB	22.7	C	13.7	B	21.2	C	12.7	B	29.0	C	20.4	C	27.0	C	17.8	B	6.3	6.7	5.8	5.1
		Frankford Ave.	NB	2.3	A			4.7	A			3.0	A			5.1	A			0.7		0.4	
			SB	4.6	A			5.4	A			14.4	B			14.5	B			9.8		9.1	
8	Frankford Ave. & Hellerman St.	Hellerman St.	EB	23.5	C	16.8	B	21.7	C	13.9	B	23.5	C	16.8	B	21.7	C	13.9	B	-	-	-	-
			WB	20.8	C			19.3	B			20.8	C			19.3	B			-		-	
		Frankford Ave.	NB	0.5	A			1.7	A			0.5	A			1.7	A			-		-	
			SB	24.1	C			25.7	C			24.1	C			25.7	C			-		-	
9	Frankford Ave. & Magee Ave.	Magee Ave.	EB	20.8	C	11.4	B	22.7	C	14.7	B	24.7	C	12.2	B	26.7	C	15.2	B	3.9	0.8	4.0	0.5
			WB	21.3	C			24.0	C			25.4	C			28.5	C			4.1		4.5	
		Frankford Ave.	NB	21.9	C			24.1	C			21.9	C			24.1	C			-		-	
			SB	1.1	A			1.3	A			1.1	A			1.3	A			-		-	
10	Frankford Ave. & Unruh Ave. & Rowland Ave.	Unruh Ave.	EB	23.6	C	14.9	B	25.0	C	19.8	B	23.6	C	28.4	C	25.0	C	21.9	C	-	13.5	-	2.1
		Frankford Ave.	NB	17.0	B			21.3	C			26.0	C			24.6	C			9.0		3.3	
			SB	6.1	A			13.5	B			29.3	C			14.5	B			23.2		1.0	
		Rowland Ave.	SEB	34.0	C			38.5	D			34.0	C			38.5	D			-		-	
11	Frankford Ave. & Knorr St.	Knorr St.	EB	18.8	B	15	B	22.8	C	13.5	B	21.6	C	15.3	B	25.3	C	17.9	B	2.8	0.3	2.5	4.4
			WB	18.9	B			23.2	C			21.7	C			25.7	C			2.8		2.5	
		Frankford Ave.	NB	0.6	A			1.1	A			0.6	A			8.4	A			-		7.3	
			SB	24.2	C			23.0	C			24.2	C			25.1	C			-		2.1	
12	Frankford Ave. & Longshore Ave.	Longshore Ave.	EB	20.1	C	8.8	A	20.0	B	14.5	B	24.8	C	9	A	23.7	C	15.1	B	4.7	0.2	3.7	0.6
			WB	20.9	C			22.7	C			25.9	C			27.2	C			5.0		4.5	
		Frankford Ave.	NB	20.2	C			24.6	C			19.4	B			24.6	C			-0.8		-	
			SB	0.8	A			1.0	A			0.8	A			1.0	A			-		-	
13	Frankford Ave. & Tyson Ave.	Tyson Ave.	EB	19.2	B	11.1	B	20.1	C	10.5	B	20.0	B	13.8	B	25.0	C	12.3	B	0.8	2.7	4.9	1.8
			WB	17.6	B			18.2	B			18.4	B			22.4	C			0.8		4.2	
		Frankford Ave.	NB	5.1	A			5.2	A			8.7	A			5.2	A			3.6		-	
			SB	6.5	A			4.7	A			10.9	B			4.7	A			4.4		-	
14	Frankford Ave. & Princeton Ave.	Princeton Ave.	EB	17.6	B	3.9	A	20.5	C	3.7	A	17.6	B	3.9	A	20.5	C	3.7	A	-	-	-	-
			WB	17.8	B			19.6	B			17.8	B			19.6	B			-		-	
		Frankford Ave.	NB	1.4	A			1.5	A			1.4	A			1.5	A			-		-	
			SB	1.7	A			0.8	A			1.7	A			0.8	A			-		-	
15	Frankford Ave. & Wellington St.	Wellington St.	WB	23.0	C	9.4	A	22.9	C	8	A	23.0	C	9.4	A	22.9	C	8	A	-	-	-	-
		Frankford Ave.	NB	5.1	A			0.9	A			5.1	A			0.9	A			-		-	
			SB	10.1	B			11.7	B			10.1	B			11.7	B			-		-	

No source - this was part of the DVRPC analysis

Table C-1: Level of Service Overview (continued)

				Existing								Proposed								Difference			
				AM Peak Hour				PM Peak Hour				AM Peak Hour				PM Peak Hour				Delay (s)			
Intersection		Approach		Approach		Intersection		Approach		Intersection		Approach		Intersection		Approach		Intersection		AM Peak Hour		PM Peak Hour	
				Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Approach	Intersection	Approach	Intersection
18	Frankford Ave. & Bleigh Ave.	Bleigh Ave.	EB	19.3	B	3.2	A	21.1	C	6.2	A	19.3	B	8.9	A	21.1	C	13.5	B	-	5.7	-	7.3
			WB	20.1	C			20.5	C			20.1	C			20.5	C			-		-	
		Frankford Ave.	NB	0.5	A			7.0	A			13.6	B			21.9	C			13.1		14.9	
			SB	0.7	A			0.8	A			2.3	A			2.9	A			1.6		2.1	
19	Frankford Ave. & Shelmire Ave.	Shelmire Ave.	EB	20.5	C	13.8	B	21.3	C	5.3	A	20.5	C	18	B	21.3	C	4.4	A	-	4.2	-	-0.9
			WB	21.3	C			22.0	C			21.3	C			22.1	C			-		0.1	
		Frankford Ave.	NB	0.6	A			0.7	A			1.6	A			2.1	A			1.0		1.4	
			SB	22.3	C			6.0	A			29.8	C			2.7	A			7.5		-3.3	
20	Frankford Ave. & Sheffield St.	Sheffield St.	EB	19.9	B	13.8	B	15.8	B	15.7	B	19.9	B	21.1	C	15.8	B	20.9	C	-	7.3	-	5.2
			WB	21.6	C			16.7	B			21.6	C			16.8	B			-		0.1	
		Frankford Ave.	NB	23.4	C			27.3	C			17.4	B			36.7	D			-6.0		9.4	
			SB	0.9	A			3.2	A			24.6	C			5.7	A			23.7		2.5	
21	Frankford Ave. & Hartel Ave.	Hartel Ave.	EB	19.8	B	10	A	22.0	C	12	B	19.8	B	15.5	B	22.0	C	16.8	B	-	5.5	-	4.8
		Frankford Ave.	NB	0.4	A			0.6	A			1.7	A			3.0	A			1.3		2.4	
			SB	17.1	B			22.6	C			28.1	C			30.6	C			11.0		8.0	
22	Frankford Ave. & Rhawn St.	Rhawn St.	EB	24.9	C	10.3	B	24.0	C	15	B	24.9	C	10.4	B	24.0	C	15.7	B	-	0.1	-	0.7
			WB	22.8	C			30.7	C			22.8	C			30.7	C			-		-	
		Frankford Ave.	NB	0.9	A			9.7	A			1.4	A			11.6	B			0.5		1.9	
			SB	1.4	A			2.9	A			1.4	A			3.0	A			-		0.1	
23	Frankford Ave. & Welsh Rd.	Welsh Rd.	EB	27.4	C	7.9	A	31.7	C	8.3	A	27.4	C	7.9	A	31.7	C	8.3	A	-	-	-	
			WB	25.0	C			30.1	C			25.0	C			30.1	C			-		-	
		Frankford Ave.	NB	0.9	A			1.8	A			0.9	A			1.8	A			-		-	
			SB	8.8	A			8.4	A			8.8	A			8.4	A			-		-	

No source - this was part of the DVRPC analysis

Table C-2: Performance Measures, AM Existing

AM PEAK HOUR

#	Intersection	Approach	Dir.	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
1	Frankford Ave. & Bustleton Ave. / Bridge St.	Bustleton Ave.	EB	L T R	26 199 203	7.9 7.7	158 154	25.9 28.3	C C	27.0	C	17.4	B
		Bridge St.	WB	L T R	28 117 12	5.4	108	24.9	C	24.9	C		
		Frankford Ave.	NB	L T R	82 155 26	1.6 3.5	32 70	10.2 9.5	B A	9.8	A		
		Frankford Ave.	SB	L T R	11 396 27	5.0	100	9.2	A	9.2	A		
2	Frankford Ave. & Cheltenham Ave.	Cheltenham Ave.	EB	L T R	108 168 7	3.0 4.6	60 92	18.1 16.7	B B	17.3	B	21.5	C
		Cheltenham Ave.	WB	L T R	10 140 0	6.0	120	33.8	C	33.8	C		
		Frankford Ave.	NB	L T R	15 150 10	4.1	82	14.3	B	14.3	B		
		Frankford Ave.	SB	L T R	2 459 135	16.3	326	22.5	C	22.5	C		
3	Frankford Ave. & Comly St.	Comly St.	EB	L R	36 4	1.3	26	23.2	C	23.2	C	3.9	A
		Frankford Ave.	NB	T R	242 27	4.6	92	8.8	A	8.8	A		
		Frankford Ave.	SB	L T	18 568	0.0 0.2	0 4	0.5 0.3	A A	0.3	A		
4	Frankford Ave. & Benner St. & Duffield St. / Battersby St.	Frankford Ave.	NB	HL BL T BR	19 24 212 3		0 0	12.6 12.8	B B	12.8	B	12.6	B
		Frankford Ave.	SB	HL T BR HR	6 530 2 0		0 0	4.0 5.0	A A	5.0	A		
		Battersby St.	SEB	L BL T BR	7 30 0 22		0	33.4	C	33.4	C		
		Duffield St.	NWB	HL L T BR R	1 0 22 12 2		0	30.2	C	30.2	C		
		Benner St.	NEB	L BL T HR	0 2 13 27		0	33.9	C	33.9	C		
		Benner St.	SWB	BL T BR R	13 7 22 19		0	33.8	C	33.8	C		

No source - this was part of the DVRPC analysis

Table C-2: Performance Measures, AM Existing (continued)

AM PEAK HOUR

Intersection		Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue (HCM 6th Ed. Only) ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
5	Frankford Ave. & Harbison Ave. & Devereaux Ave. & Hawthorne St.	Harbison Ave.	EB	L	23		0	21.8	C	29.5	C	30.3	C
				T	961								
				R	13		0	29.7	C				
				HR	0								
			WB	L	17		0	25.0	C	47.7	D		
				BL	189								
				T	485		0	55.6	E				
				R	147		0	14.4	B				
		Frankford Ave.	NB	HL	2		0	24.1	C	29.8	C		
				L	14								
				T	304		0	25.5	C				
				R	135		0	40.0	D				
			SB	L	306		0	17.8	B	15.0	B		
				T	508		0						
				R	79		0	13.5	B				
				BR	2								
6	Frankford Ave. & Robbins St.	Robbins St.	EB	L	56							15.7	B
				T	917	14.9	298	22.8	C	22.2	C		
				R	28								
		Frankford Ave.	NB	T	319	7.7	154	25.5	C	25.4	C		
				R	57								
			SB	L	214	2.3	46	11.0	B	5.2	A		
				T	766	2.0	40	3.6	A				
7	Frankford Ave. & Levick St.	Levick St.	WB	L	92							13.7	B
				T	1373	15.6	312	23.5	C	22.7	C		
				R	73								
		Frankford Ave.	NB	L	27	0.2	4	3.0	A	2.3	A		
				T	393	0.7	14	2.2	A				
			SB	T	907	2.7	54	4.6	A	4.6	A		
				R	82								
8	Frankford Ave. & Hellerman St.	Hellerman St.	EB	L	22							16.8	B
				T	27	5.3	106	23.5	C	23.5	C		
				R	112								
			WB	L	0								
				T	18	0.8	16	20.8	C	20.8	C		
				R	9								
		Frankford Ave.	NB	L	4	0.0	0	3.4	A				
				T	452	0.3	6	0.5	A	0.5	A		
				R	4								
			SB	L	4	0.1	2	15.8	B				
				T	825	15.5	310	24.2	C	24.1	C		
				R	31								
9	Frankford Ave. & Magee Ave.	Magee Ave.	EB	L	4							11.4	B
				T	31	4.4	88	20.8	C	20.8	C		
				R	112								
			WB	L	54								
				T	85	5.4	108	21.3	C	21.3	C		
				R	36								
		Frankford Ave.	NB	L	0	0.0	0	0.0	N/A				
				T	460	9.4	188	21.9	C	21.9	C		
				R	18								
			SB	L	54	0.2	4	2.0	A				
				T	701	0.5	10	1.0	A	1.1	A		
				R	36								

No source - this was part of the DVRPC analysis

Table C-2: Performance Measures, AM Existing (continued)

AM PEAK HOUR

Intersection		Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
10	Frankford Ave. & Unruh Ave. & Rowland Ave.	Unruh Ave.	EB	HL	3					23.6	C	14.9	B
				L	16		0	23.8	C				
				T	18								
				R	25		0	23.3	C				
		Frankford Ave.	NB	BL	66		0	45.2	D	17.0	B		
				T	438		0	12.9	B				
				R	18								
			SB	L	6					6.1	A		
				T	567		0	5.8	A				
				HR	9		0	22.5	C				
		Rowland Ave.	SEB	HL	0								
				BL	0		0	34.0	C	34.0	C		
				BR	186								
11	Frankford Ave. & Knorr St.	Knorr St.	EB	L	9							15.0	B
				T	58	2.2	44	18.8	B	18.8	B		
				R	10								
			WB	L	17								
				T	42	2.1	42	18.9	B	18.9	B		
				R	15								
		Frankford Ave.	NB	L	25	0.2	4	2.4	A	0.6	A		
				T	392	0.3	6	0.5	A				
				R	20								
			SB	L	24	0.8	16	19.1	B	24.2	C		
				T	583	11.5	230	24.4	C				
				R	10								
12	Frankford Ave. & Longshore Ave.	Longshore Ave.	EB	L	22	0.8	16	20.1	C	20.1	C	8.8	A
				R	4								
			WB	L	40								
				T	13	2.1	42	20.9	C	20.9	C		
				R	18								
		Frankford Ave.	NB	L	4	0.1	2	17.3	B	20.2	C		
				T	328	6.0	120	20.2	C				
			SB	T	597	0.4	8	0.8	A	0.8	A		
				R	22								
13	Frankford Ave. & Tyson Ave.	Tyson Ave.	EB	L	91	2.8	56	20.7	C	19.2	B	11.1	B
				T	464	12.5	250	18.9	B				
				R	21								
			WB	L	62	2.2	44	25.7	C	17.6	B		
				T	264	7.8	156	16.0	B				
				R	39								
		Frankford Ave.	NB	L	49	0.5	10	6.3	A	5.1	A		
				T	437	1.9	38	5.0	A				
				R	53								
			SB	L	54	0.5	10	5.0	A	6.5	A		
				T	695	3.3	66	6.6	A				
				R	80								
14	Frankford Ave. & Princeton Ave.	Princeton Ave.	EB	L	11							3.9	A
				T	63	2.2	44	17.6	B	17.6	B		
				R	12								
			WB	L	31								
				T	26	2.6	52	17.8	B	17.8	B		
				R	42								
		Frankford Ave.	NB	L	8	0.0	0	0.9	A	1.4	A		
				T	384	0.6	12	1.5	A				
				R	64								
			SB	L	37	0.1	2	1.1	A	1.7	A		
				T	596	0.8	16	1.7	A				
				R	9								

No source - this was part of the DVRPC analysis

Table C-2: Performance Measures, AM Existing (continued)

AM PEAK HOUR

	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
15	Frankford Ave. & Wellington St.	Wellington St.	WB	L	36	3.3	66	23.0	C	23.0	C	9.4	A
				T	49								
				R	18								
		Frankford Ave.	NB	L	36	0.5	10	7.3	A	5.1	A		
				T	373	2.0	40	4.9	A				
				R	40								
			SB	L	18	0.3	6	9.4	A	10.1	B		
				T	633	6.3	126	10.2	B				
				R	9								
18	Frankford Ave. & Bleigh Ave.	Bleigh Ave.	EB	L	18	1.7	34	19.3	B	19.3	B	3.2	A
				T	18								
				R	22								
			WB	L	36	3.1	62	20.1	C	20.1	C		
				T	58								
				R	13								
		Frankford Ave.	NB	L	18	0.0	0	0.2	A	0.5	A		
				T	436	0.3	6	0.5	A				
				R	4								
			SB	L	18	0.0	0	0.1	A	0.7	A		
				T	561	0.4	8	0.7	A				
				R	22								
19	Frankford Ave. & Shelmire Ave.	Shelmire Ave.	EB	L	22	1.4	28	20.5	C	20.5	C	13.8	B
				T	13								
				R	13								
			WB	L	22	2.7	54	21.3	C	21.3	C		
				T	36								
				R	31								
		Frankford Ave.	NB	L	9	0.1	2	2.1	A	0.6	A		
				T	467	0.3	6	0.5	A				
				R	18								
			SB	L	22	0.7	14	17.1	B	22.3	C		
				T	597	11.9	238	22.5	C				
				R	36								
20	Frankford Ave. & Sheffield St.	Shelmire Ave.	EB	L	40	4.2	84	19.9	B	19.9	B	13.8	B
				T	64								
				R	39								
			WB	L	64	6.6	132	21.6	C	21.6	C		
				T	88								
				R	58								
		Frankford Ave.	NB	L	16	0.5	10	18.4	B	23.4	C		
				T	532	11.1	222	23.6	C				
				R	40								
			SB	L	22	0.1	2	2.1	A	0.9	A		
				T	588	0.4	8	0.8	A				
				R	20								
21	Frankford Ave. & Hartel Ave.	Hartel Ave.	EB	L	40	3.6	72	19.8	B	19.8	B	10.0	A
				R	81								
		Frankford Ave.	NB	L	36	0.1	2	1.2	A	0.4	A		
				T	440	0.1	2	0.3	A				
			SB	T	462	7.5	150	17.1	B	17.1	B		
				R	18								

No source - this was part of the DVRPC analysis

Table C-2: Performance Measures, AM Existing (continued)

AM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue (HCM 6th Ed. Only) ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
22	Frankford Ave. & Rhawn St.	Shelmire Ave.	EB	L	43	11.4	228	24.9	C	24.9	C	10.3	B
				T	277								
				R	33								
			WB	L	36	8.3	166	22.8	C	22.8	C		
				T	162								
				R	56								
		Frankford Ave.	NB	L	57	0.1	2	0.4	A	0.9	A		
				T	333	0.5	10	1.1	A				
				R	65	0.1	2	0.2	A				
			SB	L	33	0.1	2	0.2	A	1.4	A		
				T	368	0.8	16	1.5	A				
				R	54								
23	Frankford Ave. & Welsh Rd.	Welsh Rd.	EB	L	19	4.0	80	27.4	C	27.4	C	7.9	A
				T	25								
				R	68								
			WB	L	6	0.6	12	25.0	C	25.0	C		
				T	3								
				R	8								
		Frankford Ave.	NB	L	98	0.4	8	2.2	A	0.9	A		
				T	321	0.3	6	0.5	A				
				R	0								
			SB	L	2	0.0	0	5.9	A	8.8	A		
				T	431	7.9	158	8.8	A				
				R	28								

No source - this was part of the DVRPC analysis

Table C-3: Performance Measures, PM Existing

PM PEAK HOUR

#	Intersection	Approach	Direction	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
1	Frankford Ave. & Bustleton Ave. / Bridge St.	Bustleton Ave.	EB	L	26	5.6	112	20.9	C	22.1	C	20.3	C
				T	169								
				R	165	5.3	106	23.6	C				
		Bridge St.	WB	L	27	7.3	146	22.6	C	22.6	C		
				T	175								
				R	38								
		Frankford Ave.	NB	L	183	4.2	84	14.3	B	14.2	B		
				T	335	8.5	170	14.2	B				
				R	42								
			SB	L	10	9.4	188	28.6	C	28.6	C		
				T	251								
				R	35								
2	Frankford Ave. & Cheltenham Ave.	Cheltenham Ave.	EB	L	283	7.4	148	17.5	B	16.5	B	21.1	C
				T	320	8.5	170	15.7	B				
				R	34								
			WB	L	18	6.0	120	34.0	C	34.0	C		
				T	131								
				R	6								
		Frankford Ave.	NB	L	31	11.8	236	21.8	C	21.8	C		
				T	388								
				R	22								
			SB	L	6	12.0	240	22.6	C	22.6	C		
				T	315								
				R	116								
3	Frankford Ave. & Comly St.	Comly St.	EB	L	31	2.8	56	26.7	C	26.7	C	7.5	A
				R	49								
		Frankford Ave.	NB	T	548	10.5	210	10.1	B	10.1	B		
				R	54								
			SB	L	49	0.4	8	3.0	A	0.5	A		
				T	390	0.1	2	0.1	A				
4	Frankford Ave. & Benner St. & Duffield St. / Battersby St.	Frankford Ave.	NB	HL	21		0	14.8	B	35.4	D	26.8	C
				BL	49								
				T	551		0	37.9	D				
				BR	19								
			SB	HL	22		0	21.6	C	10.5	B		
				T	397								
				BR	7		0	9.9	A				
				HR	7								
		Battersby St.	SEB	HL	8		0	31.6	C	31.6	C		
				L	65								
				T	0								
				BR	31								
		Duffield St.	NWB	HL	2		0	27.9	C	27.9	C		
				L	3								
				T	36								
				BR	29								
				R	7								
		Benner St.	NEB	L	1		0	33.3	C	33.3	C		
				BL	4								
				T	22								
				HR	28								
			SWB	BL	13		0	33.9	C	33.9	C		
				T	20								
				BR	36								
				R	18								

No source - this was part of the DVRPC analysis

Table C-3: Performance Measures, PM Existing (continued)

PM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue (HCM 6th Ed. Only) ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
5	Frankford Ave. & Harbison Ave. & Devereaux Ave. & Hawthorne St.	Harbison Ave.	EB	L	19		0	17.5	B	19.4	B	26.9	C
				T	678								
				R	29		0	19.4	B				
				HR	4								
			WB	L	25					42.5	D		
				BL	222		0	16.4	B				
				T	689		0	52.3	D				
				R	271		0	11.9	B				
		Frankford Ave.	NB	HL	0					14.3	B		
				L	35		0	15.6	B				
				T	568		0	15.9	B				
				R	145		0	8.1	A				
			SB	L	187		0	23.3	C	20.3	C		
				T	355								
				R	73		0	19.0	B				
				BR	11								
6	Frankford Ave. & Robbins St.	Robbins St.	EB	L	110	18.6	372	32.9	C	31.4	C	22.1	C
				T	1012								
				R	19								
		Frankford Ave.	NB	T	747	14.2	284	26.2	C	26.2	C		
				R	73								
			SB	L	218	6.0	120	23.0	C	6.1	A		
				T	654	0.2	4	0.4	A				
7	Frankford Ave. & Levick St.	Levick St.	WB	L	77	15.6	312	22.0	C	21.2	C	12.7	B
				T	1329								
				R	127								
		Frankford Ave.	NB	L	40	0.3	6	4.8	A	4.7	A		
				T	873	2.7	54	4.7	A				
			SB	T	724	2.8	56	5.4	A	5.4	A		
				R	62								
8	Frankford Ave. & Hellerman St.	Hellerman St.	EB	L	63	7.2	144	21.7	C	21.7	C	13.9	B
				T	94								
				R	72								
			WB	L	13	2.8	56	19.3	B	19.3	B		
				T	45								
				R	40								
		Frankford Ave.	NB	L	36	0.4	8	4.5	A	1.7	A		
				T	908	0.8	16	1.6	A				
				R	22								
			SB	L	27	1.0	20	19.6	B	25.7	C		
				T	695	14.4	288	25.9	C				
				R	85								
9	Frankford Ave. & Magee Ave.	Magee Ave.	EB	L	18	3.1	62	22.7	C	22.7	C	14.7	B
				T	54								
				R	27								
			WB	L	36	5.1	102	24.0	C	24.0	C		
				T	72								
				R	49								
		Frankford Ave.	NB	L	9	0.3	6	15.7	B	24.1	C		
				T	954	16.4	328	24.2	C				
				R	0								
			SB	L	58	1.0	20	7.1	A	1.3	A		
				T	738	0.5	10	0.9	A				
				R	54								

No source - this was part of the DVRPC analysis

Table C-3: Performance Measures, PM Existing (continued)

PM PEAK HOUR

No.	Intersection	Approach	Dir.	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue (HCM 6th Ed. Only) ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
10	Frankford Ave. & Unruh Ave. & Rowland Ave.	Unruh Ave.	EB	HL	6							19.8	B
				L	26		0	25.1	C	25.0	C		
				T	62								
				R	2		0	23.1	C				
		Frankford Ave.	NB	BL	183		0	54.9	D				
				T	829					21.3	C		
				R	38		0	14.2	B				
			SB	L	31		0	13.5	B	13.5	B		
				T	705								
				HR	6		0	19.0	B				
		Rowland Ave.	SEB	HL	0								
				BL	0		0	38.5	D	38.5	D		
				BR	137								
11	Frankford Ave. & Knorr St.	Knorr St.	EB	L	20							13.5	B
				T	126	4.7	94	22.8	C	22.8	C		
				R	4								
			WB	L	39								
				T	83	4.8	96	23.2	C	23.2	C		
				R	27								
		Frankford Ave.	NB	L	29	0.2	4	3.0	A				
				T	772	0.6	12	1.1	A	1.1	A		
				R	48								
			SB	L	93	4.0	80	22.6	C				
				T	687	13.1	262	23.1	C	23.0	C		
				R	25								
12	Frankford Ave. & Longshore Ave.	Longshore Ave.	EB	L	40	1.4	28	20.0	B	20.0	B	14.5	B
				R	9								
			WB	L	54								
				T	58	6.4	128	22.7	C	22.7	C		
				R	94								
		Frankford Ave.	NB	L	36	1.3	26	19.9	B	24.6	C		
				T	765	13.5	270	24.8	C				
			SB	T	718	0.5	10	1.0	A	1.0	A		
				R	27								
13	Frankford Ave. & Tyson Ave.	Tyson Ave.	EB	L	125	4.1	82	24.9	C			10.5	B
				T	388	11.2	224	18.8	B	20.1	C		
				R	57								
			WB	L	47	1.5	30	23.9	C				
				T	318	9.4	188	17.5	B	18.2	B		
				R	57								
		Frankford Ave.	NB	L	52	0.4	8	4.5	A				
				T	705	2.8	56	5.3	A	5.2	A		
				R	101								
			SB	L	46	0.4	8	4.8	A				
				T	562	2.2	44	4.7	A	4.7	A		
				R	104								
14	Frankford Ave. & Princeton Ave.	Princeton Ave.	EB	L	24							3.7	A
				T	94	4.1	82	20.5	C	20.5	C		
				R	26								
			WB	L	30								
				T	31	2.4	48	19.6	B	19.6	B		
				R	26								
		Frankford Ave.	NB	L	15	0.0	0	0.2	A				
				T	801	0.8	16	1.5	A	1.5	A		
				R	90								
			SB	L	25	0.1	2	0.3	A				
				T	617	0.4	8	0.8	A	0.8	A		
				R	7								

No source - this was part of the DVRPC analysis

Table C-3: Performance Measures, PM Existing (continued)

PM PEAK HOUR

Intersection		Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only)		LnGrp		Approach		Intersection	
						veh/ln	ft	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
15	Frankford Ave. & Wellington St.	Wellington St.	WB	L	85								
				T	63	5.5	110	22.9	C	22.9	C		
				R	31								
		Frankford Ave.	NB	L	45	0.2	4	2.0	A				
				T	684	0.5	10	0.9	A	0.9	A	8.0	A
				R	72								
			SB	L	36	0.7	14	9.6	A				
				T	596	7.8	156	11.9	B	11.7	B		
				R	171								
18	Frankford Ave. & Bleigh Ave.	Bleigh Ave.	EB	L	36								
				T	58	3.7	74	21.1	C	21.1	C		
				R	36								
			WB	L	22								
				T	63	2.8	56	20.5	C	20.5	C	6.2	A
				R	13								
		Frankford Ave.	NB	L	4	0.0	0	5.5	A				
				T	653	4.1	82	7.0	A	7.0	A		
				R	36								
			SB	L	9	0.0	0	0.4	A				
				T	682	0.4	8	0.8	A	0.8	A		
				R	22								
19	Frankford Ave. & Shelmire Ave.	Shelmire Ave.	EB	L	18								
				T	31	1.8	36	21.3	C	21.3	C		
				R	13								
			WB	L	22								
				T	49	2.9	58	22.0	C	22.0	C	5.3	A
				R	27								
		Frankford Ave.	NB	L	13	0.0	0	0.4	A				
				T	655	0.4	8	0.7	A	0.7	A		
				R	22								
			SB	L	22	0.2	4	4.9	A				
				T	709	3.8	76	6.1	A	6.0	A		
				R	22								
20	Frankford Ave. & Sheffield St.	Shelmire Ave.	EB	L	36								
				T	71	3.5	70	15.8	B	15.8	B		
				R	38								
			WB	L	63								
				T	70	4.9	98	16.7	B	16.7	B	15.7	B
				R	64								
		Frankford Ave.	NB	L	31	1.2	24	23.7	C				
				T	591	12.0	240	27.5	C	27.3	C		
				R	65								
			SB	L	47	0.5	10	6.6	A				
				T	583	1.3	26	3.0	A	3.2	A		
				R	23								
21	Frankford Ave. & Hartel Ave.	Hartel Ave.	EB	L	36	3.5	70	22.0	C	22.0	C		
				R	81								
		Frankford Ave.	NB	L	49	0.4	8	3.0	A	0.6	A	12.0	B
				T	682	0.2	4	0.4	A				
			SB	T	623	12.2	244	22.6	C	22.6	C		
				R	58								

No source - this was part of the DVRPC analysis

Table C-3: Performance Measures, PM Existing (continued)

PM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
22	Frankford Ave. & Rhawn St.	Shelmire Ave.	EB	L	53							15.0	B
				T	201	10.4	208	24.0	C	24.0	C		
				R	95								
			WB	L	61								
				T	404	17.5	350	30.7	C	30.7	C		
				R	88								
		Frankford Ave.	NB	L	119	1.8	36	9.1	A				
				T	490	7.6	152	10.3	B	9.7	A		
				R	94	1.2	24	7.3	A				
			SB	L	35	0.1	2	1.9	A				
				T	545	1.5	30	3.0	A	2.9	A		
				R	84								
23	Frankford Ave. & Welsh Rd.	Welsh Rd.	EB	L	34							8.3	A
				T	20	4.7	94	31.7	C	31.7	C		
				R	66								
			WB	L	17								
				T	36	2.9	58	30.1	C	30.1	C		
				R	24								
		Frankford Ave.	NB	L	146	1.5	30	5.0	A				
				T	533	0.6	12	0.9	A	1.8	A		
				R	11								
			SB	L	6	0.1	2	4.6	A				
				T	614	10.1	202	8.4	A	8.4	A		
				R	42								

No source - this was part of the DVRPC analysis

Table C-4: Performance Measures, AM Proposed

AM PEAK HOUR

#	Intersection	Approach	Dir.	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
1	Frankford Ave. & Bustleton Ave. / Bridge St.	Bustleton Ave.	EB	L T R	26 199 203	7.9 7.7	158 154	25.9 28.3	C C	27.0	C	17.4	B
		Bridge St.	WB	L T R	28 117 12	5.4	108	24.9	C	24.9	C		
		Frankford Ave.	NB	L T R	82 155 26	1.6 3.5	32 70	10.2 9.5	B A	9.8	A		
		Frankford Ave.	SB	L T R	11 396 27	5.0	100	9.2	A	9.2	A		
2	Frankford Ave. & Cheltenham Ave.	Cheltenham Ave.	EB	L T R	108 168 7	3.0 4.6	60 92	18.1 16.7	B B	17.3	B	21.5	C
		Cheltenham Ave.	WB	L T R	10 140 0	6.0	120	33.8	C	33.8	C		
		Frankford Ave.	NB	L T R	15 150 10	4.1	82	14.3	B	14.3	B		
		Frankford Ave.	SB	L T R	2 459 135	16.3	326	22.5	C	22.5	C		
3	Frankford Ave. & Comly St.	Comly St.	EB	L R	36 4	1.3	26	23.2	C	23.2	C	11.2	B
		Frankford Ave.	NB	T R	242 27	4.6	92	8.8	A	8.8	A		
		Frankford Ave.	SB	L T	18 568	0.3 10.9	6 218	10.0 11.6	A B	11.6	B		
4	Frankford Ave. & Benner St. & Duffield St. / Battersby St.	Frankford Ave.	NB	HL BL T BR	19 24 212 3		0 0	17.4 18.3	B B	18.1	B	26.3	C
		Frankford Ave.	SB	HL T BR HR	6 530 2 0		0 0	21.2 27.6	C C	27.6	C		
		Battersby St.	SEB	L BL T BR	7 30 0 22		0	36.0	D	36.0	D		
		Duffield St.	NWB	HL L T BR R	1 0 22 12 2		0	32.0	C	32.0	C		
		Benner St.	NEB	L BL T HR	0 2 13 27		0	32.9	C	32.9	C		
		Benner St.	SWB	BL T BR R	13 7 22 19		0	32.7	C	32.7	C		

No source - this was part of the DVRPC analysis

Table C-4: Performance Measures, AM Proposed (continued)

AM PEAK HOUR

	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
5	Frankford Ave. & Harbison Ave. & Devereaux Ave. & Hawthorne St.	Harbison Ave.	EB	L	23		0	20.0	C	26.8	C	32.9	C
				T	961								
				R	13		0	27.0	C				
				HR	0								
			WB	L	17		0	23.0	C	39.4	D		
				BL	189								
				T	485		0	45.2	D				
				R	147		0	14.5	B				
		Frankford Ave.	NB	HL	2		0	40.5	D	38.9	D		
				L	14								
				T	304		0	38.9	D				
				R	135		0		N/A				
			SB	L	306		0	41.1	D	30.6	C		
				T	508		0	28.3	C				
				R	79		0	5.1	A				
				BR	2								
6	Frankford Ave. & Robbins St.	Robbins St.	EB	L	56							20.0	C
				T	917	17.7	354	32.6	C	31.3	C		
				R	28								
		Frankford Ave.	NB	T	319	8.1	162	22.5	C	22.5	C		
				R	57								
			SB	L	214	5.0	100	26.6	C	7.5	A		
				T	766	1.2	24	2.2	A				
7	Frankford Ave. & Levick St.	Levick St.	WB	L	92							21.1	C
				T	1373	17.7	354	30.4	C	29.0	C		
				R	73								
		Frankford Ave.	NB	L	27	0.6	12	13.6	B	3.7	A		
				T	393	0.7	14	2.2	A				
			SB	T	907	7.6	152	14.5	B	16.2	B		
				R	82								
8	Frankford Ave. & Hellerman St.	Hellerman St.	EB	L	22							16.8	B
				T	27	5.3	106	23.5	C	23.5	C		
				R	112								
			WB	L	0								
				T	18	0.8	16	20.8	C	20.8	C		
				R	9								
		Frankford Ave.	NB	L	4	0.0	0	3.4	A	0.5	A		
				T	452	0.3	6	0.5	A				
				R	4								
			SB	L	4	0.1	2	15.8	B	24.1	C		
				T	825	15.5	310	24.2	C				
				R	31								
9	Frankford Ave. & Magee Ave.	Magee Ave.	EB	L	4							12.2	B
				T	31	4.9	98	24.7	C	24.7	C		
				R	112								
			WB	L	54								
				T	85	6.0	120	25.4	C	25.4	C		
				R	36								
		Frankford Ave.	NB	L	0	0.0	0	0.0	N/A	21.9	C		
				T	460	9.4	188	21.9	C				
				R	18								
			SB	L	54	0.2	4	2.0	A	1.1	A		
				T	701	0.5	10	1.0	A				
				R	36								

No source - this was part of the DVRPC analysis

Table C-4: Performance Measures, AM Proposed (continued)

AM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
10	Frankford Ave. & Unruh Ave. & Rowland Ave.	Unruh Ave.	EB	HL	3					23.6	C	28.4	C
				L	16		0	23.8	C				
				T	18								
				R	25		0	23.3	C				
		Frankford Ave.	NB	BL	66		0	36.1	D	26.0	C		
				T	438		0	24.6	C				
				R	18								
			SB	L	6		0	29.4	C	29.3	C		
				T	567								
				HR	9		0	22.5	C				
		Rowland Ave.	SEB	HL	0		0	34.0	C	34.0	C		
				BL	0								
				BR	186								
11	Frankford Ave. & Knorr St.	Knorr St.	EB	L	9	2.4	48	21.6	C	21.6	C	15.3	B
				T	58								
				R	10								
			WB	L	17	2.3	46	21.7	C	21.7	C		
				T	42								
				R	15								
		Frankford Ave.	NB	L	25	0.2	4	2.4	A	0.6	A		
				T	392	0.3	6	0.5	A				
				R	20								
			SB	L	24	0.8	16	19.1	B	24.2	C		
				T	583	11.5	230	24.4	C				
				R	10								
12	Frankford Ave. & Longshore Ave.	Longshore Ave.	EB	L	22	0.9	18	24.8	C	24.8	C	9.0	A
				R	4								
			WB	L	40	2.4	48	25.9	C	25.9	C		
				T	13								
				R	18								
		Frankford Ave.	NB	L	4	0.1	2	16.5	B	19.4	B		
				T	328	6.0	120	19.4	B				
			SB	T	597	0.4	8	0.8	A	0.8	A		
				R	22								
13	Frankford Ave. & Tyson Ave.	Tyson Ave.	EB	L	91	2.9	58	21.6	C	20.0	B	13.8	B
				T	464	12.8	256	19.7	B				
				R	21								
			WB	L	62	2.2	44	26.9	C	18.4	B		
				T	264	7.9	158	16.7	B				
				R	39								
		Frankford Ave.	NB	L	49	0.8	16	11.9	B	8.7	A		
				T	437	2.9	58	8.4	A				
				R	53								
			SB	L	54	0.7	14	8.9	A	10.9	B		
				T	695	5.2	104	11.0	B				
				R	80								
14	Frankford Ave. & Princeton Ave.	Princeton Ave.	EB	L	11	2.2	44	17.6	B	17.6	B	3.9	A
				T	63								
				R	12								
			WB	L	31	2.6	52	17.8	B	17.8	B		
				T	26								
				R	42								
		Frankford Ave.	NB	L	8	0.0	0	0.9	A	1.4	A		
				T	384	0.6	12	1.5	A				
				R	64								
			SB	L	37	0.1	2	1.1	A	1.7	A		
				T	596	0.8	16	1.7	A				
				R	9								

No source - this was part of the DVRPC analysis

Table C-4: Performance Measures, AM Proposed (continued)

AM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
15	Frankford Ave. & Wellington St.	Wellington St.	WB	L	36	3.3	66	23.0	C	23.0	C	9.4	A
				T	49								
				R	18								
		Frankford Ave.	NB	L	36	0.5	10	7.3	A	5.1	A		
				T	373	2.0	40	4.9	A				
				R	40								
			SB	L	18	0.3	6	9.4	A	10.1	B		
				T	633	6.3	126	10.2	B				
				R	9								
18	Frankford Ave. & Bleigh Ave.	Bleigh Ave.	EB	L	18	1.7	34	19.3	B	19.3	B	8.9	A
				T	18								
				R	22								
			WB	L	36	3.1	62	20.1	C	20.1	C		
				T	58								
				R	13								
		Frankford Ave.	NB	L	18	0.4	8	10.0	A	13.6	B		
				T	436	9.9	198	13.8	B				
				R	4	0.1	2	9.6	A				
			SB	L	18	0.1	2	2.0	A	2.3	A		
				T	561	1.3	26	2.3	A				
				R	22								
19	Frankford Ave. & Shelmire Ave.	Shelmire Ave.	EB	L	22	1.4	28	20.5	C	20.5	C	18.0	B
				T	13								
				R	13								
			WB	L	22	2.7	54	21.3	C	21.3	C		
				T	36								
				R	31								
		Frankford Ave.	NB	L	9	0.2	4	8.5	A	1.6	A		
				T	467	0.8	16	1.4	A				
				R	18								
			SB	L	22	0.7	14	17.1	B	29.8	C		
				T	597	22.4	448	30.2	C				
				R	36								
20	Frankford Ave. & Sheffield St.	Shelmire Ave.	EB	L	40	4.2	84	19.9	B	19.9	B	21.1	C
				T	64								
				R	39								
			WB	L	64	6.6	132	21.6	C	21.6	C		
				T	88								
				R	58								
		Frankford Ave.	NB	L	16	0.6	12	26.0	C	17.4	B		
				T	532	13.9	278	17.1	B				
				R	40								
			SB	L	22	0.9	18	29.1	C	24.6	C		
				T	588	18.8	376	24.5	C				
				R	20								
21	Frankford Ave. & Hartel Ave.	Hartel Ave.	EB	L	40	3.6	72	19.8	B	19.8	B	15.5	B
				R	81								
		Frankford Ave.	NB	L	36	6.0	120	6.0	A	1.7	A		
				T	440	1.4	28	1.4	A				
			SB	T	462	28.1	562	28.1	C	28.1	C		
				R	18								

No source - this was part of the DVRPC analysis

Table C-4: Performance Measures, AM Proposed (continued)

AM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue (HCM 6th Ed. Only) ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
22	Frankford Ave. & Rhawn St.	Shelmire Ave.	EB	L	43	11.4	228	24.9	C	24.9	C	10.4	B
				T	277								
				R	33								
			WB	L	36	8.3	166	22.8	C	22.8	C		
				T	162								
				R	56								
		Frankford Ave.	NB	L	57	0.1	2	0.4	A	1.4	A		
				T	333	0.8	16	1.5	A				
				R	65								
			SB	L	33	0.1	2	0.2	A	1.4	A		
				T	368	0.8	16	1.5	A				
				R	54								
23	Frankford Ave. & Welsh Rd.	Welsh Rd.	EB	L	19	4.0	80	27.4	C	27.4	C	7.9	A
				T	25								
				R	68								
			WB	L	6	0.6	12	25.0	C	25.0	C		
				T	3								
				R	8								
		Frankford Ave.	NB	L	98	0.4	8	2.2	A	0.9	A		
				T	321	0.3	6	0.5	A				
				R	0								
			SB	L	2	0.0	0	5.9	A	8.8	A		
				T	431	7.9	158	8.8	A				
				R	28								

0

No source - this was part of the DVRPC analysis

Table C-5: Performance Measures, PM Proposed

PM PEAK HOUR

#	Intersection	Approach	Direction	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
1	Frankford Ave. & Bustleton Ave. / Bridge St.	Bustleton Ave.	EB	L	26	5.6	112	20.9	C	22.1	C	20.3	C
				T	169								
				R	165	5.3	106	23.6	C				
		Bridge St.	WB	L	27								
				T	175	7.3	146	22.6	C	22.6	C		
				R	38								
		Frankford Ave.	NB	L	183	4.2	84	14.3	B				
				T	335	8.5	170	14.2	B	14.2	B		
				R	42								
			SB	L	10								
				T	251	9.4	188	28.6	C	28.6	C		
				R	35								
2	Frankford Ave. & Cheltenham Ave.	Cheltenham Ave.	EB	L	283	7.4	148	17.5	B			21.1	C
				T	320					16.5	B		
				R	34	8.5	170	15.7	B				
			WB	L	18								
				T	131	6.0	120	34.0	C	34.0	C		
				R	6								
		Frankford Ave.	NB	L	31								
				T	388	11.8	236	21.8	C	21.8	C		
				R	22								
			SB	L	6								
				T	315	12.0	240	22.6	C	22.6	C		
				R	116								
3	Frankford Ave. & Comly St.	Comly St.	EB	L	31	2.8	56	26.7	C	26.7	C	10.8	B
				R	49								
		Frankford Ave.	NB	T	548	10.1	202	10.1	B	10.1	B		
				R	54								
			SB	L	49	14.5	290	14.5	B	8.8	A		
				T	390	8.0	160	8.0	A				
4	Frankford Ave. & Benner St. & Duffield St. / Battersby St.	Frankford Ave.	NB	HL	21		0	27.8	C			48.2	D
				BL	49					69.7	E		
				T	551		0	74.9	E				
				BR	19								
			SB	HL	22		0	32.0	C				
				T	397					25.5	C		
				BR	7		0	25.1	C				
				HR	7								
		Battersby St.	SEB	HL	8								
				L	65		0	41.6	D	41.6	D		
				T	0								
				BR	31								
		Duffield St.	NWB	HL	2								
				L	3								
				T	36		0	33.7	C	33.7	C		
				BR	29								
				R	7								
		Benner St.	NEB	L	1								
				BL	4		0	33.3	C	33.3	C		
				T	22								
				HR	28								
			SWB	BL	13								
				T	20		0	34.0	C	34.0	C		
				BR	36								
				R	18								

No source - this was part of the DVRPC analysis

Table C-5: Performance Measures, PM Proposed (continued)

PM PEAK HOUR

Intersection		Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
5	Frankford Ave. & Harbison Ave. & Devereaux Ave. & Hawthorne St.	Harbison Ave.	EB	L	19		0	17.5	B	19.4	B	36.1	D
				T	678								
				R	29		0	19.4	B				
				HR	4								
			WB	L	25		0	16.4	B	42.8	D		
				BL	222								
				T	689		0	52.3	D				
				R	271		0	13.3	B				
		Frankford Ave.	NB	HL	0		0	31.3	C	46.2	D		
				L	35								
				T	568		0	47.0	D				
				R	145		0	N/A	N/A				
			SB	L	187		0	62.5	E	30.3	C		
				T	355		0	19.1	B				
				R	73		0	5.9	A				
				BR	11								
6	Frankford Ave. & Robbins St.	Robbins St.	EB	L	110							29.7	C
				T	1012	21.4	428	45.0	D	41.5	D		
				R	19								
		Frankford Ave.	NB	T	747	15.1	302	34.8	C	34.7	C		
				R	73								
			SB	L	218	4.7	94	37.2	D	9.6	A		
				T	654	0.2	4	0.5	A				
7	Frankford Ave. & Levick St.	Levick St.	WB	L	77							18.3	B
				T	1329	17.7	354	26.4	C	27.0	C		
				R	127								
		Frankford Ave.	NB	L	40	0.9	18	25.8	C	5.6	A		
				T	873	2.7	54	4.7	A				
			SB	T	724	6.8	136	16.1	B	16.0	B		
				R	62								
8	Frankford Ave. & Hellerman St.	Hellerman St.	EB	L	63							13.9	B
				T	94	7.2	144	21.7	C	21.7	C		
				R	72								
			WB	L	13								
				T	45	2.8	56	19.3	B	19.3	B		
				R	40								
		Frankford Ave.	NB	L	36	0.4	8	4.5	A	1.7	A		
				T	908	0.8	16	1.6	A				
				R	22								
			SB	L	27	1.0	20	19.6	B	25.7	C		
				T	695	14.4	288	25.9	C				
				R	85								
9	Frankford Ave. & Magee Ave.	Magee Ave.	EB	L	18							15.2	B
				T	54	3.4	68	26.7	C	26.7	C		
				R	27								
			WB	L	36								
				T	72	5.7	114	28.5	C	28.5	C		
				R	49								
		Frankford Ave.	NB	L	9	0.3	6	15.7	B	24.1	C		
				T	954	16.4	328	24.2	C				
				R	0								
			SB	L	58	1.0	20	7.1	A	1.3	A		
				T	738	0.5	10	0.9	A				
				R	54								

No source - this was part of the DVRPC analysis

Table C-5: Performance Measures, PM Proposed (continued)

PM PEAK HOUR

	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
10	Frankford Ave. & Unruh Ave. & Rowland Ave.	Unruh Ave.	EB	HL	6							21.9	C
				L	26		0	25.1	C	25.0	C		
				T	62								
				R	2		0	23.1	C				
		Frankford Ave.	NB	BL	183		0	51.9	D				
				T	829		0	18.9	B	24.6	C		
				R	38								
			SB	L	31		0	14.5	B				
				T	705					14.5	B		
				HR	6		0	19.0	B				
		Rowland Ave.	SEB	HL	0								
				BL	0		0	38.5	D	38.5	D		
				BR	137								
11	Frankford Ave. & Knorr St.	Knorr St.	EB	L	20							17.9	B
				T	126	5.0	100	25.3	C	25.3	C		
				R	4								
			WB	L	39								
				T	83	5.1	102	25.7	C	25.7	C		
				R	27								
		Frankford Ave.	NB	L	29	0.6	12	13.0	B				
				T	772	5.6	112	8.2	A	8.4	A		
				R	48								
			SB	L	93	4.2	84	31.5	C				
				T	687	13.2	264	24.3	C	25.1	C		
				R	25								
12	Frankford Ave. & Longshore Ave.	Longshore Ave.	EB	L	40	1.5	30	23.7	C	23.7	C	15.1	B
				R	9								
			WB	L	54								
				T	58	7.1	142	27.2	C	27.2	C		
				R	94								
		Frankford Ave.	NB	L	36	1.3	26	19.9	B	24.6	C		
				T	765	13.5	270	24.8	C				
			SB	T	718	0.5	10	1.0	A	1.0	A		
				R	27								
13	Frankford Ave. & Tyson Ave.	Tyson Ave.	EB	L	125	4.7	94	31.0	C			12.3	B
				T	388	12.5	250	23.4	C	25.0	C		
				R	57								
			WB	L	47	1.7	34	29.3	C				
				T	318	10.4	208	21.6	C	22.4	C		
				R	57								
		Frankford Ave.	NB	L	52	0.4	8	4.5	A				
				T	705	2.8	56	5.3	A	5.2	A		
				R	101								
			SB	L	46	0.4	8	4.8	A				
				T	562	2.2	44	4.7	A	4.7	A		
				R	104								
14	Frankford Ave. & Princeton Ave.	Princeton Ave.	EB	L	24							3.7	A
				T	94	4.1	82	20.5	C	20.5	C		
				R	26								
			WB	L	30								
				T	31	2.4	48	19.6	B	19.6	B		
				R	26								
		Frankford Ave.	NB	L	15	0.0	0	0.2	A				
				T	801	0.8	16	1.5	A	1.5	A		
				R	90								
			SB	L	25	0.1	2	0.3	A				
				T	617	0.4	8	0.8	A	0.8	A		
				R	7								

No source - this was part of the DVRPC analysis

Table C-5: Performance Measures, PM Proposed (continued)

PM PEAK HOUR

#	Intersection	Approach / Movement			Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
15	Frankford Ave. & Wellington St.	Wellington St.	WB	L	85								
				T	63	5.5	110	22.9	C	22.9	C		
				R	31								
		Frankford Ave.	NB	L	45	0.2	4	2.0	A				
				T	684	0.5	10	0.9	A	0.9	A	8.0	A
				R	72								
			SB	L	36	0.7	14	9.6	A				
				T	596	7.8	156	11.8	B	11.7	B		
				R	171								
18	Frankford Ave. & Bleigh Ave.	Bleigh Ave.	EB	L	36								
				T	58	3.7	74	21.1	C	21.1	C		
				R	36								
			WB	L	22								
				T	63	2.8	56	20.5	C	20.5	C		
				R	13							13.5	B
		Frankford Ave.	NB	L	4	0.1	2	12.9	B				
				T	653	18.6	372	22.4	C	21.9	C		
				R	36	0.9	18	13.3	B				
			SB	L	9	0.1	2	5.9	A				
				T	682	1.6	32	2.9	A	2.9	A		
				R	22								
19	Frankford Ave. & Shelmire Ave.	Shelmire Ave.	EB	L	18								
				T	31	1.8	36	21.3	C	21.3	C		
				R	13								
			WB	L	22								
				T	49	2.9	58	22.1	C	22.1	C		
				R	27								
		Frankford Ave.	NB	L	13	0.0	0	0.1	A			4.4	A
				T	655	1.3	26	2.2	A	2.1	A		
				R	22								
			SB	L	22	0.0	0	0.2	A				
				T	709	1.6	32	2.8	A	2.7	A		
				R	22								
20	Frankford Ave. & Sheffield St.	Shelmire Ave.	EB	L	36								
				T	71	3.5	70	15.8	B	15.8	B		
				R	38								
			WB	L	63								
				T	70	4.9	98	16.8	B	16.8	B		
				R	64							20.9	C
		Frankford Ave.	NB	L	31	1.3	26	27.1	C				
				T	591	23.1	462	37.1	D	36.7	D		
				R	65								
			SB	L	47	1.5	30	17.8	B				
				T	583	3.5	70	5.7	A	5.7	A		
				R	23								
21	Frankford Ave. & Hartel Ave.	Hartel Ave.	EB	L	36	3.5	70	22.0	C	22.0	C		
				R	81								
		Frankford Ave.	NB	L	49	1.2	24	11.5	B	3.0	A	16.8	B
				T	682	1.4	28	2.4	A				
			SB	T	623	23.0	460	30.6	C	30.6	C		
				R	58								

No source - this was part of the DVRPC analysis

Table C-5: Performance Measures, PM Proposed

PM PEAK HOUR

#	Intersection	Approach	Direction	Movement	Volume	95th %ile Queue (HCM 6th Ed. Only) veh/ln	95th %ile Queue ft	LnGrp Delay (s)	LnGrp LOS	Approach Delay (s)	Approach LOS	Intersection Delay (s)	Intersection LOS
22	Frankford Ave. & Rhawn St.	Shelmire Ave.	EB	L	53	10.4	208	24.0	C	24.0	C	15.7	B
				T	201								
				R	95								
			WB	L	61	17.5	350	30.7	C	30.7	C		
				T	404								
				R	88								
		Frankford Ave.	NB	L	119	1.8	36	9.1	A	11.6	B		
				T	490	9.3	186	12.1	B				
				R	94								
			SB	L	35	0.3	6	3.4	A	3.0	A		
				T	545	1.5	30	3.0	A				
				R	84								
23	Frankford Ave. & Welsh Rd.	Welsh Rd.	EB	L	34	4.7	94	31.7	C	31.7	C	8.3	A
				T	20								
				R	66								
			WB	L	17	2.9	58	30.1	C	30.1	C		
				T	36								
				R	24								
		Frankford Ave.	NB	L	146	1.5	30	5.0	A	1.8	A		
				T	533	0.6	12	0.9	A				
				R	11								
			SB	L	6	0.1	2	4.6	A	8.4	A		
				T	614	10.1	202	8.4	A				
				R	42								

No source - this was part of the DVRPC analysis

FRANKFORD AVENUE MULTIMODAL STUDY

Publication Number:

19033

Date Published:

June 2021

Geographic Area Covered:

Frankford Avenue between Cheltenham Avenue and Rhawn Street. Wissinoming, Tacony, Mayfair and Holmesburg neighborhoods, Philadelphia, PA.

Key Words:

Traffic calming, road diet, pedestrian, bicycle, transit, trackless trolley, safety, community engagement.

Abstract:

Frankford Avenue is an important commercial corridor and cultural hub for surrounding communities and the City of Philadelphia. At the same time, the Avenue serves as a major arterial moving heavy volumes of fast-moving traffic.

The goal of this study is to improve circulation and safety for all roadway users, including pedestrians, transit riders, bicyclists, and drivers. The study builds off of issues and goals identified in the North Delaware District Plan and other previous work, and aims to support neighborhood vitality by improving multimodal access to local businesses and amenities.

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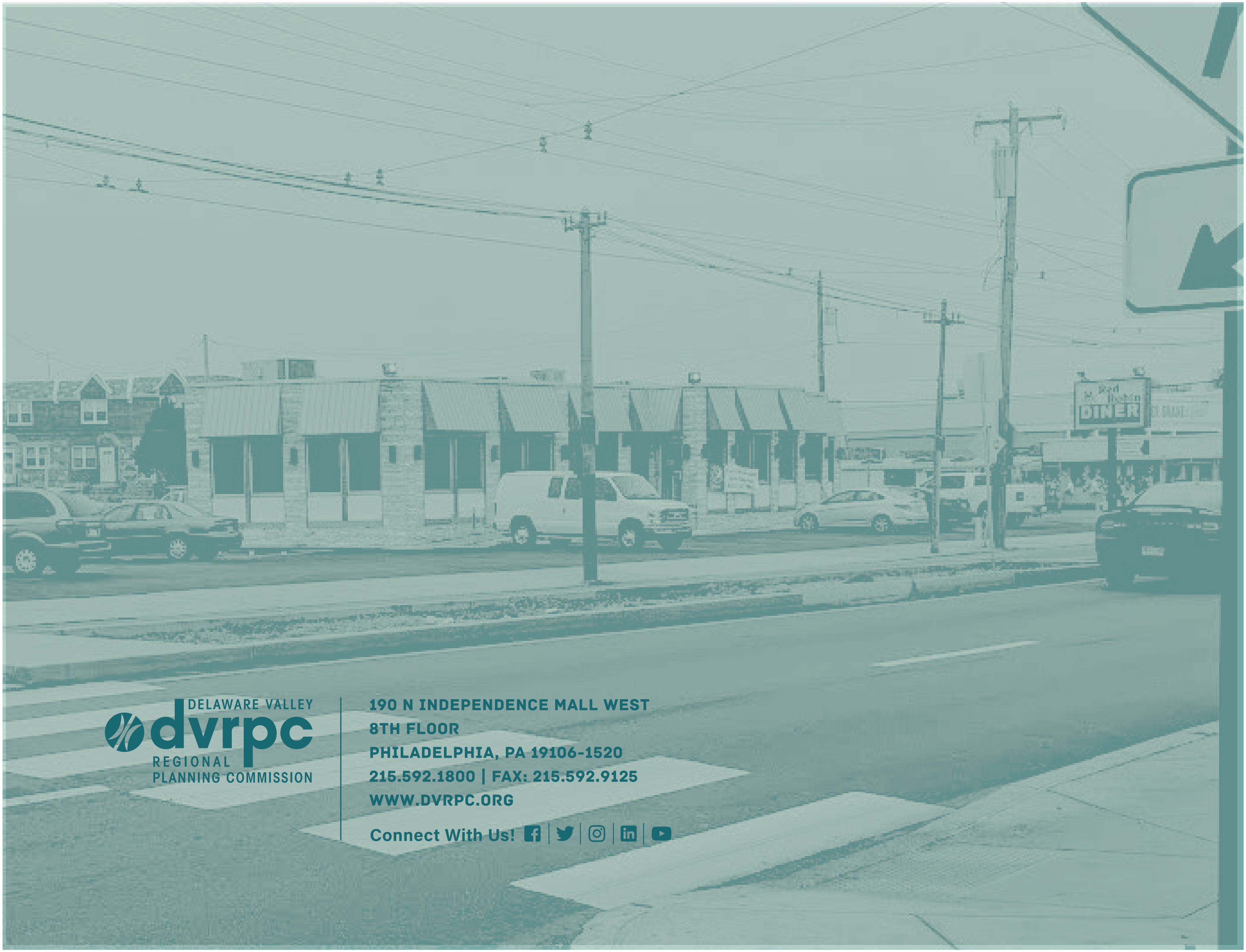

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