a mobility analysis

October 2015

DELAWARE VALLEY
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REGIONAL
PLANNING COMMISSION

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The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

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Executive Summary

This study assesses multi-modal mobility along Race Street between 5th and 9th Street, and was conducted by the Delaware Valley Regional Planning Commission at the request of the City of Philadelphia.

Race Street is an important eastbound route in Center City Philadelphia, and the segment between 5th and 9th Street is an important link that connects Old City, Chinatown, Franklin Square, and Independence Mall. While the majority of the Race Street corridor is two travel lanes–making it amenable to people walking, bicycling, or driving–the section between 6th and 8th Street is significantly wider, expanding to five vehicle travel lanes, which hinders its function as a multi-modal street. The street was initially widened to provide access to the Benjamin Franklin Bridge, but the configuration is no longer necessary because the construction of the Vine Street Expressway has made this connection redundant. This offers an opportunity to implement a new vision for this segment of Race Street.

EVALUATION

The study of the section of Race Street between 5th and 9th Street:

- is informed by complementary studies including the Philadelphia 2035 Central District plan and the Pennsylvania Horticultural Society's Civic Landscapes for the 21st Century program's Monument Plaza plan;
- evaluates existing conditions for transit, safety, pedestrians, bicyclists, and motorists;
- uses traffic modeling software to evaluate traffic impact of new proposed lane configurations;
- develops a Complete Street conceptual design for Race Street that maximizes accessibility and minimizes adverse traffic impact; and
- assesses opportunities to implement green stormwater infrastructure.

This evaluation showed that:

- the area has several significant transit connections, including SEPTA Transit, NJ Transit, and PATCO, that have limited pedestrian accessibility due to the wide road width;
- the wide width and excess capacity of the road create unsafe conditions for all road users;
- the configuration and wide width of the street is hindering accessibility between Franklin Square, Independence Mall, and Old City for those walking and biking; and
- reducing the amount of vehicle travel lanes would have negligible impact on traffic.

PROPOSED DESIGN

The proposed design informed by the evaluation would have three travel lanes, a protected bicycle lane, pedestrian islands, curb extensions, and green stormwater infrastructure. This would enhance the site in several ways by:

- reducing the north and south crossing distance at most intersections by approximately 50 percent, improving the accessibility to nearby transit stops, Franklin Square, Independence Mall, Old City, and Chinatown;
- creating a dedicated route for bicyclists that connects to bicycle facilities on 6th Street, Benjamin Franklin Bridge, and Christopher Columbus Boulevard;
- managing stormwater and improving site aesthetics through environment-friendly vegetated green stormwater infrastructure; and
- traffic calming the road to improve safety for all road users.

The next step would be to finalize the conceptual design. To facilitate faster implementation, the study recommends implementing the design in a two-stage process. The major design components would be first implemented with temporary materials and then later built out in permanent materials as part of the city's capital program.

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CHAPTER 1

PURPOSE AND NEED

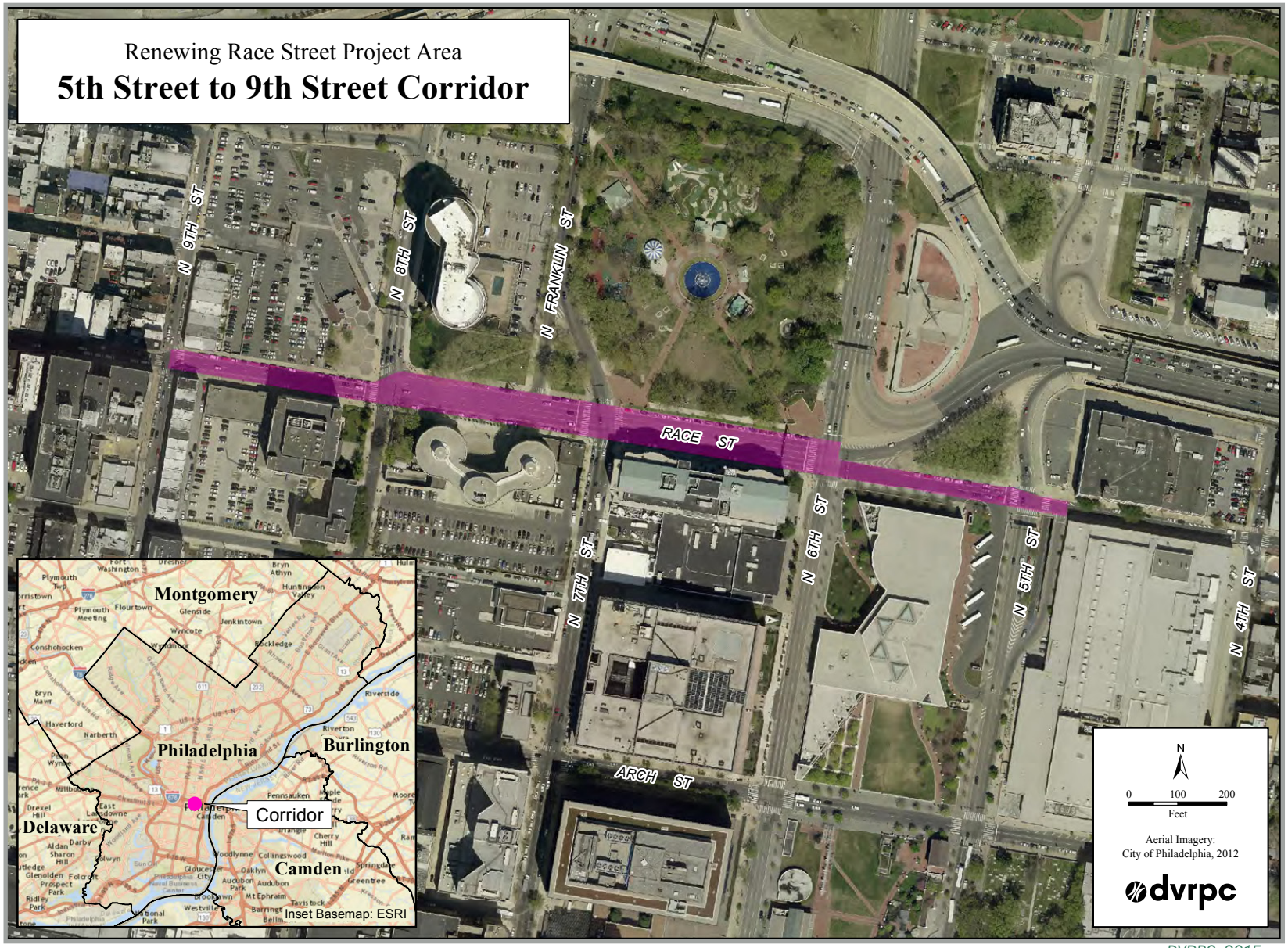
Race Street is an important eastbound route for Center City Philadelphia running from the Schuylkill River to the Delaware River connecting major attractions: Logan Square, Philadelphia Convention Center, Franklin Square, National Constitution Center, and Race Street Pier.

The majority of the route is two travel lanes, easily traversed by people walking, biking, and driving. On the eastern section of the route, the connectivity is disrupted when Race Street expands from two to five travel lanes over a two-block stretch between 6th and 8th Street. The reason for the wide width of this section is that prior to the completion of the Vine Street Expressway, this section of Race Street was the main access point to the Benjamin Franklin Bridge. This creates several problems in regard to accessibility, safety, and aesthetics.

The wide width of the street impedes linkages between Chinatown, Old City, and Independence Mall; it creates a barrier isolating Franklin Square, disrupts an important eastbound bicycle connection to several important north and south bicycle lanes, and encourages vehicle speeding, resulting in dangerous conditions for people walking, biking, and driving. Additionally, the width and lack of greenery creates a poor aesthetic statement to city visitors who travel through this gateway location to reach major attractions on Independence Mall.

As traffic is now routed through the Vine Street Expressway, there is no longer a need for the four- and five-lane configuration for this segment of Race Street. This presents an opportunity to renew Race Street and re-establish historic connections that existed prior to the street being widened. To create a renewed Race Street, the study will assess existing conditions, evaluate traffic network impact, and develop design alternatives that will enhance the site.

FIGURE 01: Race Street Project Area



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CHAPTER 2

BACKGROUND

Historically, Race Street between 6th and 8th Street was significantly narrower with only two lanes of traffic. This section of Race Street was initially widened to facilitate vehicle access to the Benjamin Franklin Bridge, but the construction of the Vine Street Expressway in 1991 made this connection redundant. Consequently, this section of Race Street now has a significant amount of excess capacity.

This offers an opportunity to implement a new vision for this segment of Race Street. The Renewing Race Street study is based on and complements several other concurrent proposals, specifically the Philadelphia 2035 Central District plan and the Pennsylvania Horticultural Society's Civic Landscapes for the 21st Century plan for Monument Plaza. Additionally, the Renewing Race Street proposal is informed by preliminary analysis work done by Villanova University engineering students.

FIGURE 02: Original Street Configuration in 1931, Race and 6th Street looking west

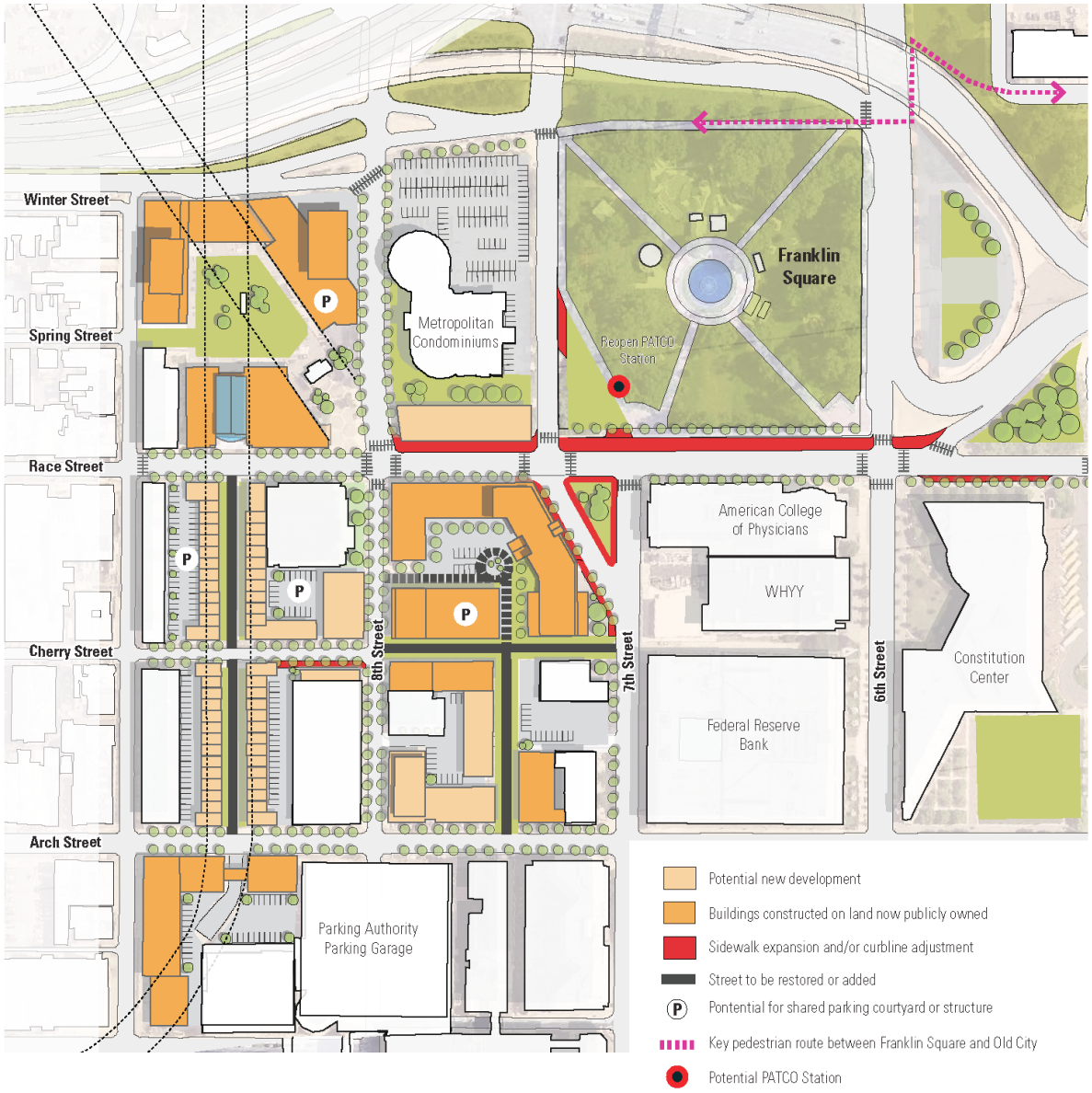
Source: City of Philadelphia, Department of Records

PHILADELPHIA 2035 CENTRAL DISTRICT PLAN – FOCUS AREA "BRINGING CHINATOWN TO FRANKLIN SQUARE"

Philadelphia 2035 is the city's comprehensive plan that guides development for the next 20 years based on the themes of "Thrive, Connect, and Renew." The Central District section of the plan calls for improvements shown in Figure 3 for the east section of Race Street identified as the focus area "Bringing Chinatown to Franklin Square."

The plan identifies that the large width of Race Street between 6th and 8th Street, which is incongruent with the rest of the corridor, creates a barrier that cuts off local assets such as Franklin Square from the rest of the area. The width also impedes connections between two of the city's most vibrant neighborhoods: Chinatown and Old City. The plan recommends narrowing Race Street between 6th and 8th Street, developing underutilized lots, realigning 7th Street to reconnect the southwest corner of Franklin Square after the expected relocation of the Philadelphia Police Headquarters, and improving bicycle and pedestrian connections to the Benjamin Franklin Bridge. This plan was one of the impetuses for the Renewing Race Street study as improving Race Street is critical in tying together these long-term development plans.

FIGURE 03: Philadelphia 2035 – Focus Area Bringing Chinatown to Franklin Square



Source: Philadelphia City Planning Commission, Philadelphia 2035: Central District Plan, 2013

CIVIC LANDSCAPES FOR THE 21ST CENTURY – PENNSYLVANIA HORTICULTURAL SOCIETY

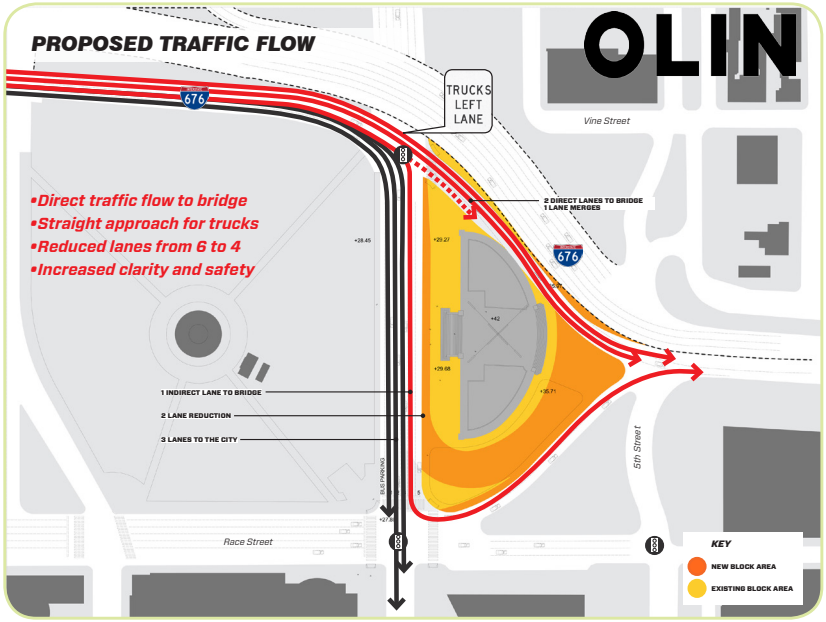
The Pennsylvania Horticultural Society has identified the area around Franklin Square as one of seven city landscapes to improve in its Civic Landscapes for the 21st Century program. This program calls for the Horticultural Society to partner with organizations to improve the vibrancy of important cityscapes in Philadelphia. Specifically, the organization is interested in spurring discussion on how to reconnect Monument Plaza, with the famous Noguchi "Bolt of Lightning" sculpture, to Franklin Square and Independence Mall. Figure 4 shows the initial conceptual design for Monument Plaza. To facilitate this discussion, the Pennsylvania Horticultural Society is currently funding a study to determine the feasibility of rerouting eastbound I-676 directly to the Benjamin Franklin Bridge. This would allow 6th Street to be narrowed, enabling installation of pedestrian crossings that would create a direct connection between Franklin Square and Monument Park.

The Pennsylvania Horticultural Society proposal shown in Figure 5 would close the main eastside access point to the Benjamin Franklin Bridge on 6th Street between Wood and Race Street, but, based on recommendations from DVRPC, would maintain the Race Street access point to the bridge at 6th and Race Street. As shown in Figure 6 this proposal would allow for significant accessibility improvements; crosswalks would be able to be added on the north and east sides of Race and 6th Street, allowing for a direct connection to Monument Plaza.

FIGURE 04: Pennsylvania Horticultural Society – Rendering of Proposed Improvements for Monument Plaza

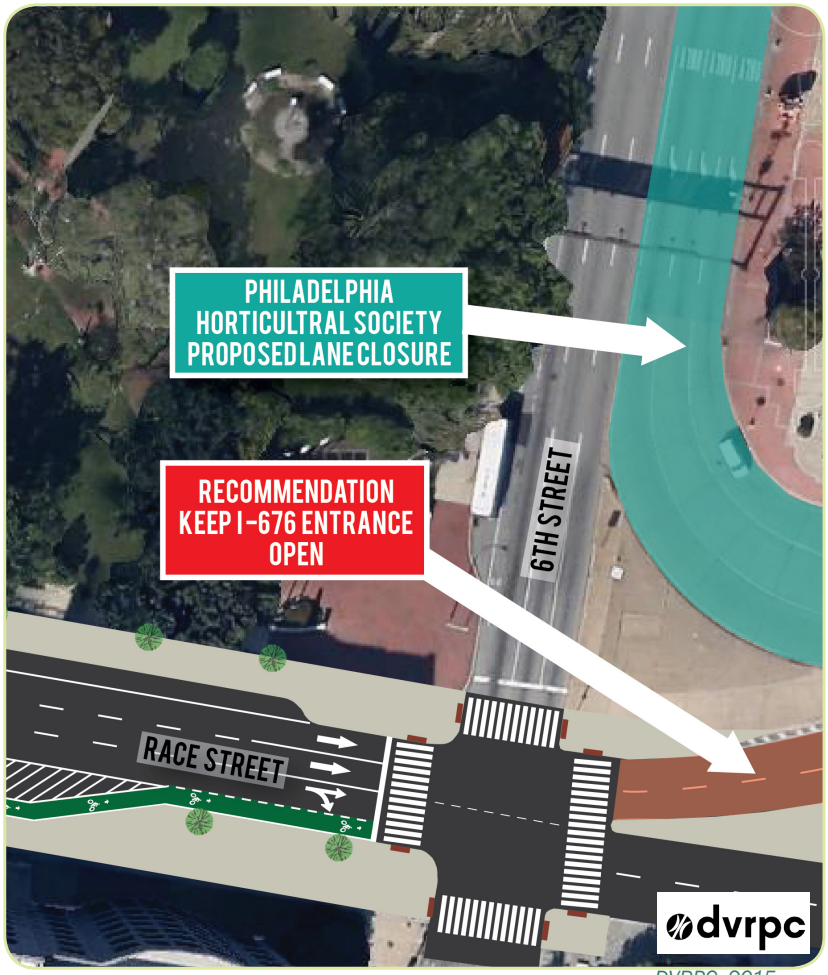
Source: Pennsylvania Horticultural Society and OLIN Landscape Architecture, 2015

FIGURE 05: Proposed Traffic Flow for I-676 in Pennsylvania Horticultural Society Monument Plaza Study



Source: Pennsylvania Horticultural Society and OLIN Landscape Architecture, 2015

FIGURE 06: Conceptual Design – Integration of Renewing Race Street and Pennsylvania Horticultural Society Monument Plaza Proposals



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VILLANOVA UNIVERSITY'S PROFESSIONAL PRACTICES IN ENGINEERING COURSE

As part of the Renewing Race Street study, DVRPC worked with professors and civil and environmental engineering students at Villanova University through the university's Professional Practices in Engineering course. Students analyzed three improvement opportunities in the project area: road dieting Race Street between 6th and 8th Street, identifying a preferred 7th Street realignment, and an analysis of the feasibility of connecting eastbound I-676 to the Benjamin Franklin Bridge. DVRPC provided technical information and feedback throughout the process. The final reports produced by the students were reviewed by DVRPC, and relevant sections informed the Race Street study.

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CHAPTER 3

DESCRIPTION OF AREA

Streetscape

Race Street is a one-way eastbound street in Center City Philadelphia that runs from the Schuylkill River to the Delaware River. There is also a small disconnected section of the street in West Philadelphia. The majority of the route is two travel lanes, conducive to people walking, biking, and driving. The study focuses on the atypically wide section of Race Street between 6th and 8th Street shown in Figure 7.

The characteristics that define this section of Race Street are wide width, uninviting street wall, and lack of public parking. Race Street between 7th and 8th Street is four travel lanes and two parking lanes reserved for authorized vehicles, and between 6th and 7th Street there are five travel lanes and two parking lanes reserved for authorized vehicles. While the north side of the street that abuts Franklin Square is vegetated with a significant amount of greenery, the south side of the street is uninviting

FIGURE 07: Atypically Wide Section of Race Street – Race and 8th Street looking east

DVRPC, 2015

with a barren street wall between 6th and 8th Street. The only significant greenery on the south side is between 6th and 7th Street, which is punctuated with tree plantings that add visual diversity to the otherwise blank wall surrounding the Philadelphia Police Headquarters.

FIGURE 08: Visually Barren Street Wall – Race Street between 6th and 7th Street looking south

DVRPC, 2015

Neighborhoods and Destinations

The segment of Race between 6th and 8th Street is at the juncture of Old City, Chinatown, Franklin Square, and Independence Mall. Currently, the street functions poorly as a connection between these areas due to the wide road width, high vehicle speeds, and uninviting street wall.

Old City, as the name implies, is one of the oldest neighborhoods in Philadelphia. It is situated next to the Delaware River and bounded in the west by Independence Mall. Within the neighborhood, there are the historical sites Elfreth's Alley and Betsy Ross's house. It is one of the most walkable areas of Philadelphia, with a multitude of restaurants, shops, and art galleries.

FIGURE 09: Old City Philadelphia

Source: Old City District, 2015

Chinatown is situated between Broad Street and Franklin Square and is bounded to the north by the Vine Street Expressway. It is a neighborhood that is populated by a multitude of people with Asian cultural backgrounds, including but not limited to Cantonese, Fujianese, Northern Sichuan, and Taiwanese. It is a significant restaurant district and main location for the city's Chinese New Year festivities, with the Lion Dance Parade taking place there.

FIGURE 10: Chinatown Philadelphia

Source: Visit Philadelphia, 2015

Independence Mall, located between Chinatown and Old City, is part of the Independence National Historical Park. It includes the city's most visited tourist attractions and showcases the country's colonial past with buildings that include the National Constitution Center, the Independence Visitor Center, the Free Quaker Meetinghouse, the Liberty Bell Center, and Independence Hall, where the Declaration of Independence and U.S. Constitution were signed.

FIGURE 11: Independence Hall

Source: National Park Service, 2015

Franklin Square, located on the north side of Race Street between 6th and 7th Street, is one of Philadelphia's five original squares. It is a beautiful park with several attractions, including a carousel, a mini golf course, and food options such as SquareBurger. It is a popular destination for tourists and those working in the area. Also, many of the daycare centers in the area take children to the square for recreational purposes. The report focuses on improving connections for the south side of Franklin Square, but the square's northwest corner also has poor accessibility for those walking, and although outside of the scope of this report improvements should be explored in further studies.

FIGURE 12: Franklin Square

Source: Historic Philadelphia, 2015

Development Opportunities

As identified in the Philadelphia 2035 Central District Plan, there are many development opportunities in the surrounding area. A significant portion of valuable real estate is devoted to surface parking lots, many of them on government-owned land. These areas could be developed to take advantage of the area's prime location in Center City Philadelphia next to multiple amenities including transit, parks, restaurants, and shopping.

Specifically, the Broad-Ridge Spur Chinatown station is surrounded by a surface parking lot. This is an excellent location for a transit-oriented development. Parking could be conserved and condensed with multistory parking garages. Successful residential developments such as the Metropolitan Condominiums already exist in this area and could be used as a template for development efforts.

The Roundhouse building also presents another opportunity for development pending the Philadelphia Police Headquarters moving from the building to West Philadelphia. The relocation of the Police Headquarters would also allow the authorized vehicle parking spaces along Race Street to be converted to public use.

The emphasis of any improvement effort should be on developing the surface parking lots, reinstating the street grid where appropriate, and taking advantage of existing community assets such as the Broad-Ridge Spur Chinatown station and Franklin Square.

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CHAPTER 4

TRANSPORTATION NETWORK

Street Network

MAJOR CROSS STREETS

In the immediate project area from east to west, Race Street's major cross streets are 5th, 6th, 7th, North Franklin, 8th, and 9th. These cross streets provide important north and south connections for Center City Philadelphia.

INTERSTATE AND BENJAMIN FRANKLIN BRIDGE CONNECTIONS

I-676

I-676 functions as the main interstate connection to Center City Philadelphia linking the area to New Jersey and several other interstates. A portion of I-676 runs on an east and west axis through Center City Philadelphia, where it is known as the Vine Street Expressway. At its western terminus, it connects to I-76, and the eastern section goes through Camden, New Jersey, connecting to I-95, I-76, and NJ 30. Race Street is one of the main local roads that provides access to I-676. Within the project area, Race Street provides two important connections to eastbound I-676 via the Benjamin Franklin Bridge at 5th and 6th Street. Additionally, westbound I-676 is accessible from Race Street via northbound North Franklin Street. The most important link in the project area, in terms of volume of traffic, is at Race and 6th Street, where Race Street splits with two lanes diverting to eastbound I-676, two lanes continuing eastbound on Race Street, and one right-turn-only lane to southbound 6th Street.

I-95

The eastern section of Race Street also provides connections to I-95, one of the major north and south interstates that extends along the entire eastern seaboard. From Race Street, I-95 can be accessed via either northbound 9th Street or North Franklin Street. Additionally, Race Street immediately past 2nd Street provides an onramp to northbound I-95, and southbound I-95 can be accessed from Race Street via Christopher Columbus Boulevard.

Transit

The Race Street project area has several important transit connections. Except for a small section, there is not a transit route directly on Race Street. However, there are several important north and south transit routes that cross Race Street that have transit stops along the corridor.

SEPTA

Bus

Race Street between 5th and 9th Street is crossed by and has nearby stops for several important SEPTA bus routes: the 47, 47M, and 61. These bus lines provide important connections to north and south Philadelphia. There are no bus routes running directly on Race Street except for the 47M, which turns onto Race Street briefly between North Franklin and 9th Street before resuming its northbound route.

Broad-Ridge Spur

The SEPTA Broad-Ridge Spur Chinatown station is located on the northwest corner of 8th and Race Street. It is currently surrounded by a surface parking lot, which visually isolates it from the rest of the area.

NJ TRANSIT

There is an important NJ Transit bus stop at the northwest corner of Race and 6th Street. This is one of the main stops for New Jersey buses that travel to Philadelphia, and it is used by several NJ Transit bus lines—the 400, 401, 402, 404, 406, 408, 409, 410, 412, 414, 417, and 551. Several other tourism-focused bus lines use this stop as well, resulting in overcrowding at the stop on occasion. The location of the bus stop means the majority of passengers boarding and alighting are forced to cross Race Street, which is inhospitable to pedestrians due to the wide width of the street at 6th and Race Street.

PORT AUTHORITY TRANSIT CORPORATION (PATCO)

The area is connected to New Jersey via the nearby PATCO rapid transit station at 8th and Market Street. This is one of the main stations for the PATCO system as it is currently the first station when entering Pennsylvania and the last one before entering New Jersey. More directly abutting the project area is the currently closed Franklin Square PATCO station. Recently due to the improvements at Franklin Square, there has been study regarding reopening the station.

PRIVATE BUS COMPANIES

Independence Mall attracts a significant number of tourists, and there are many tourism-related bus companies operating in the area. The tourism bus traffic occasionally causes issues with traffic flow. When the Constitution Center bus parking lot is full, buses wishing to enter idle on Race Street between 6th and 5th Street, which partially blocks one traffic lane. Additionally, there is traffic conflict at the northwest corner bus stop at 6th and Race Street with NJ Transit, tourist, and long-haul buses competing for space.

Pedestrian and Bicycle

PEDESTRIAN CONDITIONS

The current configuration of Race Street between 6th and 8th Street creates a barrier that impedes pedestrian travel. The excessive width of Race Street at this section, which is approximately 30’ wider than the other sections of the road, inhibits what would be a natural linkage between Chinatown, Independence Mall, and Franklin Square. Pedestrians are abruptly confronted with an unwelcoming crossing of four and five lanes of traffic.

FIGURE 13: Typical Daily Pedestrian Volumes

DVRPC, 2015

Despite the hostile pedestrian environment, there are still a significant amount of pedestrians crossing Race Street to use Franklin Square, one of the major park and recreation sites in the area. During a typical day, over 1,000 people at both the intersections of 6th and 7th Street are crossing Race Street going to and from Franklin Square, shown in Figure 13.

The peak pedestrian volumes are during the midday, and a substantial number of these pedestrians are small children, primarily coming from the daycare centers in the area. Franklin Square is also a major destination for tourists, and it is a natural endpoint for tourists viewing the sites along Independence Mall. Additionally, there are several other important pedestrian generators and destinations. Along with the sites on Independence Mall, there are several other important tourist attractions, including the African American Museum, Philadelphia History Museum, and National Museum of American Jewish History.

FIGURE 14: Non-ADA-compliant curb ramps and stormwater drainage issues

DVRPC, 2015

The high volumes of pedestrian traffic in this this area must also deal with issues related to the condition of sidewalks and curb ramps. There is inadequate stormwater management, with water frequently ponding at pedestrian ramp locations as shown in Figure 14. This is inconvenient as well as a safety hazard for pedestrians.

Additionally, none of the curb ramps in the area are Americans with Disabilities Act (ADA) compliant, with all ramps lacking detectable warning surfaces. A top priority should be to upgrade all curb ramps in the area to be compliant with the ADA. The wide width of Race Street and poor condition of the sidewalks and curb ramps create an overall inhospitable pedestrian experience.

BICYCLE NETWORK

Race Street is currently designated as a bicycle connector street defined by the Mayor's Office of Transportation and Utilities as "an important connecting route for cyclists and/or is considered bicycle friendly." The east section of Race Street connects to important bicycle routes at Race and 6th Street and at Race Street and Christopher Columbus Boulevard as shown in Figure 15.

FIGURE 15: Bicycle Network in Race Street Project Area

DVRPC, 2015

It also provides access to the shared pedestrian and bicycle path on the Benjamin Franklin Bridge. The northbound bicycle lane on 5th Street is not directly accessible from Race Street as 5th Street diverts to an underground tunnel at the approach to Race Street. In addition, the route functions as a critical eastbound link between Chinatown, Independence Mall, Old City, and the Delaware Riverfront area with the nearest alternative eastbound bicycle-friendly routes either five blocks north at Spring Garden Street or six blocks south at Pine Street.

Although the street does not have a bicycle lane, the majority of Race Street is amenable as a shared motor vehicle and bicycle route with a narrow two-lane configuration with slower vehicle speeds that allow comfortable mixing of traffic. Between 6th and 8th Street, the road configuration becomes difficult to traverse by bicycle, dramatically expanding for the two blocks from two travel lanes to a 70' four and five travel lane configuration. The wide width of the street allows vehicles to travel at excessive speeds increasing the speed differential between people biking and driving. This condition significantly increases the probability a crash between a vehicle and bicycle will result in a fatality or severe injury for the person biking.

Despite the adverse bicycling conditions, over 200 people a day ride through this segment due to its importance as an eastbound connection, as shown in Figure 16. Race Street reverts back to a bicycle-friendly configuration of two lanes between 6th Street and the riverfront. Bicycle parking, although limited, is provided at two locations in Franklin Square.

Additionally, the Philadelphia bike share system, Indego, has several bicycle rental stations near this section of the Race Street corridor. There is a station directly on the route at Race and 6th Street, with additional nearby stations in Chinatown, Independence Mall, and Old City. Overall, the wide width of the Race Street and lack of bicycle facilities is an impediment to bicycle connectivity.

FIGURE 16: Typical Daily Bicycle Volumes

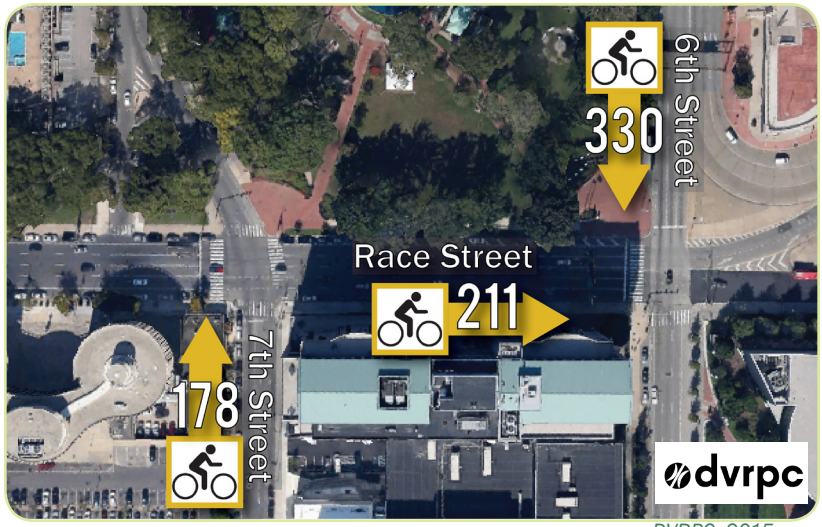

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FIGURE 17: Bike Share Station at 6th and Race Street

DVRPC, 2015

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CHAPTER 5

SAFETY

Crash analysis was conducted for six intersections along the Race Street corridor at 5th, 6th, 7th, North Franklin, 8th, and 9th Street. The crash history for the period 2008–2013 was reviewed. The total number, severity, and types of crashes are indicated in Figure 18.

SAFETY STUDY AREA

The safety study identified two distinct areas: a narrow section where Race Street is two travel lanes at 5th and 9th Street and a wide section where Race Street expands to four and five travel lanes at 6th, 7th, and 8th Street. The crash rate was significantly higher along the wide section compared to the narrow section.

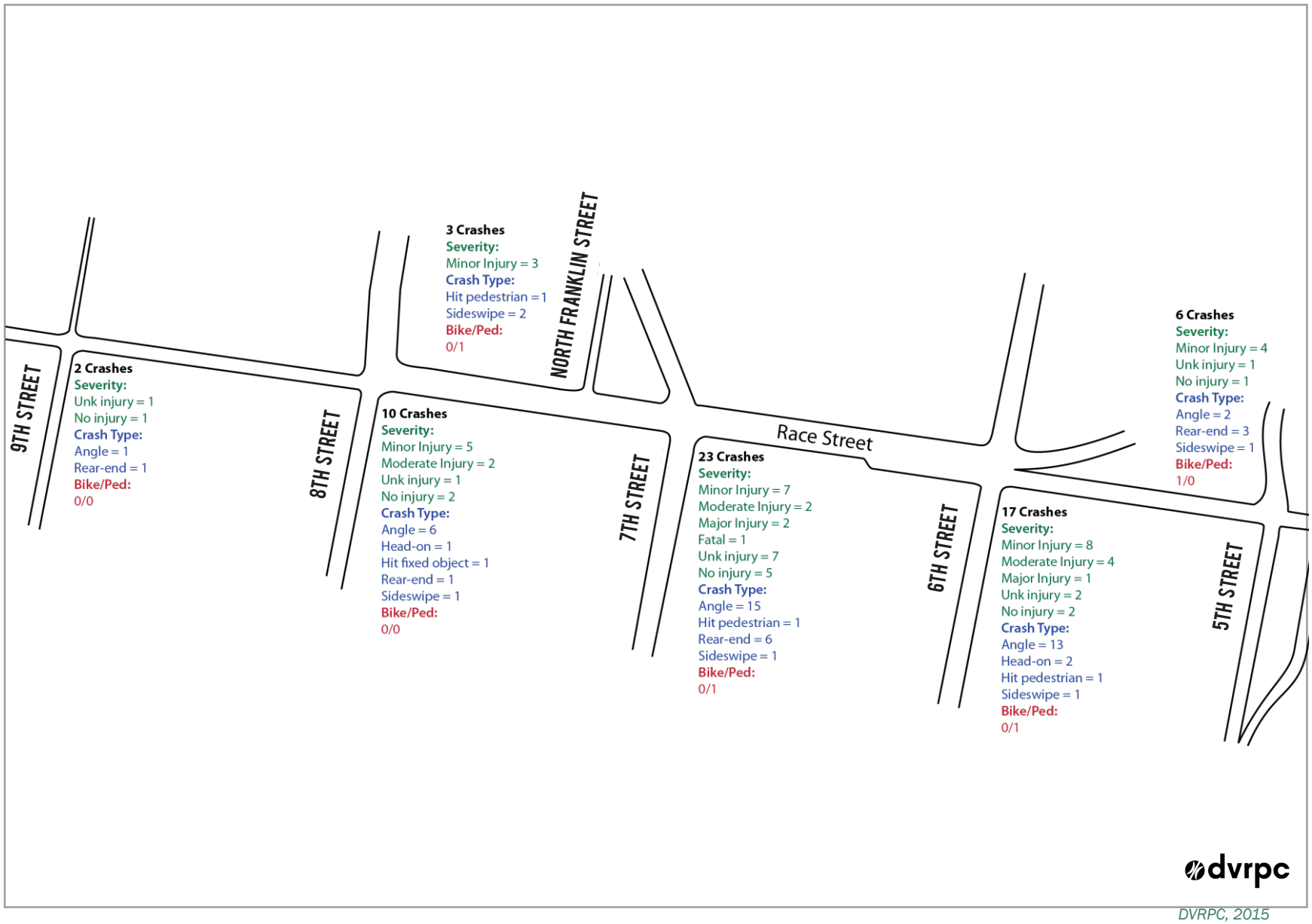
Over the five-year period, the intersections along the wide part of Race Street, 6th, 7th, and 8th Street had an average of 16 crashes, and the intersections along the narrow section of Race Street, 5th, and 9th Street had an average of four crashes. The highest amount of crashes occurred at 6th and Race Street, which had 23 crashes during the five-year period.

The four times higher average crash rate for the intersections along the wide section of Race Street indicates that the main distinguishing feature between the sections—the width of the street—is contributing to a higher crash rate.

TYPE OF CRASHES

The intersections in the high-crash section at Race Street and 6th, 7th, and 8th Street all have a single dominant crash type with 60 percent or more of the crashes at these intersections classified as right angle, where a vehicle's front impacts the side of another vehicle. Right-angle crashes relative to other crash types—for example, rear end or sideswipe crashes—have a higher probability of severe injury due to the lack of protection along the side of most vehicles. A main contributor to this type of crash is long crossing distances, which make it difficult for vehicles to successfully traverse the intersection during the signal clearance phase before the opposing vehicles are allowed to proceed. As cited in the FHWA's Road Diet Informational Guide, reducing the amount of travel lanes and road width is an effective way to reduce the prevalence of right-angled crashes.

FIGURE 18: Crash History 2008–2013



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CHAPTER 6

PROPOSED CORRIDOR DESIGN

The proposed new corridor design for Race Street will create an aesthetically vibrant gateway location to Independence Mall and Franklin Square that builds on the strengths of the area and addresses the deficiencies at the site through a Complete Street design approach. The design is based on guidelines from the Philadelphia Complete Streets Design Handbook, City of Philadelphia Green Streets Design Manual, and the FHWA-endorsed National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide.

Design Concept

The main features of the proposal are:

- a new three-lane road diet configuration to traffic calm the street;
- curb extensions and pedestrian islands to reduce the street crossing distance;
- plantings and green stormwater infrastructure to aid stormwater management and improve the aesthetics of the area; and
- a protected bicycle path to fill in the gap in the bicycle network on Race Street between 6th and 8th Street.

Figures 20 to 29 show the conceptual design in aerial, cross-section and 3D rendering views. Additional information on layout and dimensions is available in Appendix A. Additionally, ADA-compliant curb ramps would be installed at all intersections in the project area. The existing authorized vehicle parking would be maintained and could be converted to public parking in the future pending the relocation of the Philadelphia Police Headquarters, which is currently the primarily user of this parking.

TRAVEL LANE CONFIGURATION

The design changes the segment of Race Street between 6th and 8th Street to a three travel lane configuration with a protected bicycle lane on the south side. The width of the travel lanes was reduced from 12’ to 11’ based on guidelines from the Philadelphia Complete Streets Design Handbook. This lane configuration traffic calms this atypically wide segment of Race Street and better aligns this segment with the rest of the corridor, which is two travel lanes east of 6th Street and west of 8th Street.

RACE STREET NORTH SIDE

For Race Street between 7th and 8th Street on the north side, the existing authorized vehicle parking would be maintained. To shorten pedestrian crossing distances, curb extensions would be added along Race Street at 8th Street, North Franklin Street, and 7th Street. On Race Street between 6th and 7th Street on the north side, the area next to the curb is channelized, and it is used by the Philadelphia Police Department for parking. This arrangement would be formalized in the design by creating a parking area by adding curb extensions at the corners of 6th and 7th Street. Also, currently on this section of Race Street, there is limited access to the curb due to an approximately two-foot mini-wall abutting the street. A walkway would be created next to the wall to facilitate access for those parking along this block.

RACE STREET SOUTH SIDE—PROTECTED BICYCLE LANE

The protected bicycle lane was chosen as a component of the design as the one-way road grid allows a bicycle lane to be installed without creating dangerous conflicts between turning motor vehicles and bicyclists.

The bicycle lane would be located against the curb and separated from the vehicle travel lanes with concrete pedestrian islands. The concrete pedestrian islands would be planted with low height vegetation to maintain visibility between people walking, biking, and driving. These pedestrian islands would also function to reduce the street's crossing distance.

Similar designs in New York City shown in Figure 19 have shown significant benefits to those walking and biking with injury rates for pedestrians dropping between 12 and 52 percent[1] and injuries to bicyclists dropping 50 percent or more[2].

1 NYCDOT Making Streets Safer, 2013
2 NYCDOT Measuring the Street, 2012

Additionally, this design has the added benefit of reducing pedestrian crossing distances without having to physically widen the sidewalk along the entire south curb of Race Street.

FIGURE 19: Example protected bicycle lane with pedestrian islands

Source: NYC Department of Transportation

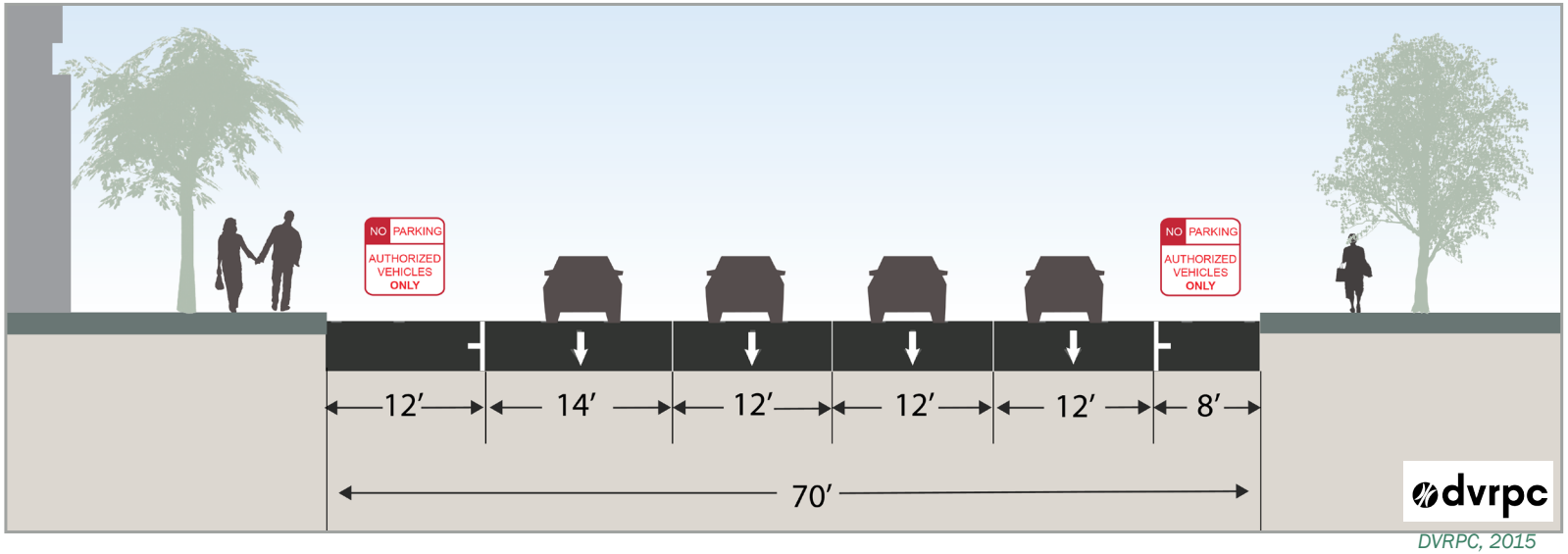
FIGURE 20: Existing Conditions–Race Street between 7th and 8th Street

City of Philadelphia Aerial 2012, DVRPC Overlay, 2015

FIGURE 21: Proposed Design–Race Street between 7th and 8th Street

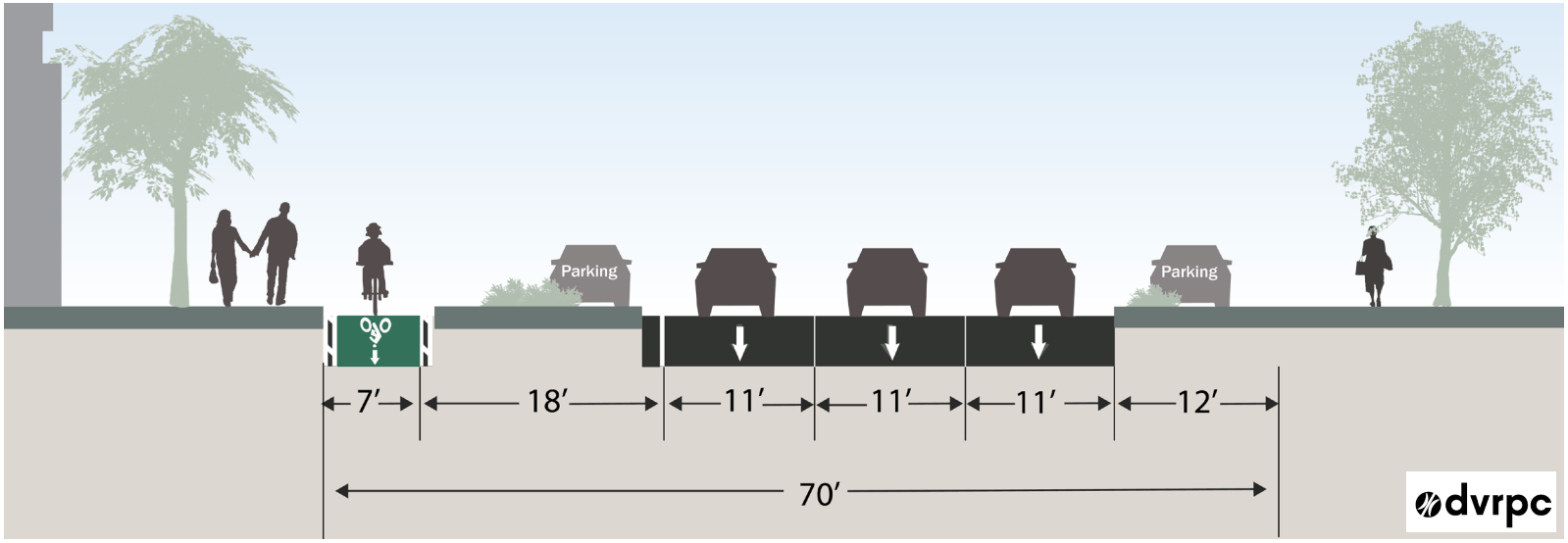
City of Philadelphia Aerial 2012, DVRPC Overlay, 2015

FIGURE 22: Existing Conditions Cross-Section–Race at 7th Street looking west



DVRPC, 2015

FIGURE 23: Proposed Design Cross-Section–Race at 7th Street looking west



DVRPC, 2015

FIGURE 24: Proposed Design–Race at 7th Street looking west with new conceptual building development

DVRPC, 2015

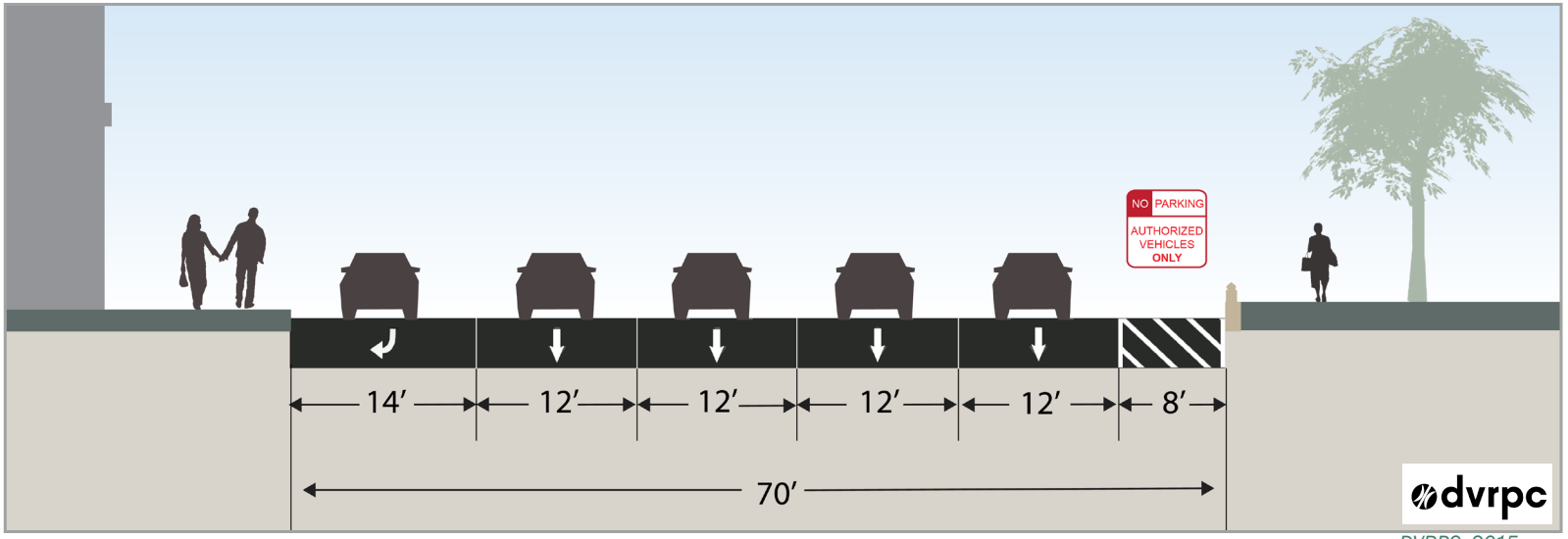
FIGURE 25: Existing Conditions–Race Street between 6th and 7th Street

City of Philadelphia Aerial 2012, DVRPC Overlay, 2015

FIGURE 26: Proposed Design–Race Street between 6th and 7th Street

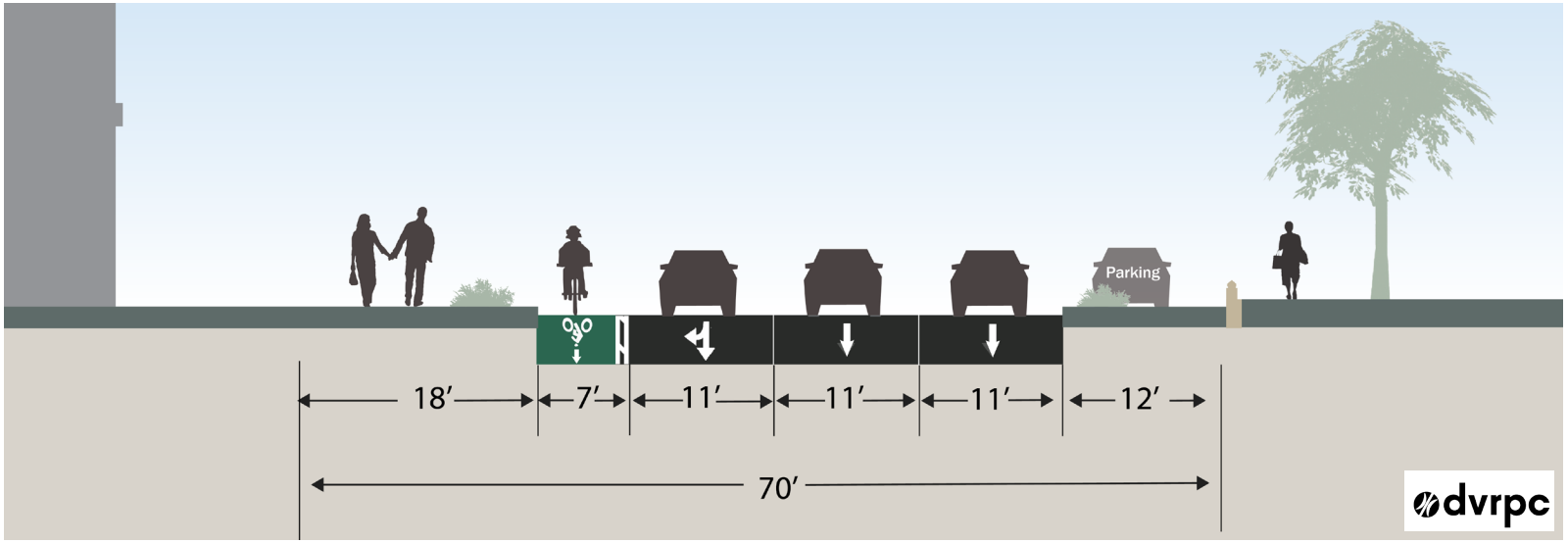
City of Philadelphia Aerial 2012, DVRPC Overlay, 2015

FIGURE 27: Existing Conditions Cross-Section–Race at 6th Street looking west



DVRPC, 2015

FIGURE 28: Proposed Design Cross-Section–Race at 6th Street looking west



DVRPC, 2015

FIGURE 29: Proposed Design–Race at 6th Street looking west with new conceptual building development

DVRPC, 2015

FIGURE 30: Existing Conditions and Proposed Protected Bicycle Lane–Race Street at 7th Street looking east

DVRPC, 2015

Bicycle Lane between 7th and 8th Street

The existing authorized vehicle parking would be maintained on the south side of Race Street between 7th and 8th Street and would be separated from the bicycle lane with a 3' painted buffer. The delineation would be further reinforced with flexible bollards. A painted buffer is preferable to concrete as it would not impede stormwater flow to drainage inlets and green stormwater infrastructure, and it provides easier curb access for people who have parked. Additionally, if 7th Street is realigned to reconnect the southwest corner of the park, the painted buffer could be easily adjusted to the new configuration.

Bicycle Lane between 6th and 7th Street

Between 6th and 7th Street, the bicycle lane would continue and would be protected with a planted concrete median. Alternatively, the median could be shortened and parking allowed similar to the design between 7th and 8th Street. The midblock access to American College of Physicians (ACP) building's truck loading entrance would be maintained, and special markings would be used to highlight the conflict area.

INTERSECTION TREATMENTS

Race and 7th Street

At this intersection, to facilitate safe left turns by bicyclists, a two-stage left-turn bicycle box would be provided. Figure 31 shows an example of this treatment. This is a common treatment that allows bicyclists to safely make left turns on wider roads without having to weave through traffic to reach the far left side of the roadway. One example of this treatment in Philadelphia is at the intersection of Vine and 20th Street. Additionally, to facilitate vehicles traveling northbound on 7th Street making right turns onto Race Street, the pedestrian island on the east side would be slightly set back to facilitate the vehicle turning movement.

FIGURE 31: Example Two-Stage Turn Queue Box

Source: NACTO Urban Bikeway Design Guide, 2015

Race and 6th Street

The intersection of Race Street and 6th Street where the traffic diverges onto I-676 or continues eastbound on Race Street is the critical transition zone in the project area. Two of the three travel lanes would be aligned to the higher volume traffic route leading to I-676 and the Benjamin Franklin Bridge. The third travel lane would handle the lower volume of traffic proceeding eastbound on Race Street or southbound on 6th Street.

To create a safe transition for bicyclists, the bicycle lane would shift north to abut the vehicle travel lane, a standard treatment in the NACTO Urban Bikeway Design guide. This intersection treatment improves visibility between right-turning vehicles and bicyclists and allows a safe transition from the protected bicycle path to the shared road space. The City of Philadelphia commonly uses this treatment on streets with bicycle lanes and right-turn conflicts. One example is the westbound bicycle lane at Spring and 11th Street shown in Figure 32.

FIGURE 32: Example bicycle lane and motor vehicle right-turn merge area–Spring and 11th Street, Philadelphia

Source: Google Street View, 2015

The new lane configuration would require modifications to the overhead signs on Race Street's eastbound approach to 6th Street. There are three signs on the overhead signage structure. The northernmost sign directs two lanes of vehicle traffic to East 676, East 30 and the Benjamin Franklin Bridge. This sign would not need to be modified as the two northern Race Street lanes in the proposal would remain in approximately the same alignment. The middle sign directs two lanes of vehicle traffic to 95 North and Penns Landing. This sign would need to be updated as the number of lanes continuing eastbound on Race Street would be reduced from two to one. The southernmost sign that indicates Independence Hall is located at the next right may need to be shifted north to accommodate the new three lane reconfiguration. All adjustments should be based on the Manual on Uniform Traffic Control Devices (MUTCD).

FIGURE 33: Example of Two-Stage Implementation with Temporary and then Capital Materials– NYC Department of Transportation Allen and Pike Street Improvement Project

Source: NYC Department of Transportation

TWO-STAGE IMPLEMENTATION PROCESS

The design could be implemented in a two-stage process. The design would be first laid out in temporary materials and then made permanent with capital project construction. This is an approach used successfully by transportation agencies such as the NYC Department of Transportation. One example is the Allen and Pike Street project done by the NYC Department of Transportation shown in Figure 33. This strategy has many benefits as it allows for quicker implementation and reduces risk, as it is easy to adjust the design if there are unforeseen negative traffic impacts. For the first phase using temporary material, the street layout including curb extensions would be reconfigured in paint, and would be delineated from the street with flexible bollards or movable planters. An example of this treatment is shown in Figure 34, and the full proposal in temporary materials is shown in Appendix B.

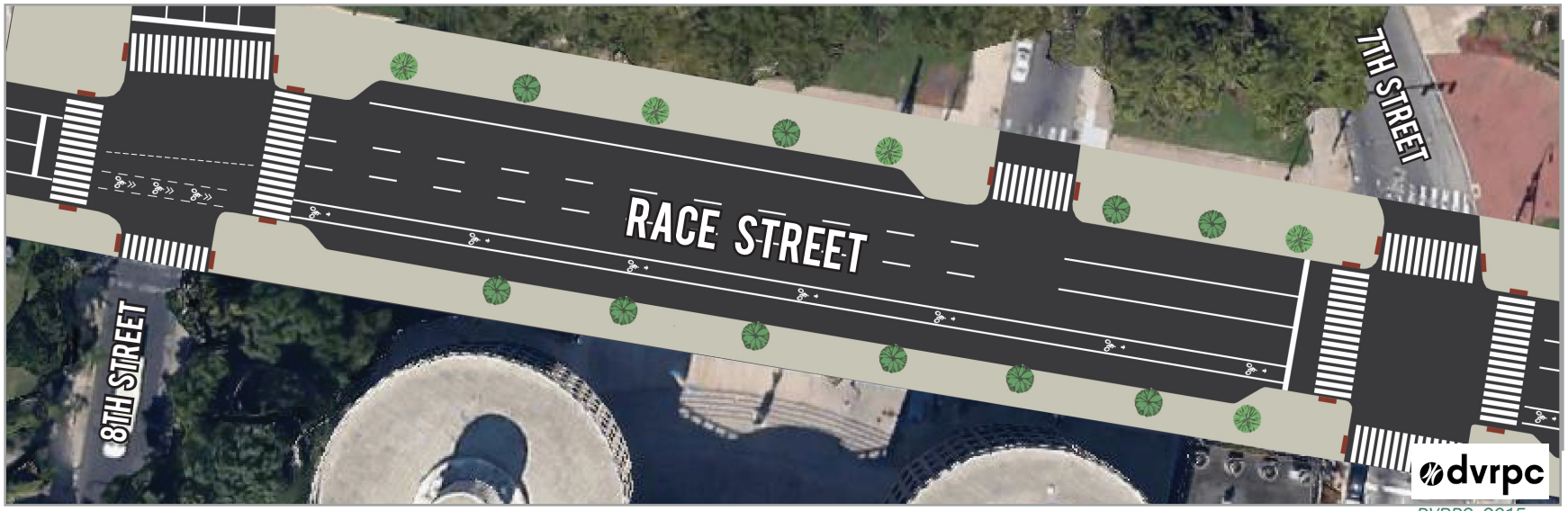
FIGURE 34: Example of Temporary Materials used to create a Curbside Protected Bicycle Lane with Pedestrian Areas

DVRPC, 2015

Alternative Design

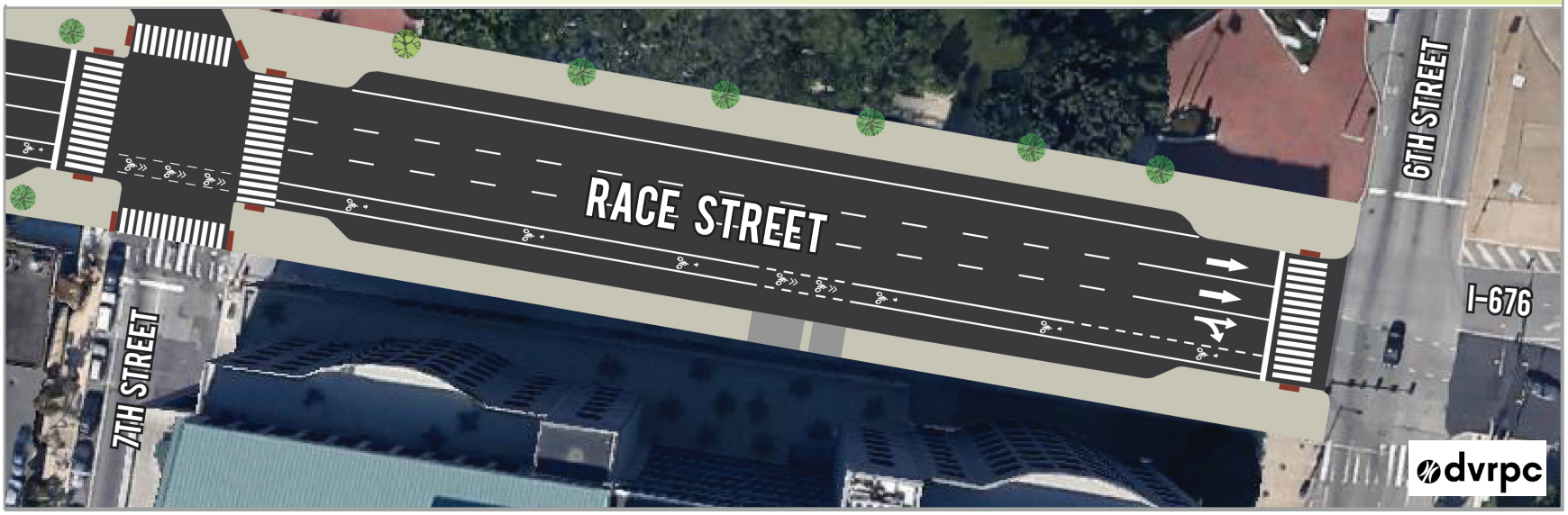
A simplified alternative design was developed that maintains the basic components of the preferred design shown in Figure 35 and 36. Between 6th and 8th, the roadway would be maintained as three lanes, curb extensions are added at the corners, and a non-protected bicycle lane is added on the south side. This would have some of the benefits of the protected bicycle lane design, but, unlike the preferred design, there would be conflict between bicyclists and those accessing the parking spaces, fewer opportunities for greening the area, and longer crossing distances for pedestrians.

FIGURE 35: Proposed Alternative Design–Race Street between 7th and 8th Street



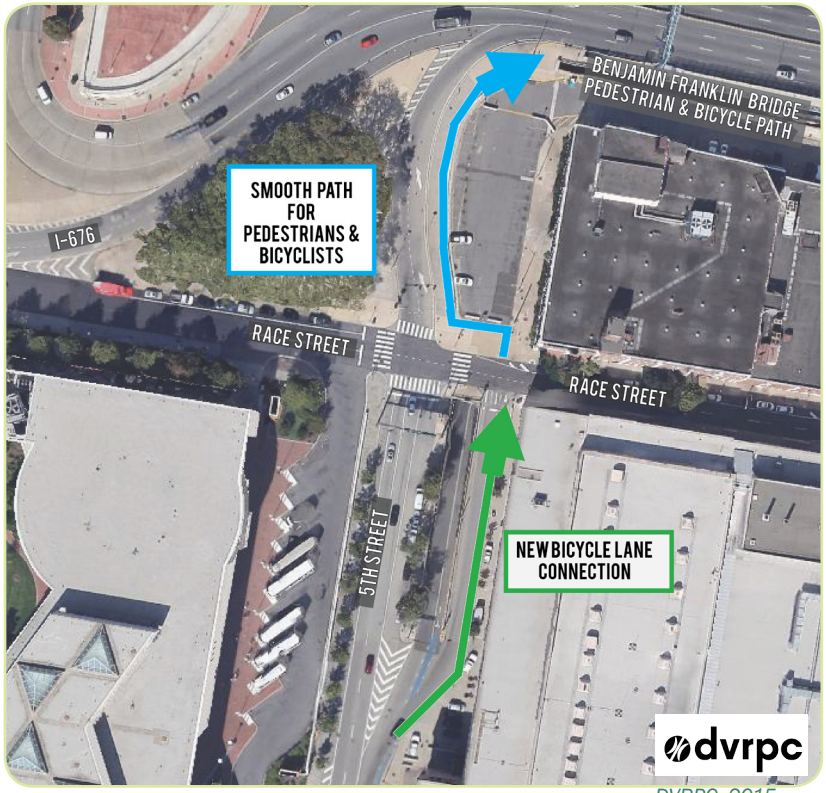
DVRPC, 2015

FIGURE 36: Proposed Alternative Design–Race Street between 6th and 7th Street



DVRPC, 2015

FIGURE 37: Additional Proposed Improvements – Race at 5th Street



DVRPC, 2015

Additional Improvements

Shared bicycle markings, sharrows, should be added to Race Street east of 6th Street to clarify the road's role as a designated bicycle connector route and indicate that it provides connections to important north and south bicycle lanes.

A bicycle-friendly route shown in Figure 37 should be created to facilitate access to the Benjamin Franklin Bridge pedestrian and bicycle path. Currently, the route has a cobblestone surface, making it difficult to either walk or ride a bicycle to the bridge connection.

On the northbound 5th Street approach to Race Street, a bicycle lane should be added at the split before 5th Street enters the tunnel, as shown in Figure 37. This would create a useful connection for bicyclists to eastbound Race Street and would also connect to the proposed bicycle path to the Benjamin Franklin Bridge.

Additionally, the traffic signal timing modification leading pedestrian interval (LPI) should be considered for the north-south crosswalks connecting to Franklin Square. An LPI is a signal modification where vehicle traffic is held, and pedestrians are given a head start to cross the street, typically three to five seconds. This significantly improves visibility between those driving and walking, as pedestrians are positioned in the crosswalk rather than on the corner when vehicles are allowed to proceed. The improved visibility has many safety benefits, especially in regards to those driving correctly yielding to pedestrians. This modification would reduce the green time available to vehicles and would require additional network impact analysis.

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CHAPTER 7

GREEN STORMWATER INFRASTRUCTURE

The Race Street project would benefit from incorporating green stormwater infrastructure (GSI) into the new design of Race Street between 5th and 9th Street.

GSI would:

- improve the site's aesthetics;
- control flooding and ponding, improving the pedestrian experience; and
- support the Philadelphia Water Department's (PWD) green infrastructure program and reduce stormwater overflow through environmentally friendly design.

The project site is located in Philadelphia's section of the Delaware Watershed, which is 40 square miles and borders 21 miles of the Delaware River waterfront. Within Philadelphia's section of the watershed the majority, 72 percent, of the land area consists of impervious surfaces. The amount of impervious surface creates water quality and stormwater management issues. This section of Philadelphia has a combined sewer system, which means that sewage and stormwater are processed through the same facilities. During heavy rains, sewage treatment facilities cannot handle the additional water flow, and to prevent system overflow, the slurry of rainfall and wastewater is released into nearby waterbodies at combined sewer outfalls. This degrades Philadelphia's waterways and is hazardous to the health of the overall environment.

As part of the citywide goal to address these types of environmental issues, the Race Street location would be an appropriate candidate for the PWD's Green Streets Program, which seeks to manage stormwater from the street right of way with GSI. The Green Streets Program was developed as part of the landmark plan Green City, Clean Waters, which details the PWD's strategy to effectively manage combined sewer overflows with an innovative blend of green and traditional

infrastructure. Building GSI within the right of way of Race Street would allow the PWD to further the goals of the plan and expand its Green Streets Program into the center of Philadelphia.

GREEN STORMWATER INFRASTRUCTURE APPLICATION

GSI intercepts, holds, and filters rainwater before it reaches sewer lines, significantly reducing the water flow that reaches traditional underground sewer infrastructure, improving the functioning of the stormwater management system. The City of Philadelphia Green Streets Design Manual (GSDM) provides design guidance for the incorporation of GSI within the street right of way.

The appropriate type of GSI is dictated by the character and function of the street. The City of Philadelphia classifies the section of Race Street between 5th Street and 9th Street as an urban arterial, a street that carries high traffic volumes while simultaneously serving as an important pedestrian route. The GSDM states that for this street type, stormwater bump-outs, tree trenches, planters, permeable pavement, and drainage wells are appropriate to consider pending a feasibility analysis of the specific location.

Based on existing site characteristics, in coordination with PWD the following GSI treatments were selected as the most appropriate for the corridor: stormwater tree trenches, planters, bump-outs, and permeable pavement.

STORMWATER BUMP-OUT

A stormwater bump-out shown in Figure 38 is a vegetated curb extension that protrudes into the street either mid-block or at an intersection. A bump-out is composed of a layer of stone that is topped with soil and plants. An inlet or curb-cut directs runoff into the bump-out structure, where it can be stored, infiltrated, and taken up by the plants (evapotranspiration). Excess runoff is permitted to leave the system and flow to an existing inlet.

STORMWATER PLANTER

A stormwater planter shown in Figure 39 is a specialized planter installed into the sidewalk area that is designed to manage street and sidewalk runoff. It is normally rectangular, with four concrete sides providing structure and curbs for the planter. The planter is lined with a permeable fabric, filled with gravel or stone, and topped off with soil, plants, and, sometimes, trees. The top of the soil in the planter is lower in elevation than the sidewalk, allowing for runoff to flow into the planter through an inlet at street level. These planters manage stormwater by providing storage, infiltration, and evapotranspiration of runoff. Excess runoff is directed into an overflow pipe connected to the existing combined sewer pipe.

STORMWATER TREE TRENCH

A stormwater tree trench shown in Figure 40 is a subsurface trench that connects to a series of street trees. During rain events water flows into inlets connected to the trench and is stored between stones or other appropriate storage material, watering the trees connected to the system.

PERMEABLE PAVEMENT

Permeable pavement shown in Figure 41 is a pavement surface that, unlike impervious surfaces traditionally used, allows water to pass through, allowing absorption and storage of water runoff. Below the permeable pavement there is a storage media, for example stone, that provides for structural support and water storage capacity. There are several different material options available including permeable asphalt, concrete, and pavers. Traffic volumes and loading conditions need to be considered when implementing permeable pavement.

FIGURE 38: Green Stormwater Bump-out

Mid-block Stormwater Bump-out

Corner Stormwater Bump-out

Source: Philadelphia Green Streets Design Manual

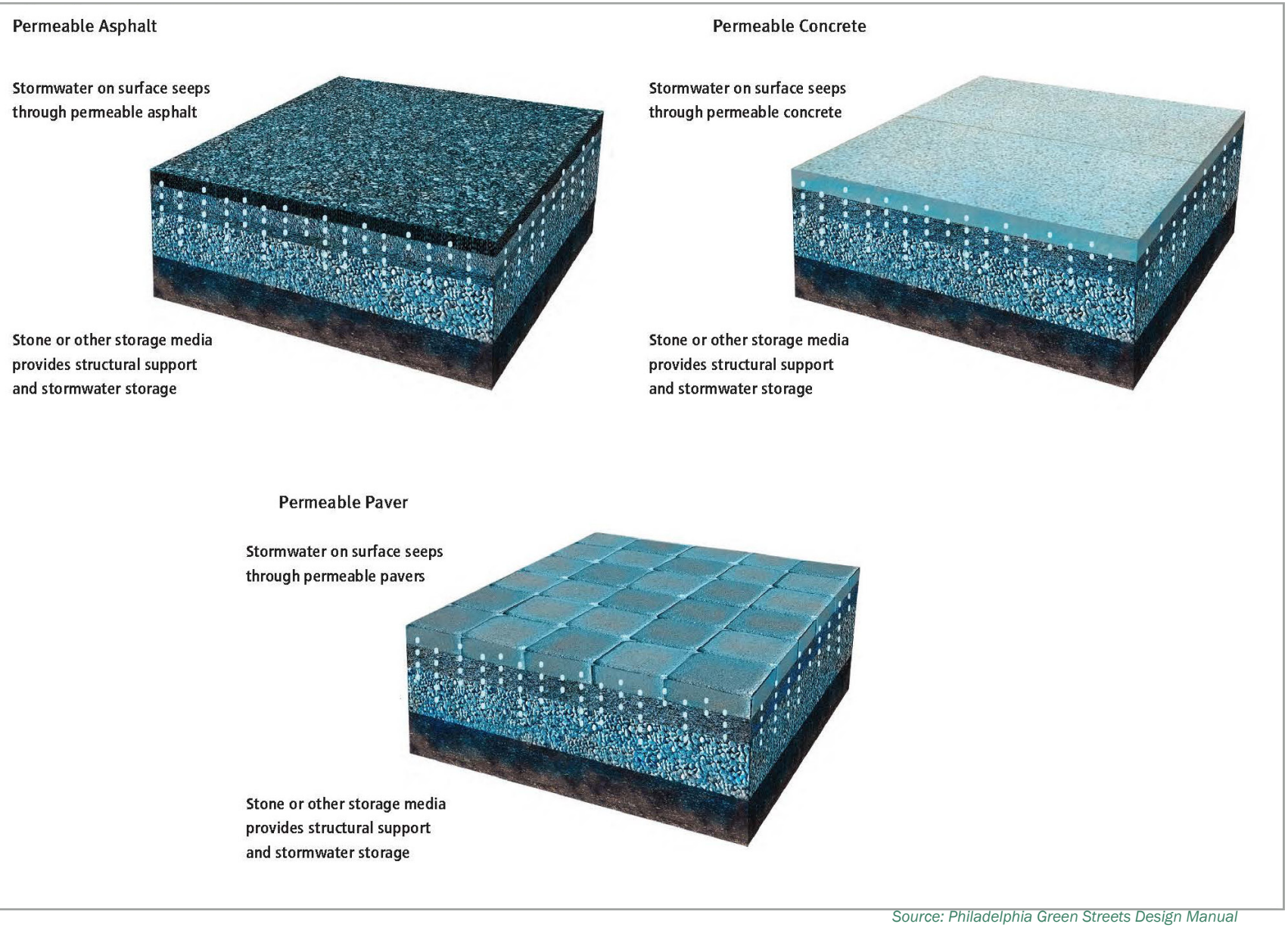
FIGURE 39: Green Stormwater Planters

Source: Philadelphia Green Streets Design Manual

FIGURE 40: Green Stormwater Tree Trench

Source: Philadelphia Green Streets Design Manual

FIGURE 41: Permeable Pavement



Source: Philadelphia Green Streets Design Manual

FIGURE 42: Existing Conditions at Race and 6th Street Water Ponding at Curb Ramps

DVRPC, 2015

DESIGN RECOMMENDATIONS

In collaboration with the PWD the water drainage areas in the project site with the highest potential for effective GSI were identified, shown in Figure 44. Based on a preliminary site analysis conducted by the PWD, the total potential drainage area for GSI management is 108,260 square feet. These locations were chosen to allow GSI to capture, store, and filter as much runoff as possible before it reaches the combined sewer system, and help reduce ponding at pedestrian ramps, a large impediment to pedestrian mobility.

GSI would be located primarily on the north side of the Race Street as underground utilities and other factors preclude locating GSI on the south side at most locations. Stormwater tree trenches or planters would be appropriate for the GSI locations one, two, three and five, identified in Figure 44. For GSI locations one and three, stormwater tree trenches would be the preferred choice as this treatment has minimal impact on curb access for street parking. A subsurface storage system with permeable pavement would be appropriate for GSI location four; this location is frequently accessed by buses so the design would need to meet appropriate structural load requirements. Additionally, at GSI locations one, three, and four there is the potential for including stormwater bump-outs. To determine the final GSI placement further analysis is needed, as possible conflicts with the nearby underground facilities, which include the Broad-Ridge Spur Chinatown station and currently dormant Franklin Square PATCO station, need to be investigated in coordination with SEPTA and PATCO.

FIGURE 43: Example Stormwater Planters Navy Yard Philadelphia

Source: Philadelphia Water Department

FIGURE 44: High Potential Green Stormwater Infrastructure Locations and Associated Drainage Areas

DVRPC, 2015

IMPLEMENTATION OF GREEN STORMWATER INFRASTRUCTURE

Installation of GSI requires coordination with the PWD and Philadelphia Street Department (PSD) and follows a multi-phase process outlined in detail in the GSDM. The process begins with submittal of the PWD's Green Street Project Proposal Form, which is available on the PWD's website; the information submitted on the form should detail the location and planned extent of the GSI. The PWD's approval of a green street application should not be interpreted as approval by PSD.

PWD does not coordinate PSD reviews for Green Street projects proposed by outside parties: said parties are responsible for organizing all appropriate design reviews. Any Green Street proposal accepted by the PWD will move from conceptual layout to final design with overview from the PWD at each stage of the process. Full detailed instructions are available in the GSDM and on the PWD's website.

FUNDING SOURCES

The PWD in many cases can coordinate and help partially fund GSI projects with other agencies. The PWD also has grant programs set up to fund GSI on private development and in unique cases, within the street right of way.

The PWD's Stormwater Management Incentives Program (SMIP) provides GSI grants to nonresidential water department customers looking to improve stormwater management on their property. SMIP provides up to $100,000 per impervious acre to manage the first one-inch of runoff with GSI. Individual property owners managing stormwater on their parcel would be eligible for SMIP funding to build stormwater infrastructure if water captured from the street right of way is stored on their property, though they would not be eligible for stormwater credits.

As part of the larger redevelopment of the area, it may be appropriate to pursue funding through the PWD's Greened Acre Retrofit Program, which provides funding to third parties for larger-scale projects which capture cumulatively at-least 10 acres, encompassing multiple properties. Both of these grant programs would require coordination with property owners, companies, and other private stakeholders in the area. There are additional funding options at the local, state, and federal level. The full list of grant programs is summarized in Appendix C Table C1.

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CHAPTER 8

IMPROVEMENT ANALYSIS

Traffic Operations

The potential improvements were assessed using VISSIM traffic modeling software. The primary performance metrics are approach and intersection delay and corresponding level of service. All five intersections–Race Street at 9th, 8th, 7th, 6th and 5th Street–in the study area were evaluated. Delay and level of service was calculated for both the AM and PM peak hours and are shown in Table 1. Of the two time periods, the PM period is the higher volume peak.

Two scenarios were evaluated.

- Existing Conditions No Build—existing infrastructure, recent traffic volumes, used to create a baseline;
- Existing Conditions Build—traffic volumes from the existing no-build scenario, Race Street between 6th and 8th Street converted to three lanes.

ROAD-DIET SECTION OF RACE STREET

Race and 8th Street

In the AM peak hour, the model showed nominal change in traffic delay in the existing conditions build scenario. The higher-volume PM period showed a minimal increase in eastbound traffic delay, which increased from 21 to 26 seconds. The typical motorists would not have an appreciable difference in driving experience and would have favorable driving conditions with steady speeds, fluid lane maneuverability, and small vehicle queues. The southbound approach had a nominal change in traffic delay.

Race and 7th Street

In the AM peak hour, the model showed nominal change in overall traffic delay in the existing conditions build scenario. The higher-volume PM period showed an increase in eastbound traffic delay from 16 to 26 seconds; this is approximately the same level of delay occurring at Race and 8th Street, and drivers would experience similar favorable conditions. The northbound approach, while having increased delay, 28 seconds, would still operate at a similar favorable performance level.

Race and 6th Street

In the AM peak hour, the model had almost no change in overall traffic delay in the existing conditions build scenario. The PM peak hour had almost no change in delay for the existing conditions build scenario with only the eastbound approach increasing slightly in delay from 25 to 30 seconds, which indicates favorable driving conditions with steady speeds. This is logical because, although capacity is reduced by two travel lanes for the eastbound approach, the majority of traffic—70 percent—in the PM peak is headed toward the I-676 entrance. No capacity is being taken away from the I-676 route as in both the no-build and build scenarios the vehicle traffic headed to I-676 is handled by two travel lanes. The remaining low volume of traffic headed either east on Race Street or south on 6th Street is able to be easily handled by the remaining travel lane.

ANALYSIS SUMMARY

All build scenarios show a negligible impact on traffic conditions in terms of delay and level of service. The level of service stays within acceptable bounds with the most impacted approaches only changing from B to C. For a typical driver, this means favorable driving conditions with steady speeds, small queues that easily clear each signal cycle, and fluid lane maneuverability. Overall, the proposals will improve safety for all road users, strengthen pedestrian connections to Franklin Square, and improve the link between Chinatown and Old City/riverfront with only a negligible impact on traffic performance.

EXPLANATION OF PERFORMANCE MEASURES

Delay – Delay is the average amount of time, in seconds, that it takes a vehicle passing through an intersection beyond what would be experienced in a free-flow condition. The value given is the average for all vehicles completing the movement.

Level of Services (LOS) – LOS are letter grades assigned to various degrees of delay. An LOS of "A" corresponds with free-, or near free-flowing conditions, while an "F" score corresponds with a breakdown in traffic flow.

The goal in traffic operations is not to achieve an LOS of A, but to create conditions that maintain stable traffic flow which typically is achieved within the LOS range of A to C. If existing conditions are LOS D or lower the aim should be to maintain conditions within that letter grade.

TABLE 01: Traffic Impact Evaluation–Existing Conditions No Build and Existing Conditions Build

		AM Peak Hour 7:45 to 8:45				PM Peak Hour 4:45 to 5:45			
		No Build		Build		No Build		Build	
Intersection	Approach	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
9th/Race	All	B	12.67	B	12.54	D	48.41	D	51.89
	NB	B	12.87	B	12.7	F	81.67	F	84.76
	EB	B	12.31	B	12.2	C	22.76	C	28.44
8th/Race	All	B	13.88	B	13.97	B	17.46	C	20.45
	SB	B	13.62	B	13.72	B	13.07	B	13.76
	EB	B	14.56	B	14.64	C	20.93	C	25.96
7th/Race	All	A	9.74	A	9.91	B	16.92	C	26.85
	NB	B	12.55	B	12.66	B	18.48	C	28.12
	EB	A	7.1	A	7.31	B	15.69	C	25.55
6th/Race	All	B	13.01	B	13.41	C	20.01	C	22.51
	SB	B	14.14	B	14.3	A	9.84	A	9.71
	EB	B	10.19	B	11.18	C	25.4	C	29.79
5th/Race	All	B	15.45	B	15.08	C	22.26	C	21.24
	NB	B	14.44	B	14.49	C	24.72	C	24.65
	EB	B	16.77	B	15.75	B	16.98	B	13.98

Source: VISSIM Traffic Simulation Average of 12 Simulation Runs for Each Period -- DVRPC, 2015

Street Network

MAJOR CROSS STREETS

The Renewing Race Street proposal would not have any adverse impact on the major cross streets—5th, 6th, 7th, North Franklin, 8th and 9th Street—as the proposal would not alter traffic signal progression or timing and would not make significant geometric changes affecting access from and to these streets.

While the Renewing Race Street proposal would not significantly impact the major cross streets, the longer-term comprehensive plan for the area, Philadelphia 2035 Central District Plan, proposes realigning 7th Street and reconnecting the southwest corner of Franklin Square to the park after the Philadelphia Police headquarters moves.

Villanova engineering students, as part of the university's Professional Practices in Engineering course, evaluated the 7th Street realignment proposal; preliminary traffic impact analysis showed this design should be feasible with minor traffic impact, but a more thorough analysis should be conducted when and if the Philadelphia Police Headquarters officially moves location.

INTERSTATE AND BENJAMIN FRANKLIN BRIDGE CONNECTIONS

I-676

Access to I-676 would be not be affected by the proposed design as the existing two eastbound travel lanes that lead to I-676 and the Benjamin Franklin Bridge would be maintained.

I-95

The proposed redesign would have negligible impact on I-95 connections as it would not reduce the number of lanes or change the geometry leading to these access points.

Safety

The narrowing of the roadway would mitigate the amount of crashes occurring at 6th, 7th, and 8th Streets by addressing the factor—wide street width—that is contributing to a high number of right-angle crashes. Additional mitigation measures could include increasing the signal timing clearance phase for the north/south cycle to complement the reduction in road width. The relatively few crashes at 5th and 9th Street on the narrow section of Race Street one block east and west of the wide section indicate a road diet will have a significant impact on reducing crashes at 6th, 7th, and 8th Streets.

Over 60 percent of the crashes in the project area are right angle; the proposed road diet for Race Street between 6th and 8th Street would directly mitigate this type of crash by narrowing the street, reducing the ability of vehicles to speed, and making it easier for vehicles to successfully clear the intersection during the clearance phase. This type of narrowing road diet treatment is endorsed by the FHWA to mitigate these type of crashes.

Pedestrian and Bicycle

The project aims to strengthen connections between Chinatown, Independence Mall, and Old City for those walking and biking. Currently, there are several impediments to biking and walking in this area: high vehicle speeds, long crossing distances, unwelcoming streetscapes, and conflicts between those walking, biking, and driving. To address these issues, each component of the project was designed to provide multiple benefits and to address multiple deficiencies in the area.

The three-lane street configuration improves safety by reducing speeding by removing excess capacity and improves access to Franklin Square by reducing the road width.

The protected bicycle lane, besides providing a safe route for those biking, calms the roadway traffic, reduces crossing distances for those walking with pedestrian islands, and provides opportunities for additional green-street elements to improve the visual streetscape along Race Street.

ADA-compliant curb ramps will further enhance accessibility for those with mobility issues. Pedestrians will no longer have to contend with five lanes of traffic to access Franklin Square, and the improved streetscape with new plantings and facilities will create a seamless transition between Chinatown, Old City, and Independence Mall. Those walking will no longer feel like they are in a freeway environment designed only for motor vehicles.

The enhancements on Race Street between 6th and 8th Street will fill in an important gap in the bicycle network. The bicycle network will better connect to important bicycle routes east of Franklin Square on 6th Street, 5th Street, the Benjamin Franklin Bridge, and Christopher Columbus Boulevard. Those biking along Race Street will no longer have to contend with treacherous conditions where they currently are forced to navigate through five lanes of high-speed motor vehicular traffic.

Transit

The Race Street design proposal, by calming the traffic on the street, reducing the crossing distance of the roadway, providing bicycle facilities, and enhancing the streetscape, would significantly improve access to the nearby transit stations for people walking and biking to SEPTA, NJ Transit, and PATCO stations. Additionally, enhancing Race Street by facilitating better access to Franklin Square would create a stronger argument for reopening the Franklin Square PATCO station.

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CHAPTER 9

SUMMARY AND NEXT STEPS

The proposed design for Race Street between 6th and 8th Street would change the road to a three travel lane configuration and add protected bicycle facilities, plantings, green stormwater infrastructure, and pedestrian islands. These improvements would improve access for people walking, biking, and driving and also improve the aesthetics of one of Philadelphia's most visited tourist areas.

It would better link the surrounding neighborhoods and amenities together, which include Chinatown, Old City, Independence Mall, and Franklin Square. The design would have minimal impact on traffic operations while creating a significantly safer traffic environment.

Next steps would include further collaboration with stakeholders to finalize the conceptual design. The study recommends that the design be implemented in a two-stage process, first with temporary materials and then with a capital project build-out. Funding opportunities may be available through a grant from the Pennslyvannia Department of Community and Economic Development (DCED) Multimodal Transportation Fund. Applications are accepted yearly and the funds can be used for projects that improve pedestrian safety through streetscape improvements.

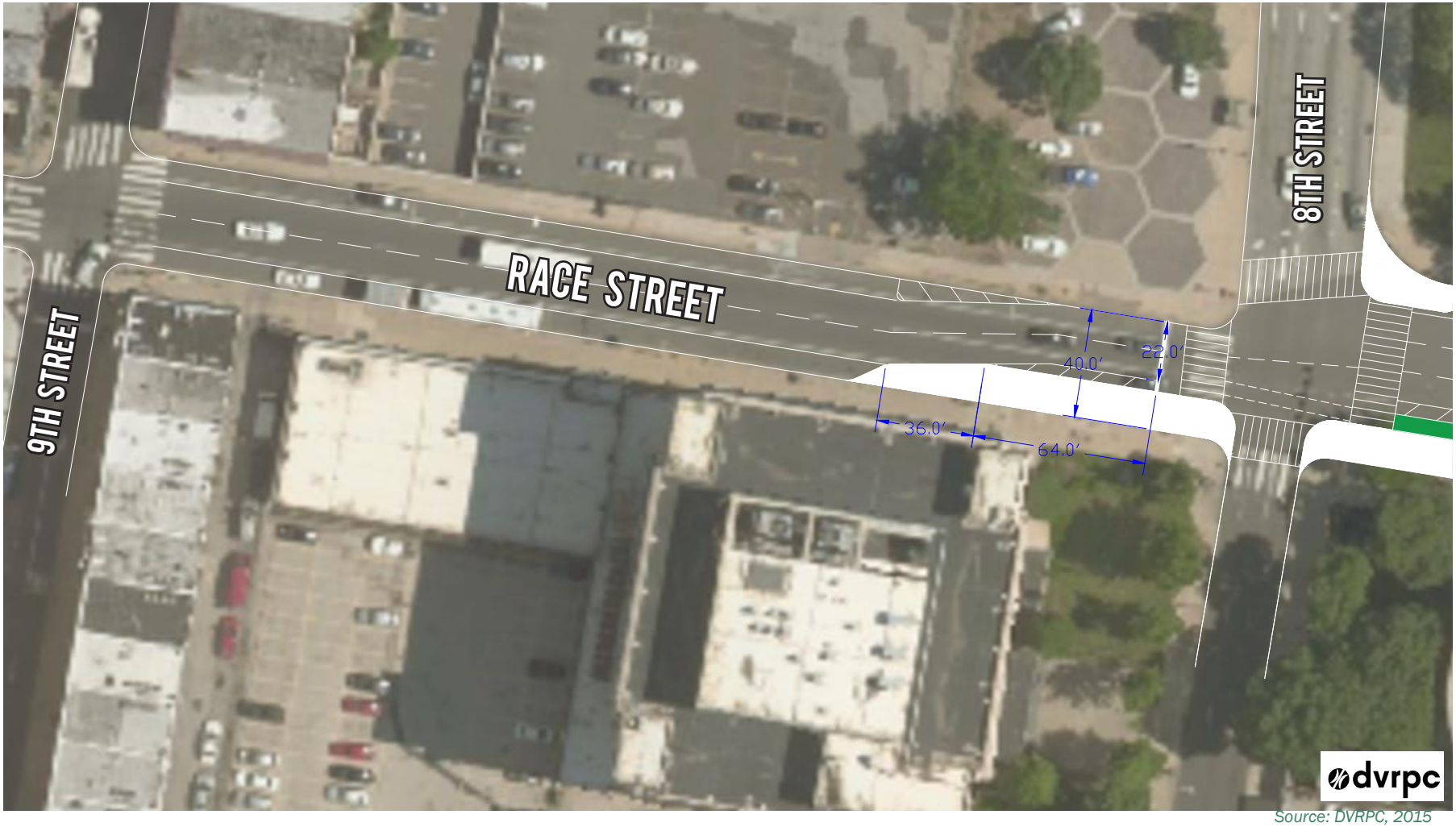
Also, as the project progresses, there needs to be a continued coordination with the Pennsylvania Horticultural Society's program Civic Landscapes for the 21st Century regarding the Monument Plaza study, specifically in regard to the eastbound I-676 vehicle access point at 6th and Race Street.

Additionally, the project requires further collaboration with the Philadelphia Water Department (PWD) to further analyze the feasible placement of Green Stormwater Infrastructure and to determine possible funding opportunities through the PWD's green infrastructure grant programs.

APPENDIX A

APPENDIX A

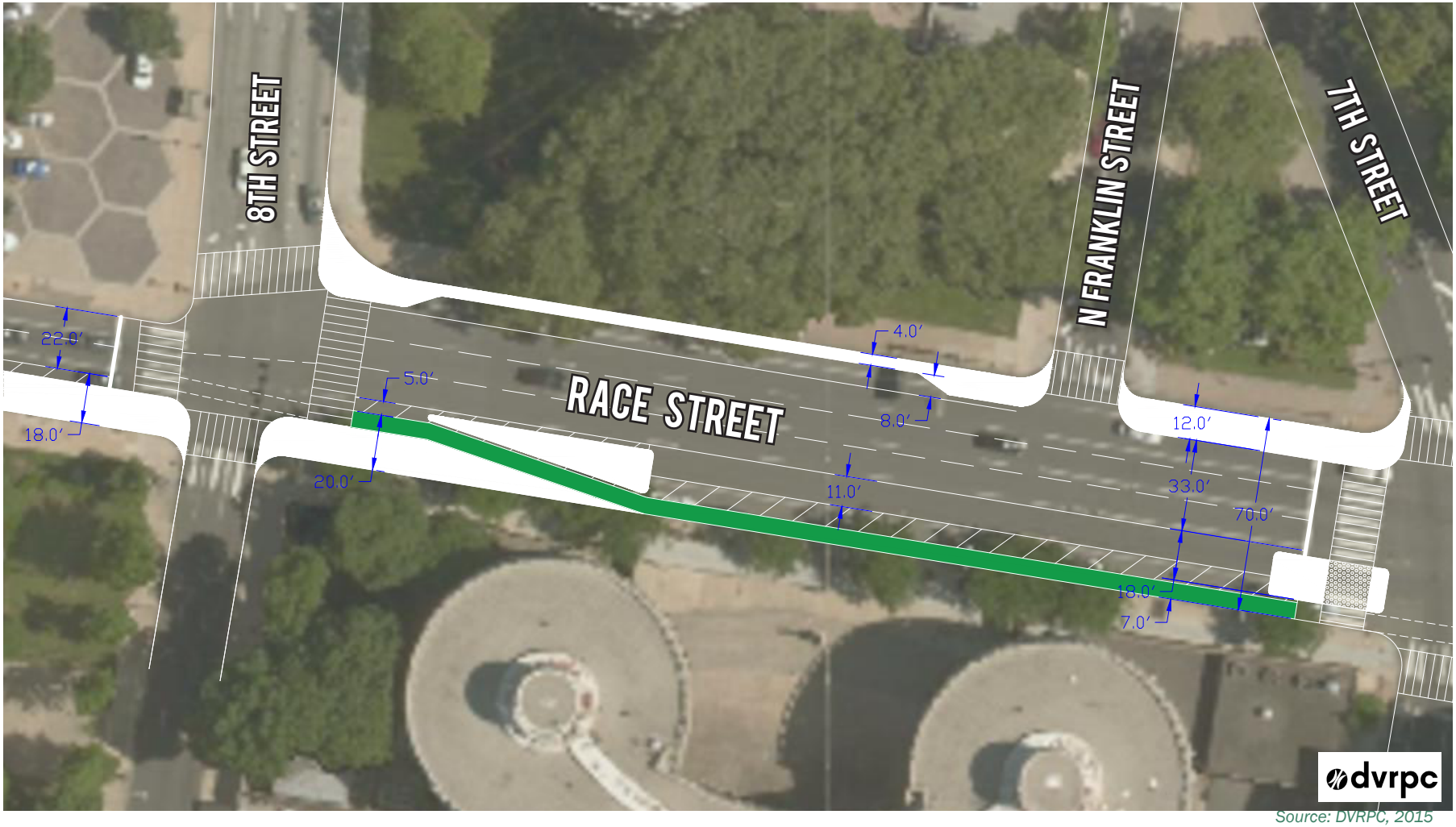
FIGURE A-1: Race Street between 9th and 8th Street Project Dimensions



Source: DVRPC, 2015

APPENDIX A

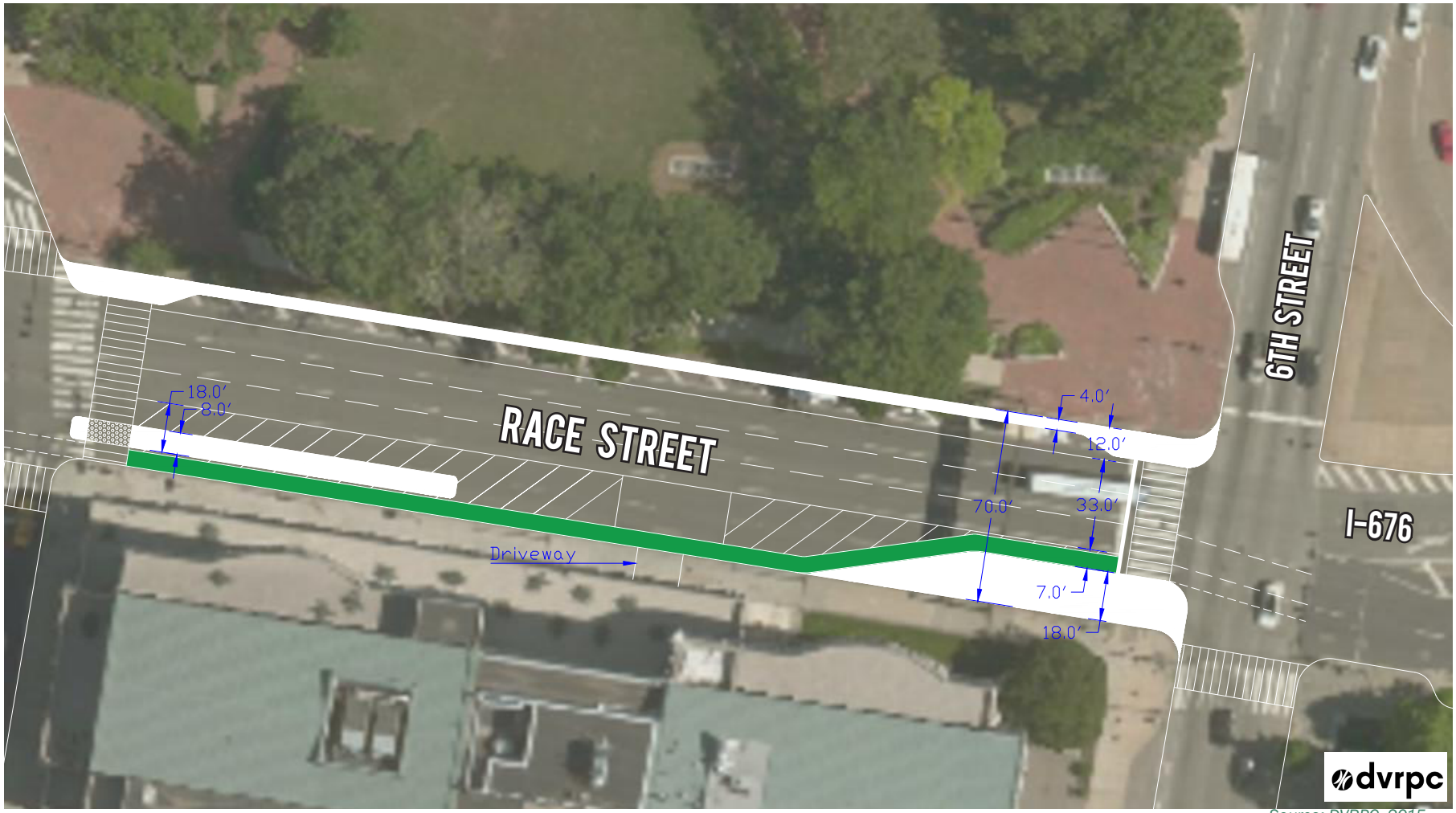
FIGURE A-2: Race Street between 8th and 7th Street Project Dimensions



Source: DVRPC, 2015

APPENDIX A

FIGURE A-3: Race Street between 7th and 6th Street Project Dimensions



Source: DVRPC, 2015

APPENDIX B

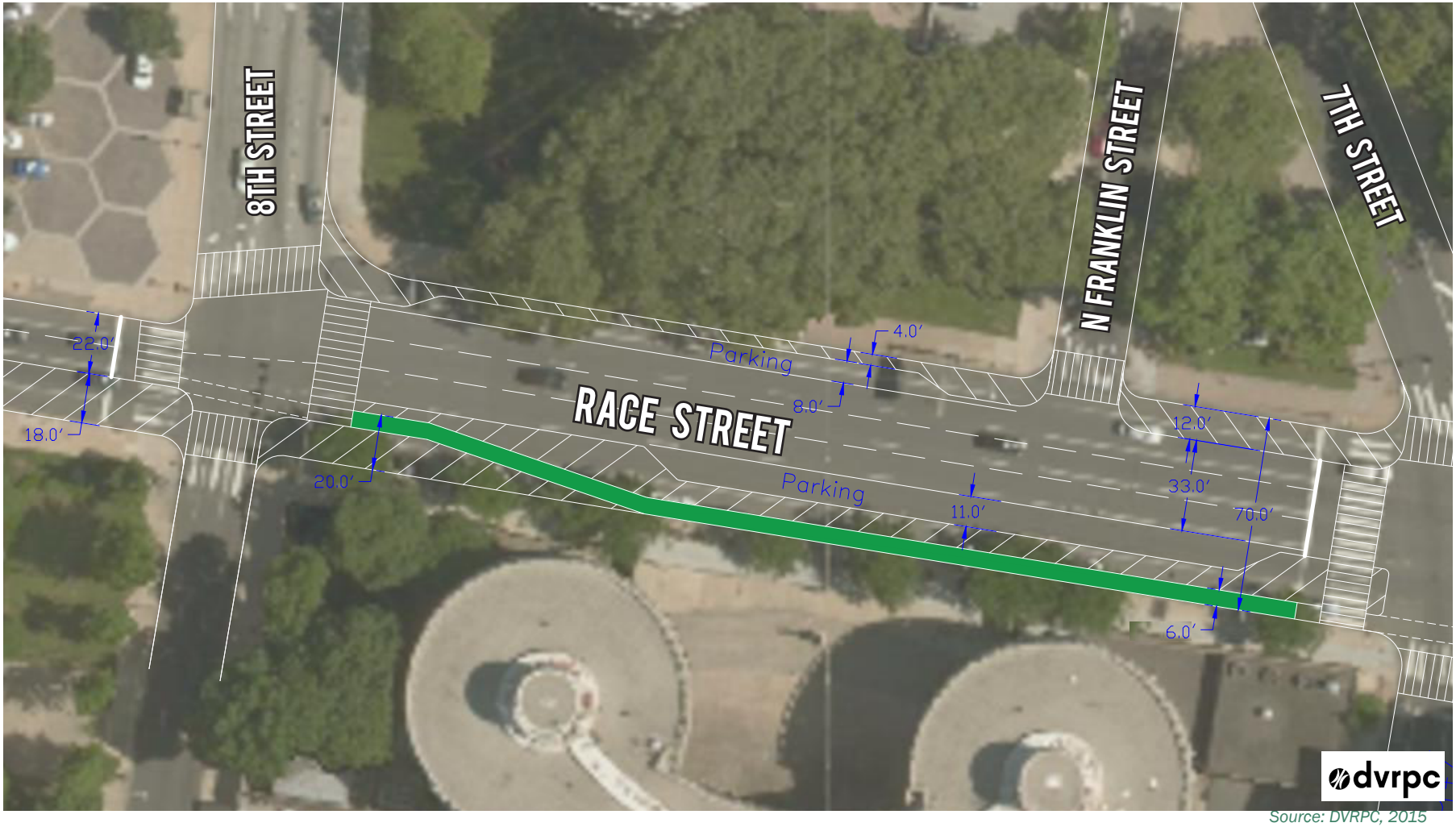
APPENDIX B

FIGURE B-1: Race Street between 9th and 8th Street Project Temporary Material Design

Source: DVRPC, 2015

APPENDIX B

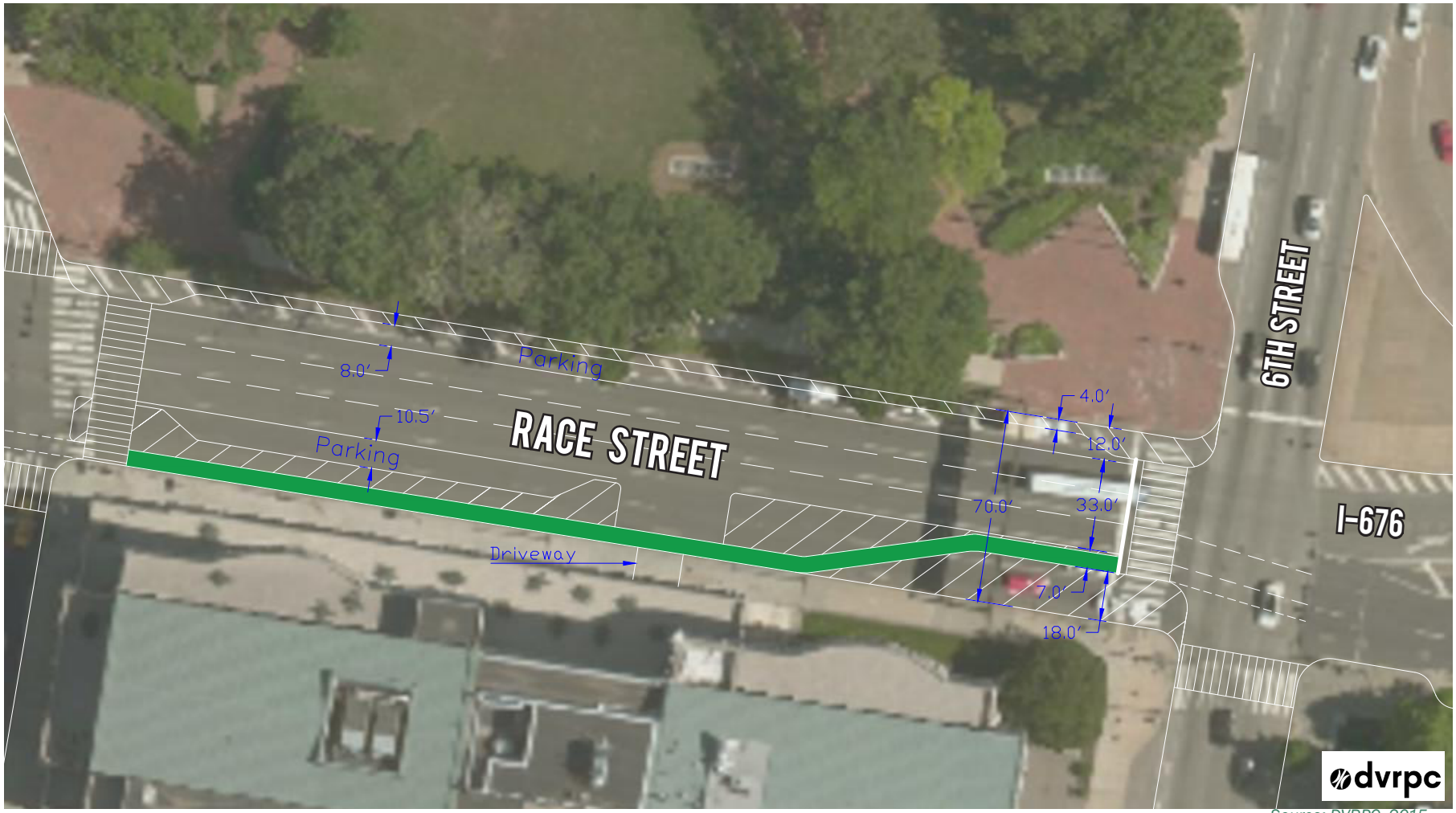
FIGURE B-2: Race Street between 8th and 7th Street Project Temporary Material Design



Source: DVRPC, 2015

APPENDIX B

FIGURE B-3: Race Street between 7th and 6th Street Project Temporary Material Design



Source: DVRPC, 2015

APPENDIX C

APPENDIX C

TABLE C-1: Green Infrastructure Funding Opportunities

FEDERAL GRANT PROGRAMS				
Grant Name	**Sponsoring Agency**	**Link to Further Information**	**Description**	**Eligibility Requirements or Funding Restrictions**
Targeted Watersheds Grant Program	EPA: Office of Water	http://water.epa.gov/grants_funding/twg/initiative_index.cfm	The targeted watersheds grant program through EPA encourages successfully community based approaches to protect and restore the nation's waterways. Grant funds can be used to support activities relating to the prevention, reduction, and elimination of water pollution. Projects cannot be activities required or regulated under the Clean Water Act.	None
Community Development Block Grants	Funding provided by U.S. Department of Housing & Urban Development (HUD); administered by the Philadelphia Office of Housing & Community Development (OHCD)	http://www.phila.gov/ohcd/hud.htm	GSI elements for green streets could be eligible for Transportation Enhancement (TE) funds. One of the categories eligible for these funds includes "mitigation of water pollution due to highway runoff." DVRPC solicits, reviews, and approves TE projects in the Philadelphia region	Municipality, county, state agency, or not-for-profit agency.
Highway Safety Improvement Program	Funding provided by USDOT, Federal Highway Administration; administered by PennDOT	http://safety.fhwa.dot.gov/hsip/	Types of projects funded include the rehabilitation and new development of parks and recreation facilities; acquisition of land for active or passive park and conservation purposes; and planning for feasibility studies, trails studies, conservation plans, site development planning, and comprehensive recreation, greenway and open space.	Municipalities and authorized non-profit organizations.
EPA Urban Waters Small Grants	EPA's Urban Waters Program	http://www.epa.gov/urbanwaters/funding/index.html	Eligible projects are those which involve the acquisition of land, easements or rights-of-way and the construction, improvement, expansion, extension, repair or rehabilitation of either a system for the supply, treatment, storage or distribution of water not used solely for residential purposes, or a system for the collection, treatment or disposal of wastewater (including industrial waste and the separation of sanitary sewers and storm sewers) not used solely for residential purposes. Grants are provided at a $5 million maximum or 75% of total eligible project costs, whichever is less. Loans are also available at a $5 million maximum per project with a 2% interest rate and repayment terms up to 20 years.	Municipalities; Industrial Development Corporations; Municipal Authorities; Investor-owned water or wastewater enterprise

(continued)

APPENDIX C

TABLE C-1: Green Infrastructure Funding Opportunities

Grant Name	Sponsoring Agency	Link to Further Information	Description	Eligibility Requirements or Funding Restrictions
TIGER Grants	United States Department of Transportation	http://www.dot.gov/tiger	Funds work designed to transform systems so that environmental problems are not created in the first place; supports efforts to reduce the damage currently being done by unsustainable practices; looks for programs and initiatives that help repair the damage caused by unsustainable practices; looks for places where capital investment are not available to correct an environmental problem.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
Clean Water State Revolving Fund (CWSRF)	Funding provided by EPA; administered by PADEP	http://www.portal.state.pa.us/portal/server.pt/community/pennvest/9242	Project must be within one of the five issue areas: global health, climate & environment, basic survival safeguards, urbanization, and social & economic security; for climate & environment it needs to be related to sustainable growth and resilience to climate change.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
PENNSYLVANIA STATE GRANT PROGRAMS				
Growing Greener	PADEP; Growing Greener grants are also available through PennVEST	http://www.depweb.state.pa.us/portal/server.pt/community/growing_greener/13958	Projects qualifying for grants under Surdna's Sustainable Environments program include those focused on improving transportation systems and encouraging smart growth. One of their funding priorities in this area is "supporting state and city leaders in the development and implementation of innovative solutions and the transfer of best practices that create environmental, economic and social benefits.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
Community Conservation & Recreation Grant	PA Department of Conservation & Natural Resources (PADCNR)	https://www.grants.dcnr.state.pa.us/LearnMore.aspx?GrantProgramId=51	Types of projects funded include the rehabilitation and new development of parks and recreation facilities; acquisition of land for active or passive park and conservation purposes; and planning for feasibility studies, trails studies, conservation plans, site development planning, and comprehensive recreation, greenway and open space.	Municipalities and authorized non-profit organizations.

(continued)

APPENDIX C

TABLE C-1: Green Infrastructure Funding Opportunities

Grant Name	Sponsoring Agency	Link to Further Information	Description	Eligibility Requirements or Funding Restrictions
Water Supply and Wastewater Infrastructure Program (PennWorks)	PA Department of Community and Economic Development	http://www.newpa.com/find-and-apply-for-funding/funding-and-program-finder/water-supply-and-wastewater-infrastructure-program-pennworks	Eligible projects are those which involve the acquisition of land, easements or rights-of-way and the construction, improvement, expansion, extension, repair or rehabilitation of either a system for the supply, treatment, storage or distribution of water not used solely for residential purposes, or a system for the collection, treatment or disposal of wastewater (including industrial waste and the separation of sanitary sewers and storm sewers) not used solely for residential purposes. Grants are provided at a $5 million maximum or 75% of total eligible project costs, whichever is less. Loans are also available at a $5 million maximum per project with a 2% interest rate and repayment terms up to 20 years.	Municipalities; Industrial Development Corporations; Municipal Authorities; Investor-owned water or wastewater enterprise
NATIONAL PRIVATE FOUNDATION GRANT PROGRAMS				
The Heinz Endowments	Howard Heinz Endowment	http://www.heinz.org/grants_apply.aspx	Funds work designed to transform systems so that environmental problems are not created in the first place; supports efforts to reduce the damage currently being done by unsustainable practices; looks for programs and initiatives that help repair the damage caused by unsustainable practices; looks for places where capital investment are not available to correct an environmental problem.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
Rockefeller Foundation Funding	The Rockefeller Foundation	http://www.rockefellerfoundation.org/grants	Project must be within one of the five issue areas: global health, climate & environment, basic survival safeguards, urbanization, and social & economic security; for climate & environment it needs to be related to sustainable growth and resilience to climate change.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.

(continued)

APPENDIX C

TABLE C-1: Green Infrastructure Funding Opportunities

Grant Name	Sponsoring Agency	Link to Further Information	Description	Eligibility Requirements or Funding Restrictions
Surdna Foundation Grant	Surdna Foundation	http://www.surdna.org/grants/grants-overview.html	Projects qualifying for grants under Surdna's Sustainable Environments program include those focused on improving transportation systems and encouraging smart growth. One of their funding priorities in this area is "supporting state and city leaders in the development and implementation of innovative solutions and the transfer of best practices that create environmental, economic and social benefits.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
Environmental & Cultural Preservation Grants	The Tiffany & Co. Foundation	http://www.tiffanyandcofoundation.org/apply.aspx	To improve the urban parks experience by supporting infrastructure improvements and beautification efforts in existing parks and by supporting the creation of additional green spaces. **They were a major funder for the High Line Park project in NYC, which includes sustainable storm-water management features.	Must be a 501(c)(3) non-profit organization to qualify. Individuals and for-profit organizations are not eligible.
REGIONAL AND LOCAL GRANT PROGRAMS				
Watershed Protection Grants	William Penn Foundation	http://www.williampennfoundation.org/WatershedProtection.aspx	Projects must be in the Delaware or Susquehanna watersheds. Priorities include: to protect and restore places of ecological significance; support watershed-wide research, policy, and practice; and empower communities to act.	Applicant must be a 501(c)(3) organization
	The Pew Charitable Trusts	http://www.pewtrusts.org/program_investments_procedure.aspx	Although stormwater is not listed as a specific program priority there is evidence of past successful grants (i.e. Race Street Pier and the Delaware River Waterfront Corporation in 2010) that have stormwater management benefits. There is a strong argument for civic initiatives and climate change benefits to the green infrastructure approach to stormwater management that will help the Water Department receive grants through these other priorities.	The majority of grants are given to public charities (501 (c)(3) organizations)

(continued)

APPENDIX C

TABLE C-1: Green Infrastructure Funding Opportunities

Grant Name	Sponsoring Agency	Link to Further Information	Description	Eligibility Requirements or Funding Restrictions
	The Albert M. Greenfield Foundation	http://thealbertmgreenfieldfoundation.org/grants/howtoapply	The foundation has a wide range of projects that it funds including science. Past projects funded by the Greenfield Foundation include PHS's "Share the Harvest," a memorial garden with the Urban Tree Connection, and the "Greening Greenfield" project at the Albert M. Greenfield School. This track record shows an interest in funding urban greening and landscaping projects, especially if they serve children and/or underserved sections of the City. The Foundation prioritizes projects and organizations that find innovative solutions to entrenched problems.	
Stormwater Management Incentives Program Grant	Philadelphia Water Department	http://www.phillywatersheds.org/what_were_doing/SMIP_Grant	The Stormwater Management Incentives Program (SMIP) grant provides assistance to non-residential Water Department customers. Use of funds is restricted to projects that support the design and construction of stormwater mitigation measures. These may include, but are not limited to: detention and retention basins, tree trenches, green roofs, porous paving, and rain gardens.	Only non-residential properties are eligible. Applicants must be owners of the property or have permission from the property owner(s).

Source: Philadelphia Green Streets Design Manual

RENEWING RACE STREET a Mobility Analysis

Publication Number: 15029

Date Published: October 2015

Geographic Area Covered:
City of Philadelphia, Pennsylvania

Key Words:
Road Diet, bicycle lane, performance measures, turn queue box, accessibility, roadway cross-section, Philadelphia 2035, green stormwater infrastructure, two-stage implementation, development opportunities

Abstract:
The study evaluated Race Street between 5th and 9th Street, and a design was developed to improve safety, accessibility, and aesthetics. Between 6th and 8th Street, the design would reduce the north and south crossing distance and change the road to a three travel lane configuration; it would also add protected bicycle facilities, plantings, and pedestrian amenities. These improvements would improve access for people walking, biking, and driving and improve the aesthetics of one of Philadelphia's most visited tourist areas. It would better link the surrounding neighborhoods and amenities together, which include Chinatown, Old City, Independence Mall, and Franklin Square. The design would have minimal impact on traffic operations while creating a significantly safer traffic environment.

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