NAMA MULTIMODAL STRATEGIC IMPLEMENTATION PLAN

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14. ABSTRACT

The NAMA Multimodal Strategic Implementation (MSI) Plan is a document that analyzes the needs of all roadway users, including pedestrians, bicyclists, transit, and micromobility users, to produce conceptual design options that can be implemented. The study area includes all NPS and District of Columbia Department of Transportation (DDOT) roadways within the NAMA area, which is identified in the 2010 National Mall Plan/Environmental Impact Statement, and adjacent to President's Park. This project includes the review of past, present, and future projects, including the vision of the 2010 National Mall Plan/Environmental Impact Statement and the review of any changes to baseline conditions since 2010. The MSI Plan provides design recommendations at locations that are indicative of many of the safety concerns that are present along corridors within NAMA.

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Overview

The National Mall (NAMA) generally stretches west from the U.S. Capitol to the Potomac River, and north from Hains Point in East Potomac Park to Constitution Avenue. With more than 36 million yearly visitors, NAMA and the surrounding areas must continue to prioritize enhancing visitor experience for all users. The National Park Service (NPS), District Department of Transportation (DDOT), and its regional partners have a strong commitment to multimodal travel, which is reflected in their coordinated efforts. It is important for the NPS and its partners to work together on these efforts to expand access to NAMA for all modes and all visitors and provide for a safer transportation system.

The NAMA Multimodal Strategic Implementation (MSI) Plan will focus on pedestrians, bicyclists, transit, and micromobility users. The study area will include all NPS and DDOT roadways within the NAMA area, which is identified in the 2010 National Mall Plan/Environmental Impact Statement, and adjacent to President's Park. Design recommendations in the MSI will be focused on NPS roadways.

This project will include the review of past, present, and future projects, including the vision of the 2010 National Mall Plan/Environmental Impact Statement and the review of any changes to baseline conditions since 2010.

The existing conditions section summarizes conditions in and around NAMA and identifies issues and opportunities that the MSI Plan should address. The information included in the existing conditions assessment provides the foundation for subsequent recommendations and ensures the NAMA MSI Plan reflects the unique desires and aspirations of the NPS in coordination with partners like DDOT.

Prior Plans and Documentation

This section provides an analysis of past, present, and future projects, studies, and plans that will help guide and influence the recommendations of the NAMA MSI Plan. Below is a summary of major relevant transportation planning efforts involving NAMA and the surrounding areas:

- **2010 National Mall Plan/Environmental Impact Statement**
  The NPS last updated their NAMA Plan in 2010. The plan uses goals, objectives, and policy recommendations related to future land use, transportation, special events, and natural and cultural resources to guide the future of NAMA and fulfill the vision of the NPS. The transportation elements of this study serve as a baseline for the MSI Plan (NPS, 2010).
- **National Mall and Memorial Parks Tour Bus Study**
  The 2010 National Mall Plan/Environmental Impact Study confirmed tour bus parking and traffic congestion issues and suggested little had been done to address previously identified concerns. In June 2015, a project was developed to quantitatively and qualitatively document existing conditions related to tour bus operations and set forth a plan of action for short-term and long-term improvements in operational efficiency. A series of studies around the Lincoln Memorial were completed between March 2012 and June 2014 that pertained to the operational efficiency, congestion, mobility, access, and safety of the site. These studies found that standardized signage and new tour bus routing patterns around Lincoln Memorial Circle, which can be easily communicated to operators through data-driven apps, could lead to improvements

in operations. This study can serve as a guide in the assessment of the Lincoln Memorial and the surrounding areas (NPS, 2015).

- **National Mall Wayfinding and New Pedestrian Guides Project**
  The NPS initiated the Wayfinding Project in response to ineffective, mismatched, and poorly maintained signage around NAMA. This 2009 project included the design, fabrication, and installation of pedestrian wayfinding and regulatory signage throughout NAMA and in East Potomac Park. Improvements to pedestrian wayfinding and signage were included in all alternatives in the National Mall Plan (2010), and the Wayfinding Project was planned in accordance with the NPS's UniGuide Sign Standards. The pedestrian sign program was completed; however, the recommended coordinated vehicular signage program has not been implemented (NPS, 2009).
- **Road Safety Audit (RSA) for the Lincoln Memorial Circle**
  In the Spring of 2014, NPS partners performed an RSA for the Lincoln Memorial Circle to identify issues affecting safety of all users, identify alternatives to increase accessibility, and identify safety improvements for both non-motorized users and motorized users. This team recommended improvements in 13 locations around the Lincoln Memorial Circle (Paul S. Sarbanes Transit in Parks Technical Center, 2014).
- **MoveDC**
  This document is the long-range transportation plan for the District of Columbia (D.C.), prepared by DDOT. The goals of this plan are safety, mobility, management and operations, project delivery, sustainability, and creating enjoyable spaces; the plan has a framework that describes specific strategies to attain these overarching goals. DDOT has identified several projects that align with MoveDC that may require strategic multimodal connections to NAMA (DDOT, 2021).
- **15th Street Cycletrack and Safety Improvements Project**
  The purpose of this project is to develop a set of infrastructure improvements that close the existing bikeway gap between Pennsylvania Avenue and the 14th Street Bridge with a 2-way cycle track. The project seeks to improve bicycle access to and throughout NAMA and looks to facilitate regional bicycle access between D.C. and Virginia. The project also seeks to enhance the multimodal network in the region. The project is being developed to reduce the vehicle impact on the region and to promote a safer more efficient multimodal system on NPS assets. The addition of a 2-way cycle track can increase the capacity of 15th Street by 26 percent, with the ability to add 7,500 people riding bikes to the roadway (or a net increase of 5,900 people given the reduction of roadway capacity for vehicles to accommodate the cycletrack) via additional bicycle infrastructure. Past NPS plans have identified the need for 15th Street improvements; for example, the 2016 NPS Paved Trails Study identified the need for a separated bike facility on 15th Street and the 2010 National Mall Plan identified 15th Street as a high-volume non-motorized corridor (DDOT, 2010).
- **The Comprehensive Plan for the National Capital**
  In 2016, the National Capital Planning Commission (NCPC), the central planning agency for the federal government, adopted an update to The Comprehensive Plan for the National Capital. The region's significant federal presence and specific development needs requires extensive

planning and coordination. The Comprehensive Plan set forth to connect the region to the waterfront, enhance the existing trail network, encourage access to Federal open spaces, and to increase transportation mobility and accessibility for users of the road network. This study can serve as a reference point for the current report (NCPC, 2020).

- **Monumental Core Streetscape Manual**
  In 2013, the NCPC revised the 2005 Streetscape Manual, which aims to serve as a unifying and visually enhancing document the historic design of the U.S. Capital area. The purpose of this manual is to provide guidelines for a coordinated and consistent streetscape treatment for roadways and associated sidewalks in the central area of the city in the vicinity of NAMA. The manual does not supersede officially adopted plans and policies established for the area but will assist in guiding the implementation of the plans, particularly the areas fronting on roadways and pedestrian ways considered part of the street scene. Illustrations and maps are provided in this manual. The manual will help to inform different agencies in the rehabilitation or reconstruction of roadways in the area extending generally from Pennsylvania Avenue and E Street, NW, including President's Park on the north, the Potomac River and the Southwest Freeway on the west and south, and Second Street on the east. A revised version is currently underway (NCPC, 2013).
- **Long Bridge Project Final Environmental Impact Statement/Record of Decision (FEIS/ROD)**
  The purpose of the project is to provide additional long-term railroad capacity and to improve the reliability of railroad service through the Long Bridge Corridor. As of 2020, there is insufficient capacity, resiliency, and redundancy to accommodate the projected demand in future railroad services. A bicycle-pedestrian crossing will be implemented as part of the Long Bridge railroad project to serve as mitigation for the use of parklands and historic sites protected under Section 4(f)[1]. The bike-pedestrian crossing will provide a connection between Long Bridge Park in Arlington, Virginia, the Mount Vernon Trail (MVT), and West Potomac Park in the District, crossing the Potomac River on an independent bridge on the upstream side of the new upstream railroad bridge. The southern end of the bike-pedestrian crossing will connect to a path at the northern end of the Long Bridge Aquatic and Fitness Center and Park Expansion in Long Bridge Park, which is currently under construction and is scheduled for completion in 2021. The bike-pedestrian path will cross over the George Washington Memorial Parkway (GWMP), MVT, and the Potomac River on a 2,300-foot-long bridge consisting of prefabricated truss spans. After crossing over the GWMP, the bike-pedestrian crossing will connect to the MVT via a ramp near the shoreline of the Potomac River. The northern end of the bike-pedestrian crossing will connect to Ohio Drive SW in West Potomac Park. The EIS analysis assumed that construction of the bike-pedestrian crossing would use some of the same construction access and staging areas as the railroad bridge construction. Additional Long Bridge Project conceptual engineering plans can be found in the Draft Environmental Impact Statement (DEIS) Appendix B6 (DDOT, DRPT, and FRA, 2020).

[1] Section 4(f): A section within the U.S. Department of Transportation Act of 1966 which provides consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development.

- **Visualize 2045 - LRTP**
  Visualize 2045 is a Long Range Transportation Plan for the Capital Region. It was adopted by the Transportation Planning Board of the Metropolitan Washington Council of Governments in 2018 and is currently being updated, to be completed in 2022. The guiding principles of the plan emphasize expanding public transportation, alleviating congestion, and increasing opportunities for people to travel by walking, biking, and transit. While the plan is high level and does not specifically discuss NPS infrastructure, the plan discusses the D.C. region, reflecting regional goals for the region and identifying major projects (National Capital Region TPB, 2018).
- **Arlington Memorial Bridge Rehabilitation**
  On December 4, 2020, the NPS reopened the rehabilitated Arlington Memorial Bridge to drivers, pedestrians, and bicyclists. The $227 million rehabilitation project also implemented recommendations from a Memorial Circle safety study by repaving, improving visibility of crossings, and adding new signs and rapid flashing beacons to make Memorial Circle (in Arlington, VA) easier and safer for bicyclists, pedestrians, and drivers to navigate (NPS, 2020).
- **2015 Bicycle and Pedestrian Plan for the National Capital Region**
  The Metropolitan Washington Council of Governments last updated their Bicycle and Pedestrian Plan in January 2015. The plan identifies the capital improvements, studies, actions, and strategies that the region proposes to carry out by 2040 for major bicycle and pedestrian facilities. This plan can be used as a baseline for the current report (National Capital Regional TPB, 2015).
- **DC Sustainable Transportation (DCST) Decongestion Pricing Study**
  In 2019, DCST began a study which evaluates and makes recommendations regarding potential road and bridge pricing policies, the potential use of revenues from such policies, and the benefits and costs to D.C. and the Washington region with a particular focus on improving equity. This project is being undertaken in partnership with DDOT and other agencies with funding from D.C. DCST and the District government are aiming to better understand the challenges, particularly around equity, which exist with the current and anticipated baseline conditions surrounding transportation and mobility in the DC region. This study can be used to analyze potential transportation initiatives in the region (DCST, 2020).
- **National Capital Region Safety Summary**
  In April 2021, NPS and the Federal Highway Administration (FHWA) published a draft safety network screening for the entire National Capital Region, including NAMA, to analyze the safety of transportation infrastructure. The summary presents a list of the top 10 segments, intersections, and ramps for each park unit with an expected crash frequency greater than zero. The list for NAMA provides NPS a starting point for further investigation, such as diagnosing issues, selecting countermeasures, or conducting an RSA or similar safety study (FHWA and NPS, 2021).
- **NPS National Capital Region (NCR) 2016 Paved Trails Study**
  The NPS paved trail network spans more than 95 miles and links together some of D.C.'s most significant cultural heritage, natural resources, and outdoor recreational assets. At NAMA, trail usage has increased significantly and as the area continues to grow in residential and

employment population, walking and biking trips will also continue to increase. These trends place increased pressure on the trail network, particularly the trail segments that form the backbone of the larger regional trail network. This study provides an understanding of the overall issues and challenges facing NPS in accommodating the growing number of bicycle and pedestrian, while analyzing potential infrastructure opportunities to successfully connect NAMA with D.C. and the rest of the regional trail network (NPS, 2016).

- **A segment-level model of shared, electric scooter origins and destinations**
  Electric scooters have quickly proliferated in cities worldwide, presenting a host of regulatory challenges to cities across the world. In this article, the authors present opportunities where data and can be used to explain how electric scooters and micro can be used as a part of first-mile, last-mile solutions that connect people to significant destinations through a combination of transit and micromobility. This article analyzed trip lengths and highlighted the popular destination locations within the D.C. region. This article can be used to identify spatial patterns for shared electric scooter usage and identify priority locations that will help model future demand and identify where redevelopment may be emphasized (Merlin, Yan, Xu, & Zhao, 2021).
- **National Mall E-Scooter Parking Plan**
  Under the National Mall E-Scooter Parking Plan, geo-fencing technology is used by the scooter companies to designate parking locations, primarily at existing bike racks at major destinations throughout NAMA. In addition, memorials and other high pedestrian traffic areas are geofenced as "no riding" areas. Since April 2021, in partnership with DDOT, NAMA has been working to better manage the high e-scooter and e-bike use, while acknowledging that this is how many visitors want to travel (NPS, 2021).
- **DDOT Bicycle Lane 20 by 22 Program**
  In 2020, DDOT initiated a plan to implement 20 miles of new protected bike lanes in D.C. over the course of three years. The plan is intended to provide greater bicycle connectivity and enhance the safety of cyclists in D.C. DDOT's Bicycle Priority Network map[2] further illustrates bike lanes connecting to NAMA that are existing, funded (in the FY21 Statewide Transportation Improvement Program (STIP)), and planned. Funded improvements include the Virginia Avenue bike lane connecting to NAMA at 18th Street and the 15th Street bike lane that crosses NAMA and connects to East Potomac Park. Improvements are planned along Constitution Avenue between 23rd Street and Pennsylvania Avenue and along 7th Street SW (crossing over NAMA) (DDOT, 2022).

Existing Conditions of the Focus Areas

The NPS has documented a number of transportation challenges related to pedestrians, bicyclists, transit, micromobility options, tour buses, and other transportation and safety factors throughout NAMA. The MSI Plan will develop designs and implementation strategies for high priority corridors and related areas around the park; the specific focus areas include:

[2] View DDOT's Bicycle Priority Network map from 2020 here: https://movedc-dcgis.hub.arcgis.com/pages/mobility-priority-networks#bike

- Lincoln Memorial Circle
- Jefferson and Madison Drives
- Independence Avenue between 14th Street and Ohio Drive SW
- Long Bridge Bicycle-Pedestrian Bridge Connection
- East and West Potomac Park
- Other Transportation Issues

This section provides an in-depth analysis of each focus area, referencing the different planning documents and data that have been both published online and provided by the NPS and DDOT. This analysis centers on the focus areas because (1) these are high priority corridors and areas for the NPS and (2) a majority of the roadways within these focus areas are owned and managed by NPS. These focus areas are depicted in Figure 1.

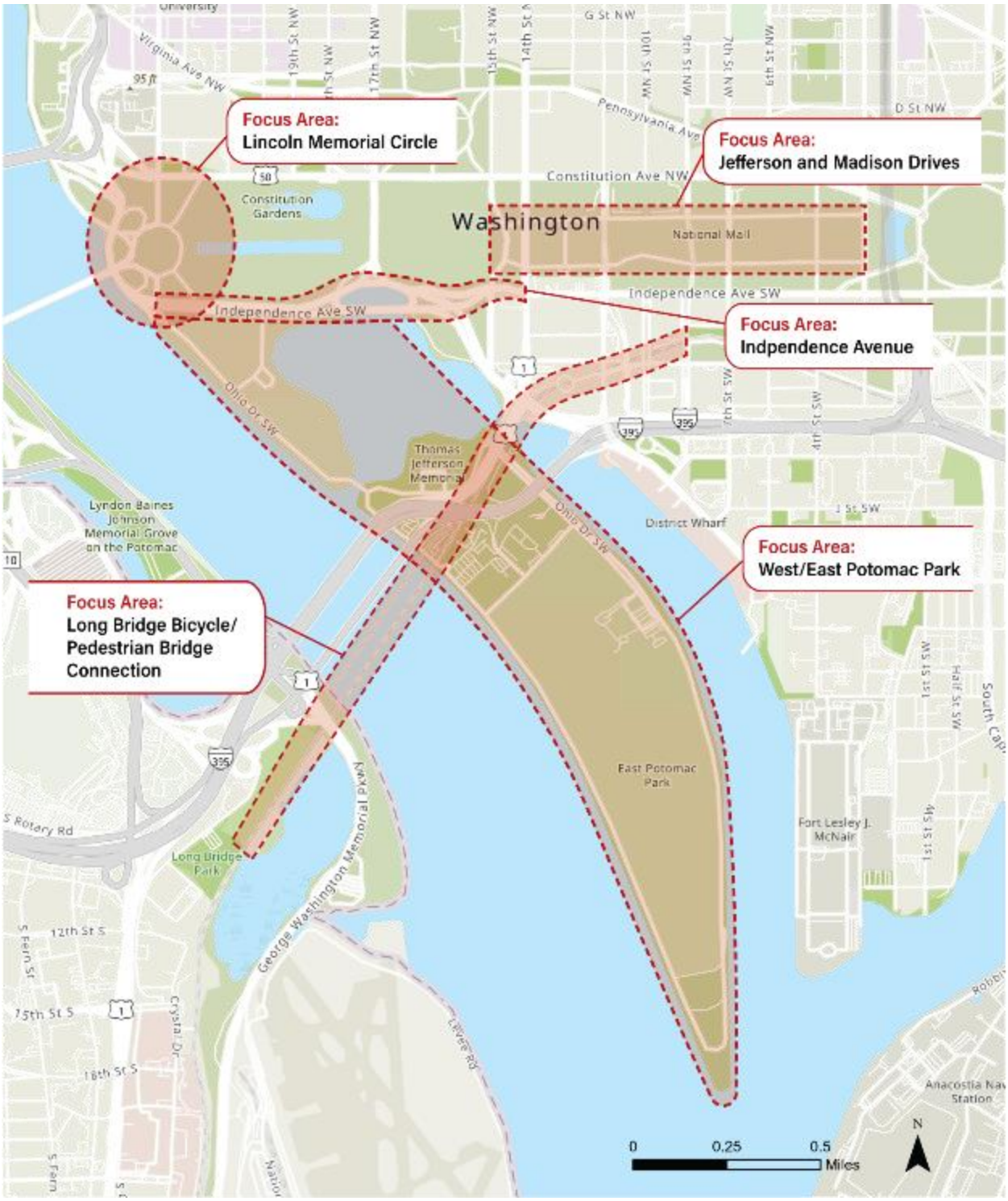

FIGURE 1: FOCUS AREAS OF THE MSI PLAN

Lincoln Memorial Circle[3]

Location Description: The Lincoln Memorial is a defining feature of the western terminus of NAMA. The Lincoln Memorial is surrounded by a circular roadway, Lincoln Memorial Circle, with radial roads linking NAMA to the Arlington Memorial Bridge and access roads for Rock Creek Parkway, the Kennedy Center and its parking area, U.S. Highway 50 and Interstate 66, and the Theodore Roosevelt Memorial Bridge.

Current Conditions: The Lincoln Memorial and grounds is comprised of three distinct landscapes as documented in the NPS Cultural Landscape Report: the reflecting pool area, the Lincoln Circle and radial roads, and the Watergate area. 23rd street NW, which feeds into Lincoln Memorial Circle, is designated as a "roadway contributing to National Register Listings" (NPS, National Mall Plan, 2010).

In 2016, Lincoln Circle North experienced an average weekday traffic volume of 26,992 annual average daily traffic (AADT). Lincoln Circle South and Arlington Memorial Bridge experienced an AADT of 39,302 (National Capital Region TPB, 2021). This location also sees high bicycle and pedestrian volumes, which can introduce points of conflict between these different modes. Over a month period in the spring of 2021, bicycle and pedestrian counters estimated over 80,000 bicycles and pedestrians crossing the Arlington Memorial Bridge (Arlington County DOT, 2021). A 2018 analysis of bicycle and pedestrian counts during peak AM traffic (between 8:45 AM and 9:00 AM) found that the intersection of Lincoln Memorial Circle and Henry Bacon Drive saw bicycle peak 15-minute flowrates of 11 and pedestrian peak 15-minute flowrates of 116. This analysis also found that, during peak PM traffic (between 5:45 PM and 6:00 PM), this intersection saw bicycle peak 15-minute flowrates of 16 and pedestrian peak 15-minute flowrates of 312 (DDOT-SOP, 2018). The Capital Bikeshare stations north and south of the Lincoln Memorial are consistently in the top 10 of highest used stations in the 500+ regional station system. These stations are primarily used by those who are purchasing short-term passes and not the local annual pass; so, riders are likely less familiar with the area.

The Lincoln Memorial Circle Roadway project was completed in 2008. The pedestrian plaza on the east side of the circle was improved, concrete bus pads were added, drainage and lighting, curbs and sidewalks were replaced, new signalized pedestrian crossings and drinking fountains were installed, and traffic patterns were coordinated (NPS, 2010).

In 2014, an RSA identified 13 locations in the Lincoln Memorial Circle for safety improvements that would apply to the many different users of this focus area (Paul S. Sarbanes Transit in Parks Technical Center, 2014). This report analyzed crash data in Lincoln Memorial Circle, finding that in 2011 there were 24 crashes, in 2012 there were 25 crashes, and in 2013 there were 10 crashes. Only a small number of the reported crashes involved pedestrians and bicycles. However, NPS recognizes that these crash numbers are likely lower than reality, because crashes are typically underreported. From this crash analysis, the report found that the majority of crashes are between motorized vehicles and the off-ramp from Arlington Memorial Bridge to Ohio Drive has a higher number of crashes compared to the other locations observed in the Lincoln Memorial Circle. Some of the relevant improvements recommended by this RSA include crosswalk markings, rumble strips, signal installation, pedestrian crossing signs and flashing beacons, and widened curb ramps (Paul S. Sarbanes Transit in Parks Technical Center, 2014).

[3] Lincoln Memorial Circle is located within West Potomac Park. This section includes information and data from some locations that may be considered within West Potomac Park that are relevant to the circulation and access of the Lincoln Memorial.

The Arlington Memorial Bridge is a major connection from Virginia to D.C. and feeds into Lincoln Memorial Circle's radial roads. Arlington Memorial Bridge was rehabilitated and subsequently reopened in December 2020. The rehabilitation included, among other repairs, replacing the bridge's deck and sidewalks (NPS, 2020). In addition to the bridge rehabilitation, the NPS made safety improvements to Memorial Circle (located across the bridge from the Lincoln Memorial Circle, in Arlington, VA), including: higher visibility crosswalks, new signage and rapid flashing beacons, clearer lane markings, and repaved road surface (NPS, 2020). The NPS will monitor the effectiveness of these changes as a part of the Memorial Circle Transportation Plan and Environmental Assessment (NPS George Washington Memorial Parkway, 2021). The Arlington Memorial Bridge and Memorial Circle rehabilitation projects improve pedestrian and bicyclist safety and increase access to the Lincoln Memorial, as well as the rest of NAMA.

The urban streets near NAMA accommodate around 400,000 commuters every weekday in 2009. The road system may be difficult to navigate for infrequent visitors. Crosswalks have limited pedestrian crossing times. There is a large regional bicycle riding population that commutes and engages in recreational riding. Up to 25 percent of visitors may not be able to walk long distances or may become exhausted from walking between memorials. There are few amenities for pedestrians walking to NAMA (NPS, 2010). Jogging is a popular activity throughout the park, but appropriate running surfaces are lacking, which has resulted in the creation of social trails adjacent to many walks and around the Lincoln Reflecting Pool. These social trails may be as hard as concrete and do not constitute an appropriate running surface (NPS, National Mall Plan, 2010). As mentioned above, Capital Bikeshare docking stations are located near Lincoln Memorial Circle on Daniel French Drive SW and Henry Bacon Drive NW; the intersection of Henry Bacon Drive NW and Constitution Ave experience high levels of trips (Capital Bikeshare, Capital Bikeshare System Map, 2022).

Multiple tour bus arrivals cause peak-season crowding. There are 6 spaces for tour bus loading and unloading at the Lincoln Memorial north on Henry Beacon Drive (a radial road) on the southwest bound side; 7 additional tour bus loading/unloading spaces are provided south on Daniel French Drive, along with 8 parking spaces for visitors with disabilities (NPS National Mall and Memorial Parks, 2020); (NPS, 2015) (NPS, 2010). Constitution Avenue, between 23rd Street NW Henry Beacon Drive, has 3 spaces for tour bus loading/unloading during non-rush hour periods (NPS, 2015) (NPS, 2010).

North of the Lincoln Memorial, the Virginia Avenue Protected Bike Lane (PBL) Project is a designed project that intends to close the gap in the regional bikeway network by connecting the Rock Creek Trail, the Theodore Roosevelt Bridge/I-66 Trail, and Capital Crescent Trail to Downtown. The PBL is planned as a two-way protected bike lane occupying the southeast-bound travel lane from Rock Creek Parkway to G Street NW and occupying the center of the roadway from G Street NW to 18th Street NW. The route connects to NAMA at 18th Street NW and Constitution Avenue/US Highway 5. The bike route project has been identified in a number of past plans and strategies, including the 2005 Bicycle Master Plan, the 2014 MoveDC Long-Range Statewide Transportation Plan, and the 2016 Royal Netherlands Embassy's "ThinkBike" workshop. The project is scheduled for construction in fall 2021 (DDOT, Virginia Avenue NW, 2021).

Jefferson and Madison Drives

Location Description: Madison Drive is bounded by 3rd Street on the east and 15th Street on the west. Jefferson Drive, which is south of and runs parallel to Madison Drive, is bounded by 3rd Street on the east and 15th Street on the west. Jefferson and Madison Drives are under NPS jurisdiction; posted speed limits along these roads is 15 mph. Madison and Jefferson Drives are intersected by north-south roadways (which are under DDOT's jurisdiction): 4th Street, 7th Street, and 14th Street. The 9th and 12th Street Expressways run underneath the National Mall and therefore do not intersect the Drives (NPS, 2010).

Current Conditions: The roadways that mark the Mall's boundaries— 3rd Street on the east (two-way traffic), Madison Drive on the north (one-way traffic going west), 14th Street on the west (two-way traffic), and Jefferson Drive on the south (one-way traffic going east). Each drive is 35-feet wide on average and provides access to many museums. Jefferson and Madison Drives have wider sidewalks than those along north-south streets, paved for half their width in gravel, half in exposed aggregate concrete. Madison Drive was milled and repaved in 2010 (NPS, 2010).

In 2007, Madison Drive experienced a traffic volume of 10,100 AADT and Jefferson Drive experienced 7,300 AADT (NPS, 2010). In 2016, 15th Street between Constitution Avenue NW and E Street NW (just north of Madison Drive) experienced traffic volume of 16,043 AADT (National Capital Region TPB, 2021). A 2018 analysis of bicycle and pedestrian volumes, during peak AM traffic (between 8:45 AM and 9:00 AM), found that the intersection of Madison Drive and 15th Street saw bicycle peak 15-minute flowrates of 37 and pedestrian peak 15-minute flowrates of 388. This volume analysis also found that, during peak PM traffic (between 6:00 PM and 6:15 PM), this intersection saw bicycle peak 15-minute flowrates of 44 and pedestrian peak 15-minute flowrates of 424 (DDOT-SOP, 2018).

Curb space is allocated for tour bus loading and unloading, paid public parking, paid parking for visitors with disabilities, permit parking, pedicab stands, and DC Circulator National Mall route stops. Small-scale features such as bike racks, lighting, and benches are designed to conform to the *Streetscape Manual*. NCPC is leading a two-tiered update to the original streetscape manual from 2013. NCPC completed the first step – documenting existing streetscape elements, removing obsolete information, and reformatting and digitizing the Streetscape Manual – in 2013. The second step includes developing an Urban Design Streetscape Framework, including Federal Lighting Policy; Streetscape Design Guidelines; and Streetscape Construction Manual Amendments. The Urban Design Streetscape Framework and Lighting Policy was published for public comment in 2020 (NCPC, 2020).

Capital Bikeshare stations are located on Madison Drive at 4th Street, and on Jefferson Drive near 12th and 14th Streets (Capital Bikeshare, Capital Bikeshare System Map, 2022). As part of DDOT's 20 by 22 Bike Lane Program, a separated bike lane has been implemented along 4th Street between Madison Drive and I Street SW. The bike lane is planned to be extended south from I Street SW to P Street SW in 2021 (DDOT, 2020).

Generally, along the Mall, single or paired gravel and concrete walks follow the routes of most cross-axial streets (except 11th Street). Two DDOT controlled streets — 4th and 7th — cross the Mall on the surface, while 9th and 12th streets are tunneled beneath it. Because 9th and 12th streets are tunneled, the entire area stretch of the Mall from 7th to 14th streets is unbroken. All streets have granite curbs; handicap curb cuts are also granite. Cross streets such as 3rd, 4th, and 7th streets are under DC

jurisdiction. Sidewalks along the north-south streets are exposed aggregate concrete, and grassed tree planting strips separate the sidewalk from the street (NPS, 2010).

The NPS has plans to resurface, restore, and rehabilitate the riding surface on Jefferson Drive between 15th Street and 3rd Street. Rehabilitation will include improvements to pavement and crosswalk markings, ADA ramps and pedestrian crosswalk signals, and an assessment of the potential for protected bike lanes (NPS NAMA, 2021).

As of 2020, Madison Drive has 203 public parking spaces (including one electric vehicle parking space), 24 parking spaces for visitors with disabilities, and approximately 13 tour bus loading/unloading spaces (NPS National Mall and Memorial Parks, 2020). As of 2020, Jefferson Drive has 133 public parking spaces and 26 parking spaces for visitors with disabilities, and approximately 19 tour bus loading/unloading spaces (NPS National Mall and Memorial Parks, 2020); (NPS, 2010).

The National Museum of American History on Madison Drive between 12th and 14th Streets has three spaces near-by for tour bus loading and unloading. The National Museum of Natural History on Madison Drive at 9th Street has approximately 4 spaces near-by for tour bus loading and unloading (NPS National Mall and Memorial Parks, 2020); (NPS, 2015). The National Air and Space Museum on Jefferson Drive at 7th Street has nine spaces near-by for tour bus loading and unloading. The National Museum of the American Indian on Jefferson Drive between 3rd and 4th Streets has nine spaces near-by for tour bus loading and unloading (NPS National Mall and Memorial Parks, 2020); (NPS, 2015).

In October 2020, the 15th Street Cycletrack and Safety Improvements Project began by identifying the needs of the corridor through establishment of project objectives and measures of effectiveness. The plan includes a traffic analysis and review of recent collision data and other sources, to ensure that the advanced design includes necessary facilities for all users' safety. In December 2020, the team completed a traffic analysis, collision data review and a conceptual design highlighting areas for infrastructure. The traffic analyses reviewing the existing conditions of the intersection of Madison Drive and 15th Street and Jefferson Drive and 15th Street were limited to peak hour conditions. It is important to note that for twenty hours a day 15th Street operates as a fast-moving roadway with vehicles operating more than the posted speed limit of 25 miles per hour (Nelson\Nygaard, 2020).

Existing conditions analysis related to the 15th Street cycletrack observed that the lay-by near Madison Drive would send buses into the proposed cycletrack area for re-entry, an area where high pedestrian traffic paired with excess roadway capacity limits safety at the intersection (see Figure 2 and Figure 3).

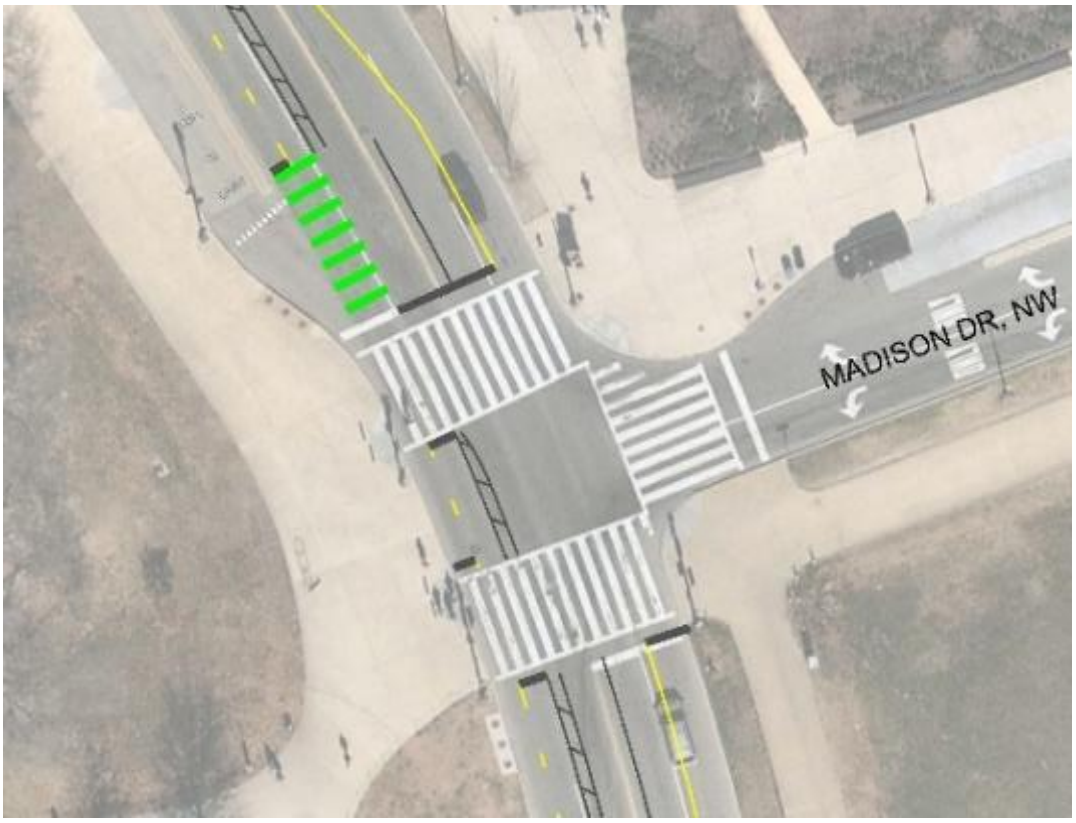

FIGURE 2: CONCEPTUAL DESIGN FOR CYCLETRACK AT INTERSECTION OF 15TH STREET AND MADISON DRIVE (NELSON\NYGAARD, 2020).

FIGURE 3: CONCEPTUAL DESIGN FOR CYCLETRACK AT 15TH STREET AND JEFFERSON DRIVE (NELSON\NYGAARD, 2020).

As a part of this greater 15th Street project, a Roadway Level of Service (LOS) analysis found that 15th Street intersections with Madison Drive and Jefferson Drive have a roadway LOS of A during peak hours (see Table 1). An LOS of A means that traffic flows relatively freely, where vehicles are moving at or above the speed limit.

TABLE 1: ROADWAY LOS ANALYSIS FOR 15TH STREET PROJECT INTERSECTIONS AT MADISON DRIVE NW AND JEFFERSON DRIVE SW (NELSON\NYGAARD, 2020).

15th Street Project Intersections	Control	Peak Hour	Delay (sec)[2]	LOS
15th St NW & Madison Dr NW	Signal	AM	5.8	A
		PM	9.7	A
15th St NW & Jefferson Dr SW	Signal	AM	8.8	A
		PM	7.6	A

Independence Avenue

Location Description: Independence Avenue runs along the southern boundary of NAMA and ultimately connects to Ohio Drive in the west, which feeds into the Lincoln Memorial Circle and into Pennsylvania Avenue, SE in the east.

Current Conditions: Independence Avenue, between 14th Street and 15th Street, is under NPS jurisdiction; and Independence Avenue east of 14th Street are under the D.C.'s jurisdiction. Along this corridor, the roadway width holds six lanes in total (three lanes in each direction). Speed limits on park roads are most frequently posted at 25 mph, with some sections of Independence Avenue posted at 30 mph (NPS, 2010). A memorial to President Dwight D. Eisenhower was completed in September 2020 at Independence Drive between 6th and 4th Streets. The accessible elevator entrance of the Smithsonian Metro station is located just north of Independence Avenue.

In 2016, Independence Avenue between 4th Street SW and Maryland Ave SW experienced a traffic volume of 32,238 AADT; Independence Avenue between 14th Street SW and Raoul Wallenberg Plaza SW experienced an AADT of 17,236 in 2016 (National Capital Region TPB, 2021). A 2018 analysis of bicycle and pedestrian volumes, during peak AM traffic (between 8:30 AM and 8:45 AM), found that the intersection of Independence Avenue SW and 14th Street saw bicycle peak 15-minute flowrates of 11 and pedestrian peak 15-minute flowrates of 412. This volume analysis also found that, during peak PM traffic (between 5:30 PM and 5:45 PM), this intersection saw bicycle peak 15-minute flowrates of 4 and pedestrian peak 15-minute flowrates of 1,076 (DDOT-SOP, 2018).

In 2020, Independence Avenue included six parking spaces for individuals with disabilities around the 1500 block (NPS National Mall and Memorial Parks, 2020); (NPS, 2010). The 1500 block of Independence Avenue has 8 curbside spaces for tour bus parking (NPS Curb Use GIS data, 2020; National Mall and Memorial Parks Tour Bus Study, 2015, Table B). A Capital Bikeshare station is located near Independence Avenue on 10th Street; these stations fall within the jurisdiction of Capital Bikeshare (Capital Bikeshare, Capital Bikeshare System Map, 2022).

As a part of the 15th Street cycletrack project, a Roadway LOS analysis found that the intersection of Raoul Wallenberg Drive SW at Independence Avenue has low northbound left-turn volumes and high northbound right-turn volumes. Figure 4 illustrates a conceptual design for the 15th Street cycletrack at the intersection of Independence Avenue. Table 2 outlines the current delay and LOS of D at this intersection. Analysis determined that high traffic delay during peak AM and PM combined with a decrease in safety had led to an unstable LOS at the intersection (see Table 2).

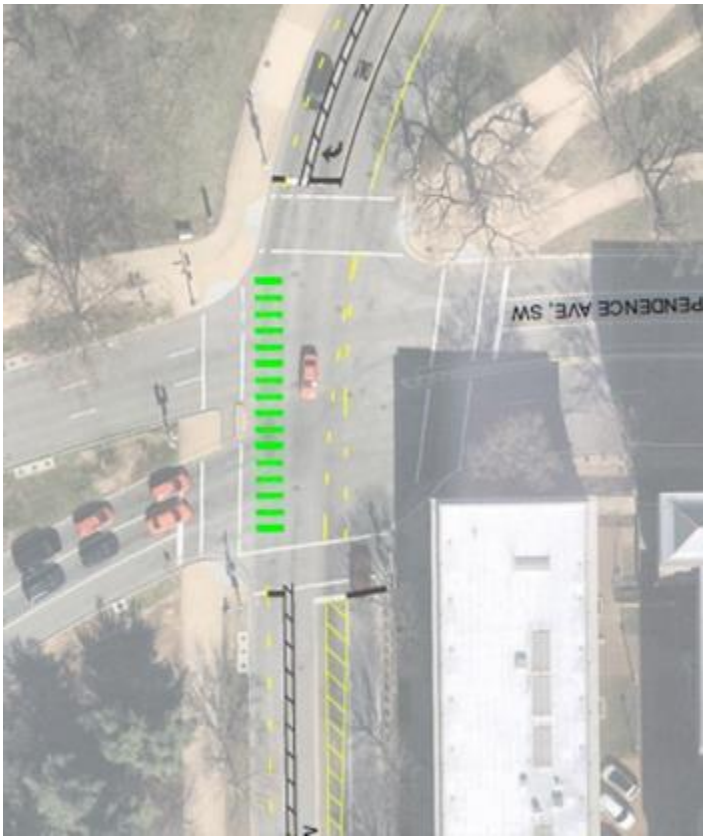

FIGURE 4: CONCEPTUAL PLAN FOR CYCLETRACK AT INTERSECTION OF RAOUL WALLENBERG DRIVE AND INDEPENDENCE AVENUE (NELSON\NYGAARD, 2020).

TABLE 2: LOS ANALYSIS FOR 15TH STREET PROJECT INTERSECTION AT RAOUL WALLENBERG DR SW AND INDEPENDENCE AVE SW (NELSON\NYGAARD, 2020).

15th Street Project Intersections	Control	Peak Hour	Delay (sec)[2]	LOS
Raoul Wallenberg Dr SW & Independence Ave SW	Signal	AM	42.9	D
		PM	38	D

Long Bridge Bicycle-Pedestrian Bridge Connection

Location Description: The Long Bridge Corridor is a 1.8-mile railroad corridor between Rosslyn (RO) Interlocking in Arlington, Virginia, and L'Enfant (LE) Interlocking near 10th Street SW in D.C. (DDOT, DRPT, and FRA, 2020).

Current Conditions: Currently, the Virginia Department of Rail and Public Transportation is spearheading the design of the Long Bridge that will provide additional long-term railroad capacity and to improve the reliability of railroad service through the Long Bridge Corridor, as well as include a new bicycle-pedestrian bridge over the Potomac River. The project included the bicycle-pedestrian component as a mitigation element for the project's impacts to Section 4(f) properties. The crossing will provide an

important connection between the parks and the regional trail system, and therefore has a regional recreational benefit (DDOT, DRPT, and FRA, 2020).

The bicycle-pedestrian crossing will provide a connection between Long Bridge Park in Arlington, Virginia, the Mount Vernon Trail (MVT), and West Potomac Park in the District, crossing the Potomac River on an independent bridge on the upstream side of the new upstream railroad bridge. The southern end of the bike-pedestrian crossing will connect to a path at the northern end of the Long Bridge Aquatic and Fitness Center and Park Expansion in Long Bridge Park, which is currently under construction and is scheduled for completion in 2021. The bike-pedestrian path will cross over the George Washington Memorial Parkway (GWMP), MVT, and the Potomac River on a 2,300-foot-long bridge consisting of prefabricated truss spans. After crossing over the GWMP, the bike-pedestrian crossing will connect to the MVT via a ramp near the shoreline of the Potomac River (DDOT, DRPT, and FRA, 2020). The Long Bridge bike-pedestrian path will terminate on Ohio Drive SW between the Inlet Bridge and Buckeye Drive SW and impact 0.31 acres. The bike-pedestrian bridge will end at a ramp near the sidewalk on Ohio Drive SW and NPS Parking Lot C, eliminating approximately 50 of 67 existing parking spaces (see Figure 5) (DDOT, DRPT, and FRA, 2020).[4]

The Long Bridge bicycle-pedestrian bridge is anticipated to benefit both recreation users and bicycle commuters by providing a connection between Arlington, VA, and D.C., improving overall community cohesion and increasing the connectivity of the existing bicycle and pedestrian network. In May 2018, the 14th Street Bridge (I-395), which is located just north of the planned bicycle-pedestrian bridge, experienced average daily bicycle volumes of 2,291 bicyclists (Arlington County Department of Environmental Services, 2022). The bridge will benefit recreation users by providing a connection between Long Bridge Park and East and West Potomac Parks, and will benefit MVT commuters by providing a direct connection between the District and Long Bridge Park (eliminating the need for cyclists to travel between the District and Crystal City to use the MVT) (DDOT, DRPT, and FRA, 2020).

[4] Note that the drawings and concepts from the Combined Final Environmental Impact Statement/Record of Decision and Final Section 4(f) Evaluation (http://longbridgeproject.com/feisrod/) will likely change with feedback from stakeholders, such as NPS, before a final design is chosen for implementation.

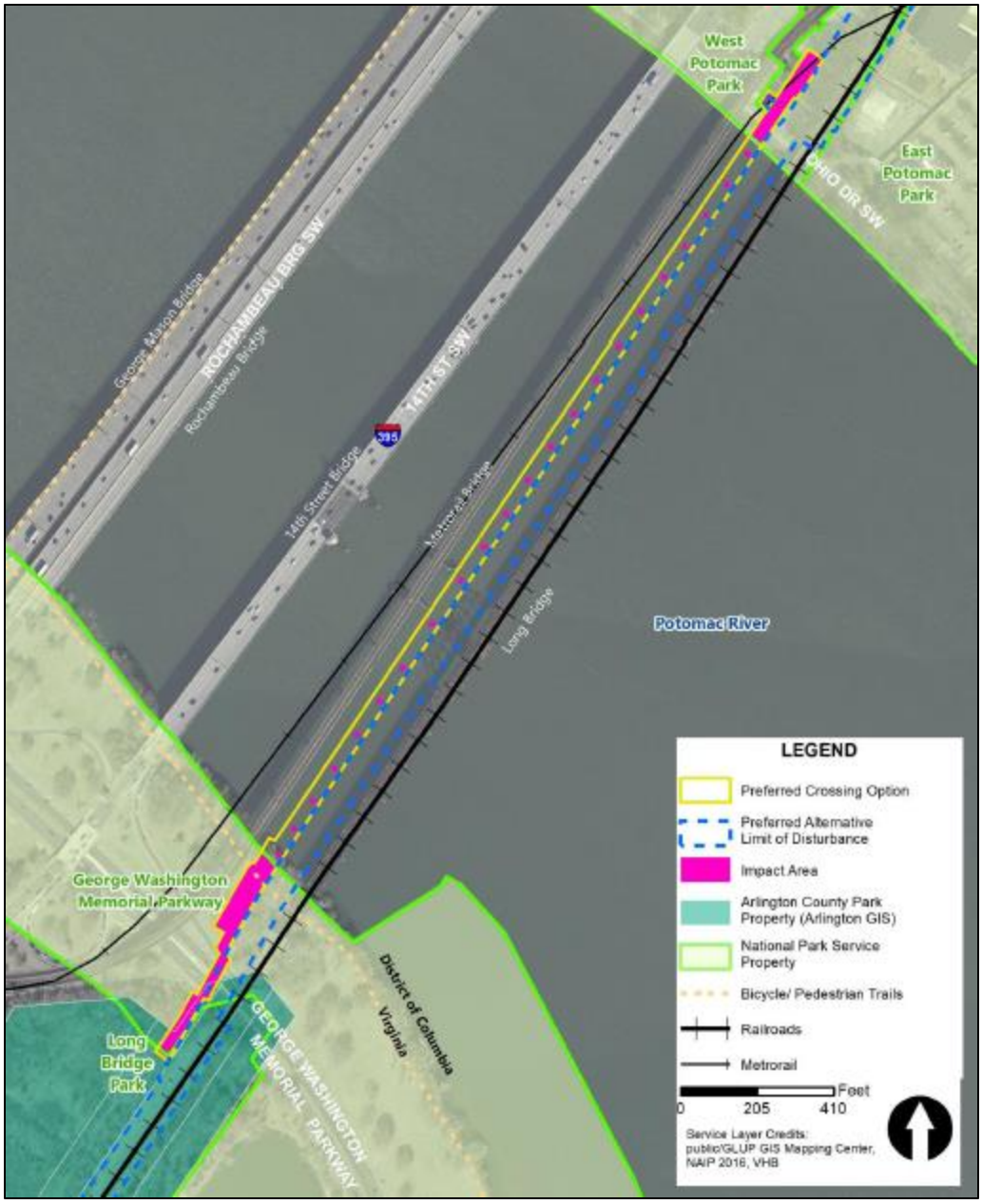

FIGURE 5: DIRECT IMPACTS OF THE PREFERRED OPTION TO PARKS AND RECREATION AREAS (DDOT, DRPT, AND FRA, 2020).

East and West Potomac Park[5]

Location Description: Together, East and West Potomac Parks are situated roughly between the Potomac River and the grounds of the Washington Memorial and have a combined area of approximately 730 acres. East Potomac Park is located south of the National Mall and is made up of 330 acres (NPS, 2010). The Park is bordered by the Potomac River and the Washington Channel, and is connected to West Potomac Park via Ohio Drive SW. The Thomas Jefferson Memorial is located within

[5] This section includes information for a portion of West Potomac Park, south of Independence Avenue, that is relevant to access and circulation.

East Potomac Park. West Potomac Park is made up of nearly 400 acres and includes areas north and south of Independence Avenue SW. South of Independence Avenue, the portion most relevant to access and circulation in East Potomac Park, West Potomac Park borders the Tidal Basin and includes the Franklin Delano Roosevelt Memorial and the Martin Luther King Jr. Memorial. The Tidal Basin area is used for demonstrations, national celebrations such as the National Cherry Blossom Festival, and other permitted events (NPS, 2010).

Current Conditions: East Potomac Park is designated as a historic district and contains, a golf course and driving range, a miniature golf course, tennis facilities and courts, picnic areas, a food service facility, restrooms, NPS office and maintenance buildings, a visitor transit operations facility, and a U.S. Park Police substation. The Park is characterized by broad expanses of open space framed by mature landscape planting and by views of the major memorials (NPS, 2010).

Tour bus parking is provided in East Potomac Park. There are 5 spaces for tour bus loading/unloading at the Thomas Jefferson Memorial on East Basin Drive (NPS National Mall and Memorial Parks, 2020); (NPS, 2015). Buses also frequently utilize the 479 public parking spaces along Ohio Drive SW (NPS National Mall and Memorial Parks, 2020); (NPS, 2010). East Basin Drive has 5 spaces for visitors with disabilities and Ohio Drive SW had 3 spaces for visitors with disabilities. The four public parking lots located south of the Thomas Jefferson Memorial (Parking Lot A, Parking Lot B, Tennis Court Parking Lot, and Hains Point Parking Lot) together had 315 public parking spaces and 20 spaces visitors with disabilities (NPS National Mall and Memorial Parks, 2020); (NPS, 2010).

In West Potomac Park, there are five spaces for tour bus loading and unloading at the Franklin Delano Roosevelt Memorial/Martin Luther King, Jr. Memorials on West Basin Drive. West Basin Drive also includes 21 public parking spaces and 11 disabled parking space (NPS National Mall and Memorial Parks, 2020). In 2020, Ohio Drive SW between the Arlington Memorial Bridge and I-395 had 150 public parking spaces (or 50 paid tour bus parking along Ohio Drive riverside) and five parking spaces for visitors with disabilities. (NPS National Mall and Memorial Parks, 2020); (NPS, 2015).

Ohio Drive, East Basin Drive, and West Basin Drive are under the jurisdiction of the NPS (NPS, 2010). The NPS has plans to resurface and restore asphalt pavement, including pavement markings, resetting select granite curbs, replacing select curb ramps, repairing and replacing select sidewalk sections, and updating signing along Ohio Drive and West Basin Drive from Hains Point to Lincoln Memorial Circle (NPS National Mall and Memorial Parks, 2021).

The I-395/14th Street Bridge corridor consists of five bridges; three of the bridges (the George Mason, Rochambeau, and Arland D. Williams Jr. memorial bridges) are four-lane automobile bridges that carry I-395 and US 1 traffic. These three roadways merge in East Potomac Park and split into two 2-way bridges — the 14th Street bridge carries northbound traffic onto 14th Street, and the Francis Case Memorial Bridge carries I-395 (and southbound US 1) traffic onto the Southwest Freeway (NPS, 2010). The 14th Street Bridge provides bicycle and pedestrian facilities for travel between East Potomac Park and Northern Virginia. In 2017, the Rochambeau Bridge SW between I-395 Virginia and I-395 D.C., which pass through East and West Potomac Parks, experienced traffic volumes of 241,377 AADT (National Capital Region TPB, 2021). In May 2018, the 14th Street Bridge (I-395) experienced average daily bicycle volumes of 2,291 bicyclists (Arlington County Department of Environmental Services, 2022). A few years ago, NAMA repaved the multimodal trail from the 14th Street Bridge. The project was funded through a

Transportation Alternatives Program (TAP) grant and was located along East Basin Drive south of Jefferson Avenue.

Two additional bridges across the Potomac River at this location carry rail traffic, the Metro Yellow Line and the Long Bridge which is the main line railroad. The Metro line enters a tunnel in West Potomac Park, and the main line railroad passes over I-395 and runs over the Washington Channel just downstream of the 14th Street approach before turning northeast along Maryland Avenue (NPS, 2010).

East Potomac Park also contains paved trails, including the Rock Creek Trail along the southern side of the park (adjacent to Ohio Drive SW). Capital Bikeshare stations are located in West Potomac Park near Ohio Drive SW and West Basin Drive SW and in East Potomac Park on West Basin Drive SW and on Buckeye Drive SW (Capital Bikeshare, Capital Bikeshare System Map, 2022). The East Potomac Golf Course occupies much of the interior of the park, and Hains Point (a picnic and recreation destination) is located on the southern tip of the park.

Hains Point also has a vehicle parking lot (41 spaces). Bus parking accommodates tour bus groups and school groups that picnic at Hains Point, but also serves as a place for bus waiting (bus idling), while tour groups and school groups tour museums and NPS sites by foot. NPS has removed signs that encouraged tour bus parking in this location to minimize buses that use this space for waiting or idling. Currently, many pedestrians walk along the roadway, because the mixed-use path along the water, the sea wall path, has deteriorated due to water infiltration (see Figure 6 and Figure 7). The shared use of the roadway between motorized vehicles, experienced bicyclists, novice bicyclists, and pedestrians has introduced conflicts between these modes and the NPS seeks increase safety by providing modal separation for these roadway users.

FIGURE 6: PEDESTRIANS AND BICYCLISTS USING THE ROADWAY AT HAINS POINT NEAR LOCATION OF APRIL 2021 PEDESTRIAN-VEHICLE CONFLICT (VOIGT, 2021)

FIGURE 7: CLOSED SEAWALL PEDESTRIAN PATH AT HAINS POINT (VOIGT, 2021)

Other Transportation Issues

Description: This section focuses on other transportation issues that were identified in the NAMA area, but do not necessarily fit within the focus areas discussed in the previous sections.

The Washington region has become a national leader in innovative policies and designs, especially bike sharing (public transit self-service bicycle rental). This region is nationally known for the quality, beauty, and extent of its bicycle paths. Its walkable core neighborhoods attract residents and visitors alike. The region has a strong foundation of walking and bicycling facilities to build upon. Walking and bicycling account for nine percent of all trips in the region.

Current Conditions: From the MWCOG 2015 Bicycle and Pedestrian Plan, 53 projects have been completed, including the 11th Street Bridge Trail and several protected or buffered bike lanes. The region has added 52 miles of multiuse path and 45 miles of bike lanes, which does not include many projects that have been partially completed, or any privately provided facilities, or projects such as sidewalk retrofits that were too small to be included in a regional plan. The number of bicycle lanes has grown rapidly in neighboring cities, as well. As of 2011, Arlington County in Virginia holds 24 miles of bicycle lanes (National Capital Regional TPB, 2015). In September 2010, D.C. and Arlington County launched a regional bike sharing system, Capital Bikeshare, which has since expanded to over 2,500 bicycles at 300 stations in D.C., Arlington, Alexandria, and Montgomery County (National Capital Regional TPB, 2015).

In 2011, a quarter of all automobile trips in the Washington Region are less than 1.5 miles long (National Capital Regional TPB, 2015). According to the Bicycle and Pedestrian Plan for the National Capital Region, the 14th Street Bridge, the Memorial Bridge, the Theodore Roosevelt Bridge, the Key Bridge, and the Chain Bridge all have bicycle and pedestrian facilities. In December 2020, the ferry at White's

Ferry, which connects Montgomery County and Loudon County closed. Cyclists and pedestrians are no longer able to use this ferry as a connection between the areas. Cyclists may use the US 15 bridge at Point of Rocks and the MD 17 bridge at Brunswick to get across Frederick County and Loudoun County, though they have no separated facilities (National Capital Regional TPB, 2015).

The 2021 National Capital Region Safety Summary found that a road segment along westbound Constitution Avenue NW, between the Ellipse to the north and Washington Monument to the south ranked as a top location with the highest expected number of crashes for pedestrians. This segment of the roadway is owned and maintained by DDOT but is an area of safety concern due to its proximity and connection to NPS sites.

In the spring of 2022, the Frederick Douglass Memorial Bridge project will come to completion. It will be part of a network of trails and paths, including part of the Anacostia Riverwalk Trail, and reconstructed bridges, such as the completed 11th Street Bridge replacement (together with the future 11th Street Bridge Park) and future new Frederick Douglass Memorial Bridge, that will help mend the divide that the river has symbolized in Washington and connect the east and west sides of the river. The objective is not only to connect the east and west shorelines, but also to connect the District itself through great parks, public places, and new neighborhoods along a restored river (City of DC, 2016).

Additional External Data Sources

External data sources provide insight into ongoing and future projects in the study's focus areas and provide additional data to inform the MSI Plan's suggested alternatives. The following list provides an initial set of external sources which will be built out during the stakeholder engagement phase of this project:

- Strava Data
- DDOT Bicycle Count Data
- Capital Bikeshare Data
- Micromobility Data
- Commercial Vehicle and Freight Data
- Bus Route and Parking Data

Strava Data

Strava maintains the largest collection of human-powered transportation information in the world. Strava users link their smart phones or GPS devices with Strava software to track their rides, runs, and walks, usually on a regular basis. In order to account for privacy concerns, the data is stripped of all potential identifiers and contextualized to provide trends, patterns, safety, and project feasibility, which can be used to see which paths people use and avoid, identify common origins and destinations, identify travel demand on certain corridors, and point out areas for investment (Strava Metro, 2020).

Since 2010, research linking bicycle usage and bikeway infrastructure has increased significantly and Strava data have become more valued. The research has evolved from the study of lanes and paths to include analyses of the entire bicycle and pedestrian network. Strava data can be used to understand some bicycle, pedestrian, and other multi-use facilities in relation to NAMA and its surrounding areas. This study notes that Strava data reflect the travel patterns of 'opt-in,' primarily recreational, users. These data have biases toward demographics that may not reflect the trends of users overall. NAMA is flush with historic and cultural resources that are connected by bicycle and pedestrian trails. The corridors outline the linkages between NAMA and the surrounding areas. Figure 8 through Figure 13 provide data and depict Strava bicycle and pedestrian corridors at NAMA from 2018 through 2020.

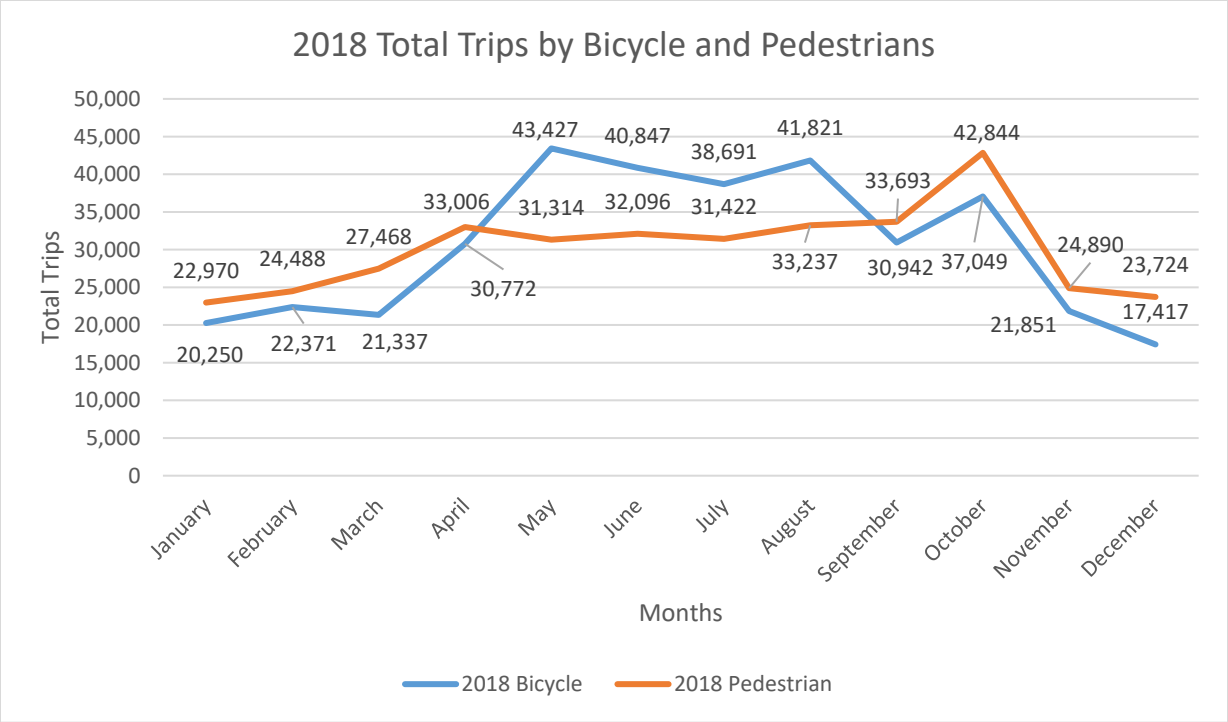

FIGURE 8: STRAVA METRO TOTAL BICYCLE AND PEDESTRIAN TRIPS AT NAMA IN 2018 (STRAVA, 2019-2020)

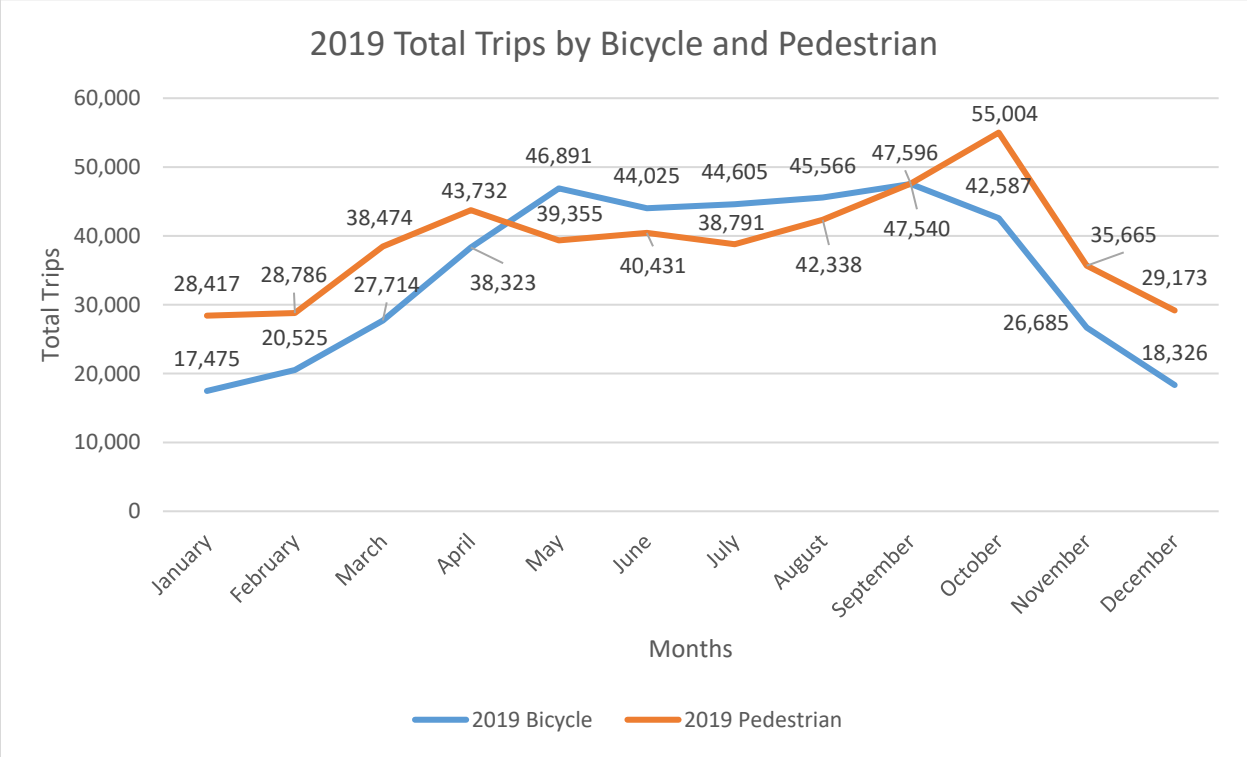

FIGURE 9: STRAVA METRO TOTAL BICYCLE AND PEDESTRIAN TRIPS AT NAMA IN 2019 (STRAVA, 2019-2020)

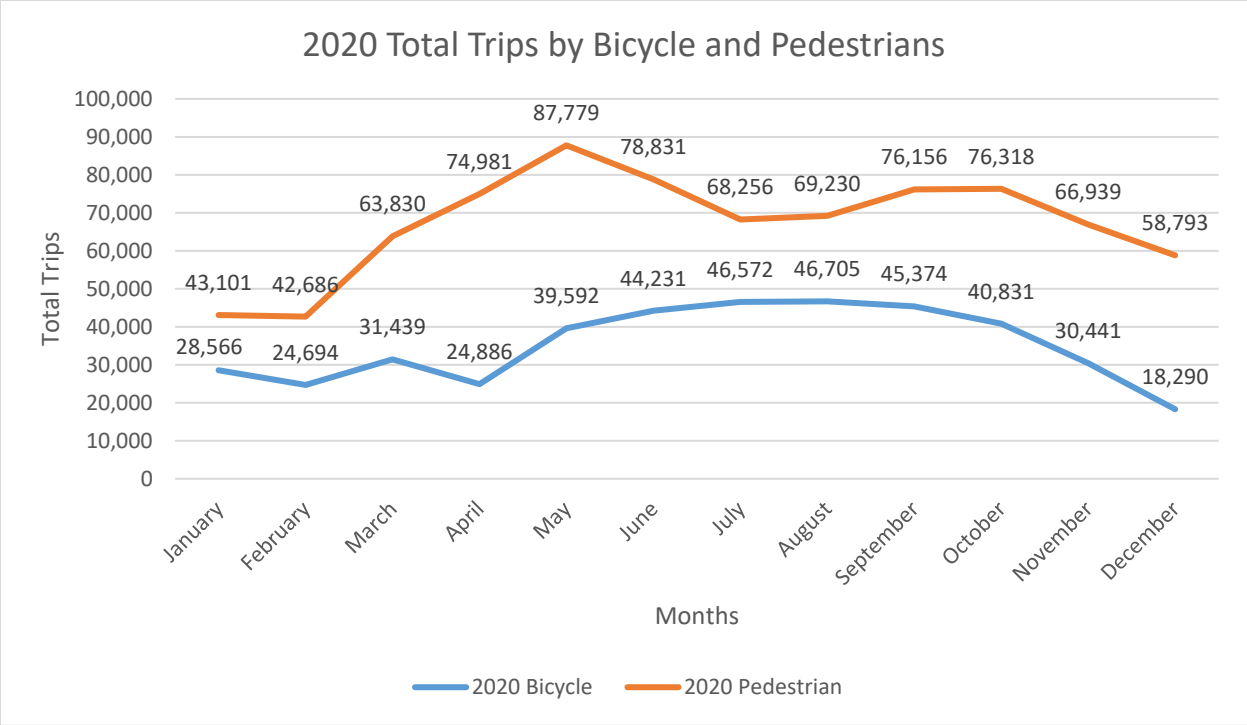

FIGURE 10: STRAVA METRO TOTAL BICYCLE AND PEDESTRIAN TRIPS AT NAMA IN 2020 (STRAVA, 2019-2020)

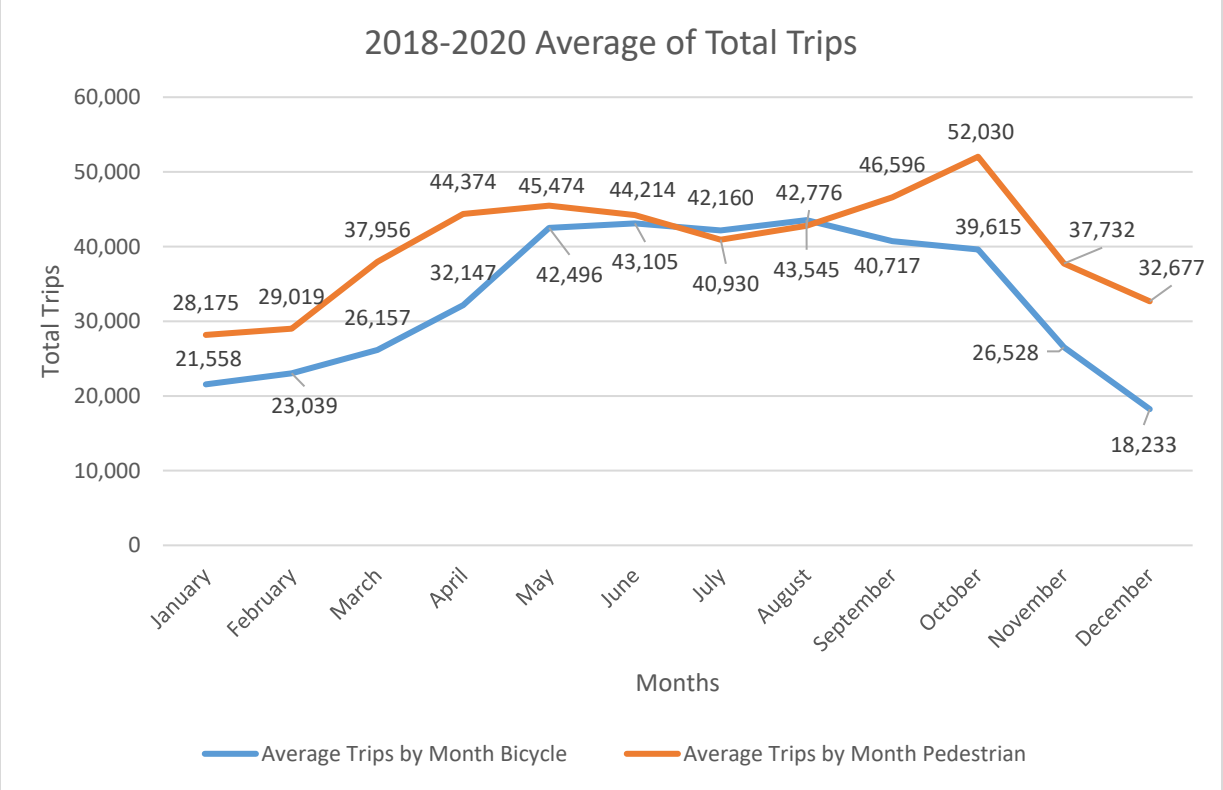

FIGURE 11: STRAVA METRO AVERAGE BICYCLE AND PEDESTRIAN TRIPS AT NAMA FROM 2018 TO 2020 (STRAVA, 2019-2020)

Pedestrian Corridors

Figure 12 depicts a heat map of heavily traveled pedestrian corridors in NAMA and surrounding areas.

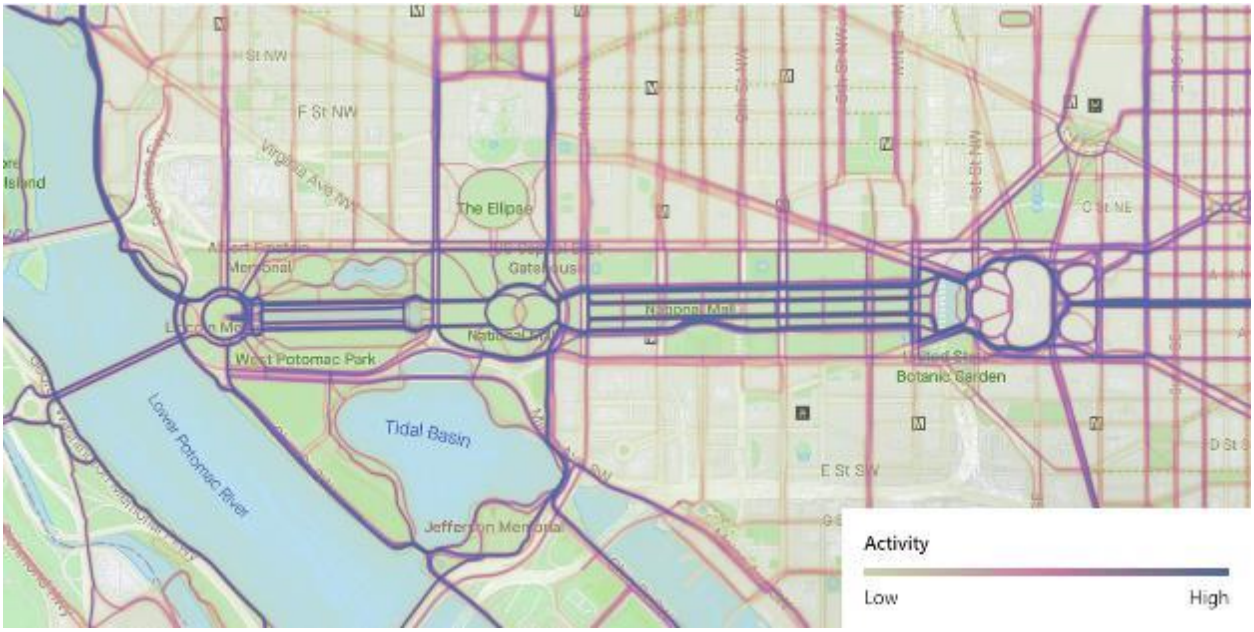

FIGURE 12: EXAMPLE OF STRAVA METRO PEDESTRIAN HEAT MAP OF ACTIVITY LEVELS FOR A PORTION OF THE PROJECT AREA'S PEDESTRIAN CORRIDORS FROM 2019-2020 (STRAVA, 2019-2020)

Pedestrian corridors include (Strava, 2019-2020):

- *Rock Creek and Potomac Parkway to Georgetown*: A heavily traveled 4.6-mile northwestern pedestrian corridor connecting NAMA to Georgetown. This corridor experiences high pedestrian volumes with spikes Tuesday and Thursday, which aligns with the Georgetown University class schedule. Pedestrian travel is the highest from 6:00 AM – 9:00 AM and 4:00 PM – 8:00 PM, consistent with a commuter schedule. Peak volumes show that this corridor is heavily used from April through September, which also aligns with the Georgetown calendar. Due to an increase in tourists the summer months of May, June, and July have the highest volumes over a 12-month period.
- *Independence Avenue Southwest*: A vital 3.4-mile southwest pedestrian loop between East Potomac Park and the National Mall. This corridor experiences the heaviest pedestrian volumes on Saturday and Sunday but sees steady pedestrian travel throughout the week. The highest usage of travel occurs in the month of September with an increase of usage throughout the year.
- *Virginia Avenue Northwest to Whitehurst Freeway*: A heavily traveled 4.8-mile vital pedestrian corridor connecting the Lincoln Memorial with West Potomac Park and Georgetown. This U-shaped connection provides an accessible route from Georgetown to NAMA, across the Arlington Memorial Bridge and north over the Francis Scott Key Memorial Bridge. This corridor experience high pedestrian volumes with the highest volume of travel on Wednesday.

Pedestrian volume is highest over a 12-hour span between 6:00 AM and 6:00 PM. Travel on this corridor is consistent throughout the year but is highest May through October.

- *National Mall, Lincoln Memorial Loop*: A 2.8-mile loop around the Lincoln Memorial. Peak pedestrian volume occurs on Wednesday from 5:00 AM through 8:00 AM. Travel is consistent throughout the year but is highest during October. The Lincoln Memorial sees high volumes of visitors throughout the year and the data shows the likelihood that this corridor is used mostly for leisurely activities and tourist visits throughout the year.
- *National Mall, East-West Corridor*: A 4.3 mile heavily traveled east-west corridor that connects the Lincoln Memorial and the U.S. Capitol. Pedestrian volume is high with a peak on Wednesday. Pedestrian volume is the highest at 6:00 PM but it is used consistently throughout the day. Travel on this corridor is steady throughout the year but is highest May through October.
- *Jefferson Drive Southwest to Madison Drive Northwest*: A 3.1-mile heavily traveled pedestrian corridor that runs west/east and intersects 14th Street Northwest. This corridor connects the Smithsonian station with the Lincoln Memorial and the U.S. Capitol. Pedestrian volume is highest Monday through Friday from 6:00 AM to 9:00 AM, 11:00 AM to 1:00 PM, and 4:00 PM to 7:00 PM, consistent with high levels of commuter travel. Travel on this corridor remains steady throughout the year but is highest April through October.
- *H Street Southeast to New Jersey Avenue Southeast*: A 4.3-mile corridor loop running parallel to Jefferson and Madison Avenues, loops around the U.S. Capitol and travels Southeast down New Jersey Avenue until it intersects the Southeast Freeway. This corridor has high pedestrian volumes with a peak on Wednesday. Pedestrian volume is the highest during the morning rush hour and again during the evening rush hour; travel does occur throughout the day but with much less volume. Travel on this corridor is steady throughout the year but is highest May through October.
- *3rd Street Southwest to the National Mall*: A heavily traveled 2.9-mile pedestrian corridor running west to east parallel down Madison and Jefferson Drive, which connects 3rd Street to the Lincoln Memorial. This corridor experience high pedestrian volume each day b with peaks on Tuesday, Wednesday, and Thursday. Pedestrian volume is consistent throughout the day with spikes at 9:00 AM, 12:00 PM, and 6:00 PM.
- *Pennsylvania Avenue*: A 3.2-mile northwest loop corridor that runs from the Botanical Gardens intersecting Jefferson and Madison Avenues and continuing northwest. Pedestrian volume is the highest at 7:00 AM but the corridor is used consistently throughout the day. The corridor is traveled mostly on Sunday, Thursday, and Saturday.
- *Pentagon Access Road:* A 4.7-mile heavily traveled pedestrian connection that travels southwest between the Pentagon Metrorail, Lincoln Memorial, and West Potomac Park, and connects to the Jefferson and Madison Drives. Peak pedestrian volumes are high Monday through Friday with minimal travel on Saturday and Sunday, consistent with commutes. Pedestrian volume is highest between the morning and evening rush hour.
- *US Marine Corps War Memorial Circle*: A 4.6-mile heavily traveled vital pedestrian connection that travels southwest between the National Mall, Arlington National Cemetery, and U.S.

Marine Corps Memorial in Radnor Heights, VA. This route sees travel around many of the major monuments in the National Mall and continues over the Arlington Memorial Bridge. This corridor experiences high pedestrian volumes with peaks on Tuesday, Wednesday, and Thursday, which is consistent with commutes. This pedestrian volume is highest between the morning and evening rush hours and is highest April through November.

- *North Lynn Street*: A 3.6-mile pedestrian corridor that connects George Washington University, Potomac Park, Georgetown University, and the National Mall. Peak pedestrian volume occurs 7-days a week but is highest Tuesday and Thursday. Travel on this corridor is consistent throughout the year but is highest April through November.
- *Theodore Roosevelt Island*: Theodore Roosevelt Island is an 88.5-acre island and a National Memorial located in the Potomac River in D.C. This island cannot be accessed by motorized vehicles, such as cars or motorcycles. Strava data shows that this island is used mostly as a weekend tourist attraction. Peak travel is highest on Saturdays.

Bicycle Corridors

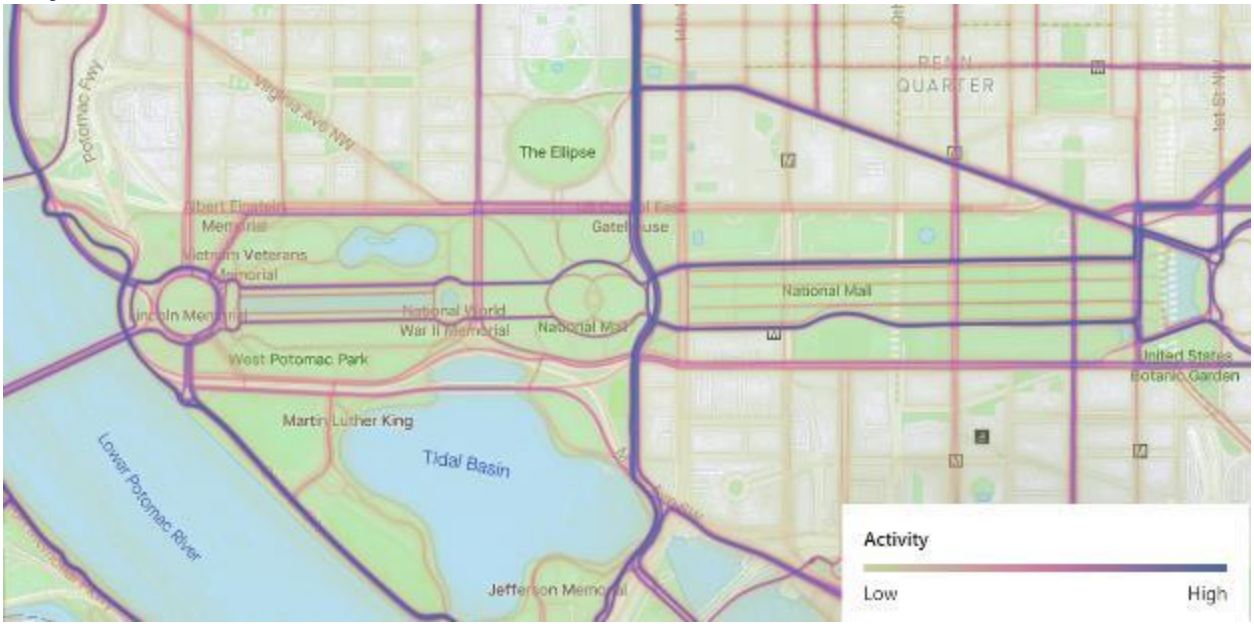

FIGURE 13: EXAMPLE OF STRAVA METRO BICYCLE HEAT MAP OF ACTIVITY LEVELS FOR A PORTION OF THE PROJECT'S BICYCLE CORRIDORS FROM 2019-2020 (STRAVA, 2019-2020)

Figure 13 depicts a heat map of heavily traveled bicycle corridors in the National Mall and surrounding areas. These corridors include (Strava, 2019-2020):

- *Madison Drive Northwest to Foggy Bottom*: A 4.7-mile heavily traveled bicycle corridor that runs west on Madison Drive and connects the US Capitol to the Lincoln Memorial, Potomac Park, Potomac River and Georgetown University. Peak travel time occurs between 8:00 AM and 10:00 AM. This corridor experiences high volumes of bicyclists with peaks on Tuesday, Wednesday, and Thursday. Travel on this corridor is steady throughout the year but is highest from May through August.

- *North Queen Street to Constitution Avenue*: A 4.4-mile heavily traveled bicycle corridor that runs East/West adjacent to Constitution Avenue crossing the Arlington Bridge and connecting with Arlington National Cemetery. Peak travel occurs Monday through Friday. This corridor sees its highest volume of travel between 8:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, consistent with the commuter schedule. Travel volumes show that this corridor is heavily used from March through November. Weather likely plays a factor in the limited travel during the winter months.
- *Ohio Drive Southwest*: A 4.1-mile heavily traveled bicycle loop that runs from East Potomac Park and connects to the Lincoln Memorial. Travel on this corridor is mostly Monday through Friday with a few Saturday trips. Travel mostly occurs from 7:00 AM to 10:00 AM and in the evening from 5:00 PM to 7:00 PM.
- *Maine Avenue Southwest to Virginia Avenue Northwest*: A 4.4-mile heavily traveled northwest commuter corridor that runs adjacent to Independence Avenue and connects the Southwest Waterfront, Jefferson Memorial, Lincoln Memorial, and the Potomac Waterfront. Increased travel occurs Monday to Friday from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, consistent with the commuter schedule. Saturday trips indicate that this corridor offers users some opportunity for leisure activities. The corridor has the highest volume in the early spring months.
- *Virginia Avenue Northwest to Jefferson Drive Southwest*: A 4.9-mile heavily traveled east/west corridor that connects the Lincoln Memorial, National Mall, and the U.S. Capitol to Virginia Avenue NW. This connection runs adjacent to Madison Drive. The highest volume occurs Monday through Friday from 4:00 PM to 6:00 PM. Travel on this corridor is steady throughout the year but is highest from May through August.
- *I Street Southeast to Downtown*: A 3.1-mile commuter corridor that connects the White House to the Southeast Waterfront. The route begins on 4th Street and runs north on I Street, West on Madison Drive, and North on 15th Street until it intersects New York Avenue. This corridor is heavily traveled Monday through Friday at 9:00 AM. Occasional Saturday trips outlines leisurely travel by tourists as it provides an easy connection from the White House and National Mall to areas south of the study area. Travel on this corridor is steady throughout the year but sees an increase in travel levels during the summer months, consistent with bicycle levels throughout the year.
- *Pennsylvania Avenue Northwest to I Street Southeast*: A 3.1-mile heavily traveled commuter corridor that runs East on Jefferson Drive and connects the Southwest Waterfront, National Mall, and the White House. Occasional Saturday trips shows this corridor offers tourists an easy connection from the White House and National Mall to areas south of the study area. Travel on this corridor is steady throughout the year but sees an increase in travel levels during the summer months.
- *Daniel French Drive Southwest to Columbia Pike*: A two-way 4.8-mile heavily traveled commuter corridor that runs southwest from the Lincoln Memorial to the Pentagon Metrorail crossing the Lower Potomac River via the 14th Street Bridge. This corridor sees its highest volume of travel between 8:00 AM to 10:00 AM and 5:00 PM to 8:00 PM, consistent with the

commuter schedule. Travel volumes show that this corridor is heavily used throughout the year but sees its highest volumes during the winter and spring months.

- *Virginia Avenue Northwest to Blair Alley Southwest*: A two-way 3.8-mile heavily traveled commuter corridor that runs northwest along the Potomac River from the Jefferson Memorial to Georgetown University. This corridor sees its highest volume of travel between 8:00 AM to 10:00 AM and 5:00 PM to 8:00 PM, consistent with the commuter schedule. Travel on this corridor is Monday through Friday with the highest volumes occurring on Friday. Travel volumes show that this corridor is heavily used from April through August. Heavy leisure usage during the summer months likely explains the increase in volume during the summer months.

Bicycle Count Data

DDOT maintains a system of automated counters to measure the number of people walking and biking. DDOT began installing these counters in 2014, and they have been installed in both bicycle lanes and trails. DDOT monitors the continuous data stream to analyze trends in walking and biking, assess the value of its facility investments, and apply this data to plan for new bike lanes and trails (DDOT, 2022). The bicycle counters relevant to the study areas include: (1) 15th Street NW between N Street and Rhode Island Avenue, (2) 11th Street (southbound) between H Street and I Street, and (3) Maine Avenue SW Cycle Track near the intersection of 7th Street. Arlington County in Virginia also monitors bicycle counts in a dashboard; the bicycle counter relevant to the study includes: (4) 14th Street Bridge (I-395). While these automatic bicycle counters are not located within or directly adjacent to this study's focus areas, they are in close proximity and reveal some information about the volume of bicyclists. Table 3 shows that within D.C. the 15th Street sees approximately 4 times more bicycle traffic than the other D.C. locations and the 14th Street Bridge counter within Arlington County, Virginia see the highest daily average bicycle count of the 4 counters analyzed.

TABLE 3: AUTOMATIC BICYCLE COUNTERS AND DAILY AVERAGE BICYCLE COUNTS

Automatic Bicycle Counter Location	Counter Location in Relation to Focus Areas	Daily Average Bicycle Counts	Data Timeframe
(1) 15th Street NW between N Street and Rhode Island Avenue	Approximately 1.25 miles from the National Mall	1,505	01/2017-01/2018
(2) 11th Street (southbound) between H Street and I Street	Approximately 0.5 miles from the National Mall	269	01/2018-01/2019
(3) Maine Avenue SW Cycle Track near the intersection of 7th Street Cycle Track	Across the Washington Channel from East Potomac Park	372	01/2018-01/2019
(4) 14th Street Bridge (I-395)	At the exit from the bridge into the Vernon Trail in Virginia	2,291	05/2018

In April 2021, a new bicycle-pedestrian counter was activated on the north sidewalk of the Arlington Memorial Bridge. Using this counter data, transportation planners have estimated 80,463 bicyclists and pedestrians were present on the Arlington Memorial Bridge during a month period (April 25, 2021, to

May 25, 2021) or an estimated daily average of 2,596 bicyclists and pedestrians (Arlington County DOT, 2021).

Additionally, DDOT performed an analysis of bicycle and pedestrian flow rates in 2018 through the Signal Optimization Project. The data provided by DDOT includes bicycle and pedestrian flow rates in April 2018 for a 15-minute increment during AM and PM peak hours. The relevant locations of this analysis include: (1) Lincoln Memorial Circle NW and 23rd Street, (2) Lincoln Memorial Circle NW and Henry Bacon Drive, (3) Madison Drive and 15th Street, (4) Jefferson Drive and 15th Street, and (5) Independence Avenue and 14th Street. Table 4 reveals that Independence Avenue and 14th Street have the highest pedestrian flowrates, while 15th Street and Madison Drive and Jefferson Drive have the highest bicyclist flowrates (DDOT, 2018).

TABLE 4: PEAK 15-MINUTE FLOWRATES FOR PEDESTRIANS AND BICYCLISTS

Bicycle and Pedestrian Signal Counting Location	Date of Collection	Peak Time of Collection (15-minute)	Peak Flowrate of Pedestrians	Peak Flowrate of Bicyclists
(1) Lincoln Memorial Circle NW and 23rd Street	April 11, 2018	AM Peak: 8:15-8:30 PM Peak: 5:15-5:30	44 224	19 14
(2) Lincoln Memorial Circle NW and Henry Bacon Drive	April 25, 2018	AM Peak: 8:45-9:00 PM Peak: 5:45-6:00	116 312	11 16
(3) Madison Drive and 15th Street	April 17, 2018	AM Peak: 8:45-9:00 PM Peak: 6:00-6:15	388 424	37 44
(4) Jefferson Drive and 15th Street	April 17, 2018	AM Peak: 8:45-9:00 PM Peak: 6:00-6:15	64 632	29 47
(5) Independence Avenue and 14th Street	April 17, 2018	AM Peak: 8:30-8:45 PM Peak: 5:30-5:45	412 1,076	11 4

Micromobility Data

Capital Bikeshare Data

In September 2010 D.C. and Arlington County launched Capital Bikeshare as one of the first largescale bikeshare systems in North America. In the following years, the system has grown into one of the largest and most popular bikeshare programs in the nation. Capital Bikeshare continues to face challenges and identify opportunities to provide the metro D.C. area with an affordable, safe, convenient, equitable, and sustainable transportation option (Capital Bikeshare, 2020).

In 2020, DDOT published the Capital Bikeshare Plan Update with analyses from bikeshare data from previous years. Table 5 shows that stations within and in close proximity to NAMA are some of the highest performing bikeshare stations (Capital Bikeshare, 2020).

TABLE 5: HIGHEST PERFORMING BIKESHARE STATIONS IN NAMA BY AVERAGE TRIPS PER BIKE PER DAY FROM 2016-2019

Station (To/From)	Average Trips Per Bike Per Day
Lincoln Memorial	5,393
Jefferson Drive at 14th Street SW	4,746
Henry Bacon Dr & Lincoln Memorial Circle NW	4,219
Jefferson Memorial	3,447
17th St & Independence Ave SW	3,347

Figure 14 identifies that, as of June 2021, there are 9 Capital Bikeshare locations within NAMA. The stations identified as the highest performing bikeshare stations are labeled.

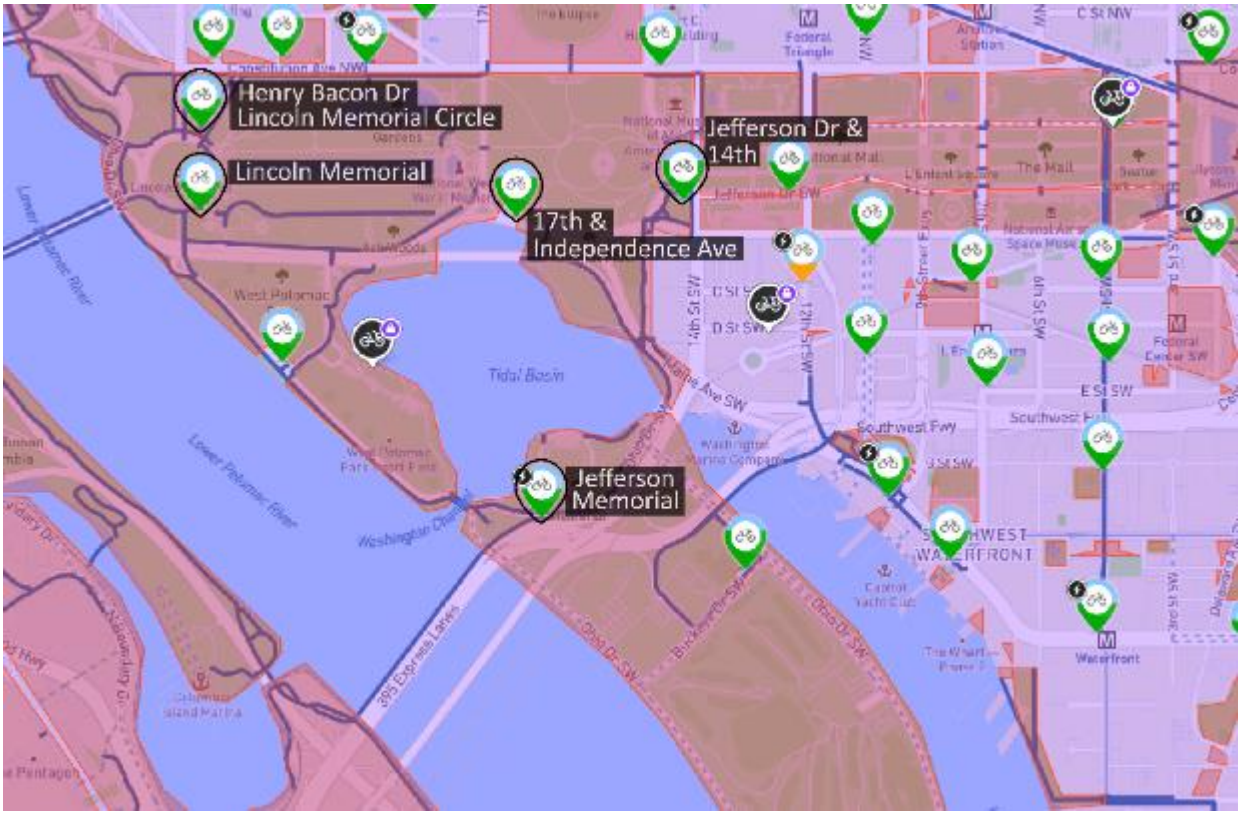

FIGURE 14: CAPITAL BIKESHARE DOCKING LOCATIONS WITHIN NAMA (CAPITAL BIKESHARE, CAPITAL BIKESHARE SYSTEM MAP, 2022)

In 2020, DDOT introduced electric bicycles (e-bikes) into the Capital Bikeshare system. E-bikes are still a fairly new concept in the U.S., so there is some confusion about how the law governs them. Federal law considers electric bicycles in the class as regular bicycles, provided they meet two conditions: (1) the top speed in "electric only" mode is 20 miles per hour; and (2) the motor power must be no more than 750W (Evelo Electric Bicycles, 2022). The following heat maps show the Capital Bikeshare e-bike trips from June 2020 to March 2021, during AM peak hours from 6:00 AM to 10:00 AM, and during PM peak hours from 4:00 PM to 8:00 PM

Figure 15 illustrates that during the AM peak the Lincoln Memorial saw the largest number of trips at the intersection of 23rd Street and Constitution Avenue, the edge of the Reflecting Pool where shared used paths connected with corridors leading to Georgetown, Arlington, and other parts of D.C. Additional intersections with increased ridership were Ohio Drive SW at the Korean War Memorial. During the PM peak the Lincoln Memorial sees an increase in riders across all major connections. The area in front of the Lincoln Memorial and at the intersection of Constitution Avenue and the Vietnam Veterans Memorial see the highest number of e-bike riders.

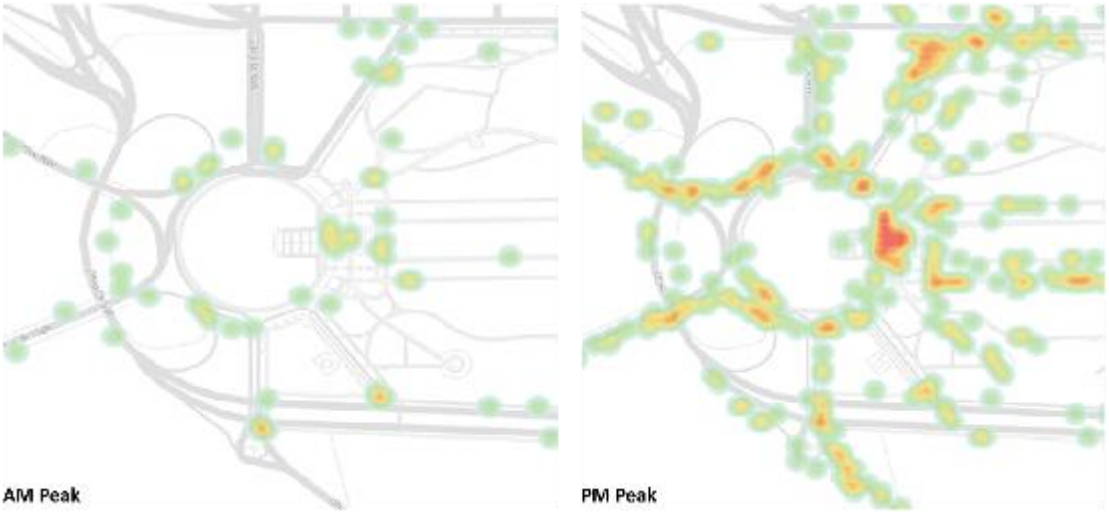

FIGURE 15: CAPITAL BIKESHARE E-BIKE HEAT MAP AT LINCOLN MEMORIAL DURING AM PEAK AND PM PEAK (CAPITAL BIKESHARE, 2021)

Figure 16 illustrates Capital Bikeshare e-bike use at East and West Potomac Park. The heat map shows that e-bike trips during the AM peak are clustered along Maine Avenue SW and 4th Street SW with the largest number of trips along the Southwest Waterfront. The heat map shows that e-bike trips during the PM peak are heavily congregated along Maine Avenue SW and 4th Street SW with the largest number of trips along the Southwest Waterfront.

FIGURE 16: CAPITAL BIKESHARE E-BIKE HEAT MAP AT EAST AND WEST POTOMAC PARK DURING AM PEAK AND PM PEAK (CAPITAL BIKESHARE, 2021)

Figure 17 illustrates Capital Bikeshare e-bike trips at Independence Avenue. During the AM peak, the highest concentration of e-bike riders along Independence Avenue occurs at the intersection at 7th Street and the intersection at 15th Street. This data shows that the connection to Maine Avenue SW has the highest concentration of e-bike riders. During PM peak, a high concentration of e-bike riders can be found at the intersection of Ohio Drive and Independence Avenue and Independence Avenue at 15th Street, which like the AM peak confirms data shows that the connection to Maine Avenue SW has the highest concentration of e-bike riders.

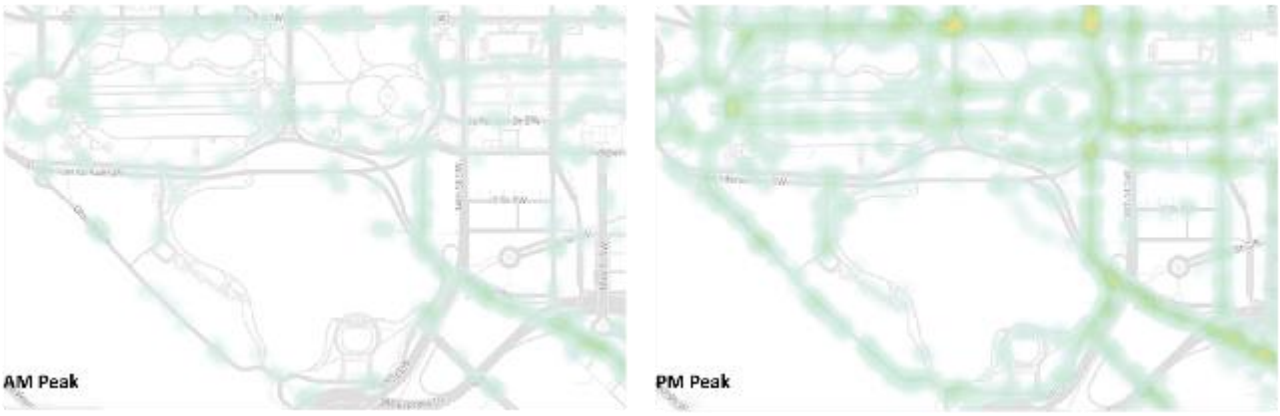

FIGURE 17: CAPITAL BIKESHARE E-BIKE HEAT MAP ALONG INDEPENDENCE AVENUE DURING AM PEAK AND PM PEAK (CAPITAL BIKESHARE, 2021)

Figure 18 illustrates Capital Bikeshare e-bike trips along Madison and Jefferson Drives. The highest concentration of ridership occurs at the intersection of independence Avenue and 9th Street SW during the AM peak. The data shows that this intersection provides the highest concentration of connections to NAMA and other areas throughout the D.C. region. The concentration of riders during the PM peak increases across the entire NAMA area. The highest concentration of riders can be found on 9th Street NW with increases in riders located at the intersections of 9th Street and Independence Avenue, 9th Street and Jefferson Drive, and 9th Street and Constitution Avenue.

FIGURE 18: CAPITAL BIKESHARE E-BIKE HEAT MAP ALONG MADISON DRIVE AND JEFFERSON DRIVE DURING AM PEAK AND PM PEAK (CAPITAL BIKESHARE, 2021)

In 2016, DDOT's Capital Bikeshare program conducted a customer satisfaction survey with the intent to identify customers' satisfaction for the Capital Bikeshare service. Current and former monthly subscribers were targeted for this survey. Survey responses varied and DDOT received a response rate of 18 percent for current monthly subscribers and 2 percent for former subscribers.

Some key takeaways resulted from the survey responses:

- Capital Bikeshare members benefit through easier, faster access to destinations and access to a wider range of destinations.
- The "transit access" role that bikeshare offers expands a user's travel range even further.
- Bikeshare serves both work-related and personal travel needs.
- Bikeshare allows members to get around without the cost and hassle of car ownership and driving.
- Bikeshare members shift some trips to bicycle from other travel modes.
- Bikeshare members who used Capital Bikeshare frequently reported the greatest reduction in use of non-bicycle modes.
- Capital Bikeshare members save on personal travel costs.
- Respondents give high marks to most bikeshare features.
- Nine out of ten Capital Bikeshare members would increase their bikeshare use if bikeshare service was expanded and/or other service enhancements were made (LDA Consulting, 2017).

Dockless Micromobility Data

In 2017, dockless micromobility was introduced into D.C.'s transportation landscape. DDOT uses the term "dockless" to classify any private micromobility services active in D.C., which include electric bikes, conventional bicycles, and e-scooters. Within the D.C. region, E-bikes saw the highest average trip length, 2.5 miles. In 2019, private micromobility companies recorded more than 5 million rented dockless bike and scooter trips in D.C.

Dockless bikeshare trip data reveals that dockless trips concentrate in high casual user markets, such as Downtown and Georgetown. These trips are not easily recorded around NAMA due to the terms of the dockless operator agreements, which do not allow dockless bikeshare trips to end on federal property, including NAMA. While dockless bikeshare trips cannot end within NAMA boundaries, these users may travel through NAMA and this zone is one of the highest performing areas in the United States.

In 2021, NAMA developed an e-scooter pilot parking proposal that includes parking areas primarily at existing bike racks at major destinations in the park.

Commercial Vehicle and Freight Data

NAMA and its surrounding areas have a mix of land uses that can accommodate freight and commercial vehicles. DDOT defines a commercial vehicle is any four-wheeled vehicle that is longer than 22 feet; or used for transporting commercial loads or property; or described as a commercial vehicle on its certificate of title; or has an irremovable commercial advertisement or insignia.

DDOT designated citywide truck and bus routes, which should be used as long as possible until reaching their final destination. Few streets in D.C. are completely restricted to trucks. Except for a few locations near sensitive federal structures, a truck restriction means that the street is closed to through truck traffic, but open to trucks making local deliveries.

Figure 19 illustrates the primary truck routes, truck restrictions, and loading zones for commercial traffic in this study's focus areas.

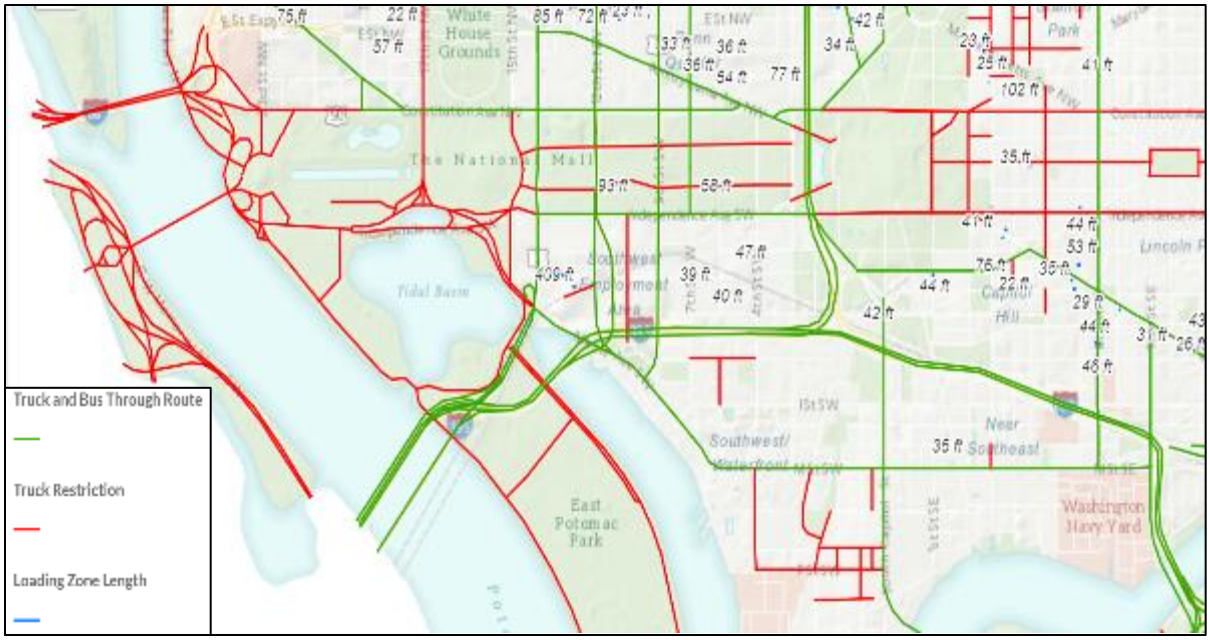

FIGURE 19: MAP OF TRUCK ROUTES, RESTRICTED TRUCK ROUTES, AND LOADING ZONES (DDOT TRUCK AND BUS MAP, 2022).

This map shows that 15th Street, 14th Street, 12th Street and 9th Street are the only zones in NAMA that are designated for commercial traffic, which includes truck and bus through routes. There are truck restrictions across NAMA and related focus areas, which include Madison Drive and Jefferson Drive. The intersections at 15th Street and Constitution Avenue, 14th Street and Constitution Avenue see increased volumes of commercial traffic due to their proximities to loading zones and connections to NAMA. 12th Street is likely to see the highest number of commercial traffic due to its connection with Interstate 395, which can bring commercial vehicles to Arlington, Virginia. Loading zones of 93 feet and 58 feet located on Jefferson Drive provides convenient access for commercial vehicles servicing the adjacent food kiosks (NPS National Mall and Memorial Parks, 2020).

Additionally, DDOT performed an analysis of heavy truck flow rates in 2018 through the Signal Optimization Project. The data provided by DDOT includes heavy truck flow rates in April 2018 for a 15-minute increment during AM and PM peak hours. The relevant locations of this analysis include: (1) Lincoln Memorial Circle NW and 23rd Street, (2) Lincoln Memorial Circle NW and Henry Bacon Drive, (3) Madison Drive and 15th Street, (4) Jefferson Drive and 15th Street, and (5) Independence Avenue and 14th Street. Table 6 shows that Independence Avenue at 14th Street has the highest heavy truck flowrate and 15th Street at both Madison Drive and Jefferson Drive hold the next highest heavy truck flowrates (DDOT-SOP, 2018).

TABLE 6: PEAK 15-MINUTE FLOWRATES FOR HEAVY TRUCKS (DDOT-SOP, 2018)

Heavy Truck Signal Counting Location	Date of Collection	Peak Time of Collection (15-minute)	Peak Flowrate
(1) Lincoln Memorial Circle NW and 23rd Street	April 11, 2018	AM Peak: 8:15-8:30 PM Peak: 5:15-5:30	40 20
(2) Lincoln Memorial Circle NW and Henry Bacon Drive	April 25, 2018	AM Peak: 8:45-9:00 PM Peak: 5:45-6:00	24 12
(3) Madison Drive and 15th Street	April 17, 2018	AM Peak: 8:45-9:00 PM Peak: 6:00-6:15	80 72
(4) Jefferson Drive and 15th Street	April 17, 2018	AM Peak: 8:45-9:00 PM Peak: 6:00-6:15	80 60
(5) Independence Avenue and 14th Street	April 17, 2018	AM Peak: 8:30-8:45 PM Peak: 5:30-5:45	228 168

Bus Route and Parking Data

Bus routes and parking are crucial to effective transportation within NAMA. Buses are restricted from several areas around the park. In particular, the areas south of the intersection at 15th Street and Constitution Avenue is restricted to buses but provides accessible parking that can allow users to access the adjacent museums, amenities, and multimodal options.

Figure 20Figure 20 identifies primary bus routes (green lines), restricted bus routes (pink lines), loading zones (blue lines), bus pick-up and drop-off locations (green squares), and available bus parking spaces (blue circles proportional to the amount of available spaces).

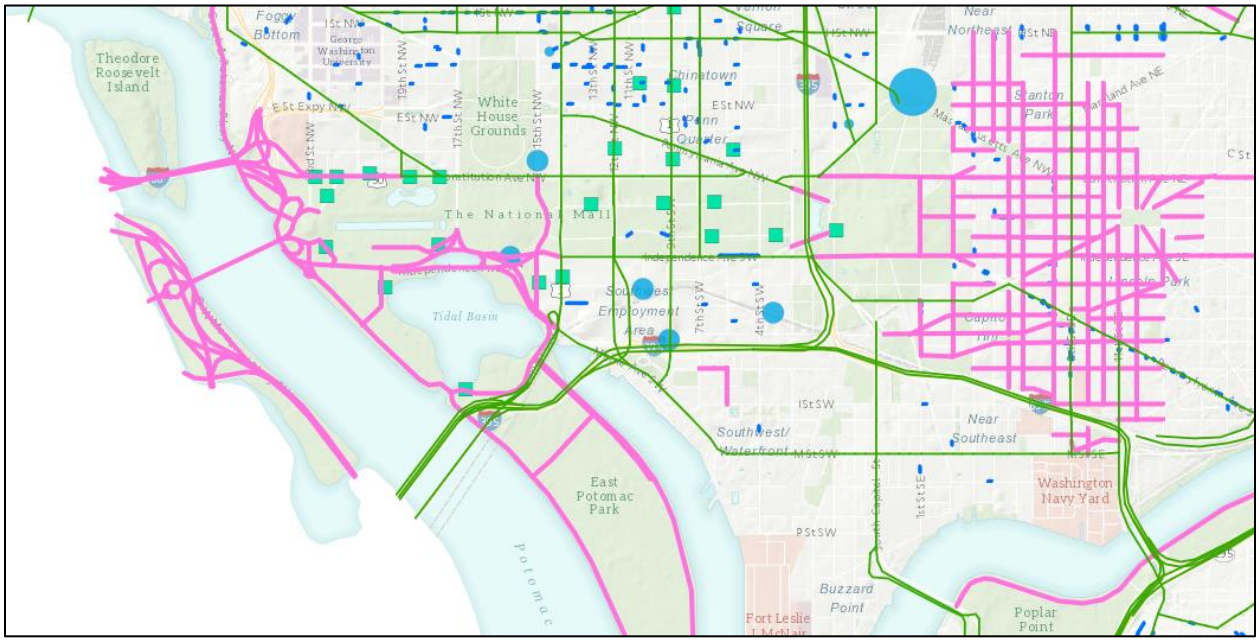

FIGURE 20: MAP OF BUS ROUTES AND PARKING LOCATIONS (DDOT TRUCK AND BUS MAP, 2022)

There are 23 tour bus pickup and drop-off locations located within NAMA. These locations are located conveniently near adjacent monuments, museums, and provides access to convenient multimodal options that can provide visitors alternative options to get around NAMA and the D.C. region.

Bus traffic is heaviest on Constitution Avenue, and the intersections of 14th Street and Constitution Avenue and 12th Street and Constitution Avenue, which is attributed to the high numbers of pickup and drop-off locations and connections to NAMA. 12th Street is likely to see the highest number of commercial traffic due to its connection with Interstate 395, which can bring commercial vehicles to Arlington, Virginia.

An analysis of 2020 curb use geospatial data found that bus parking and use for loading and unloading is found in most of the focus area locations (NPS National Mall and Memorial Parks, 2020):

- **Lincoln Memorial**: bus curb use in the vicinity of Lincoln Memorial includes 6 spaces for tour bus loading and unloading at the Lincoln Memorial north on Henry Beacon Drive (a radial road) on the southwest bound side. South on Daniel French Drive provides 7 additional tour bus loading/unloading spaces. Constitution Avenue, between 23rd Street NW Henry Beacon Drive, has 3 spaces for tour bus loading/unloading during non-rush hour periods.
- **Jefferson and Madison Drives**: bus curb use on Jefferson Drive has approximately 19 tour bus loading/unloading spaces and Madison Drive has approximately 13 tour bus loading/unloading spaces.
- **Independence Avenue**: the 1500 Block of Independence Avenue has 8 curbside bus parking spaces.
- **Long Bridge Bicycle-Pedestrian Bridge Connection**: The Long Bridge bike-pedestrian path will terminate on East Potomac Park land, near NPS Parking Lot C, which will eliminate some existing parking spaces. Currently, there is a bus loading/unloading zone located on the east side of Ohio Drive, just north of the planned bicycle-pedestrian bridge off-ramp. There are no on-road bus parking spaces.
- **East and West Potomac Park**: East Potomac Park has 5 spaces for tour bus loading/unloading at the Thomas Jefferson Memorial on East Basin Drive. Buses also frequently utilize the 479 public parking spaces along Ohio Drive SW, which runs along the outside of both East and West Potomac Park. The four public parking lots located south of the Thomas Jefferson Memorial (Parking Lot A, Parking Lot B, Tennis Court Parking Lot, and Hains Point Parking Lot) together had 315 public parking spaces and 20 spaces for visitors with disabilities. In West Potomac Park, there are 5 spaces for tour bus loading and unloading at the Franklin Delano Roosevelt Memorial/Martin Luther King, Jr. Memorials on West Basin Drive. West Basin Drive also includes 21 public parking spaces and 11 spaces for visitors with disabilities. Ohio Drive SW between the Arlington Memorial Bridge and I-395 had 150 public parking spaces (or 50 curbside spaces for buses) and five parking spaces for visitors with disabilities.

Project Prioritization

Through the review of existing plans and documents, NPS identified a list of over 50 proposed or in progress projects. This list was narrowed down to the highest priority projects to be further developed with conceptual designs as a part of the MSI Plan. In Table 7, the first 5 projects (highlighted in light blue) are the recommended design locations, and the 20 subsequent projects are either directly related to a specific design location or are general goals that apply to the design locations.

TABLE 7: PROJECTS PRIORITIZED FOR THE NAMA MSI PLAN.

Focus Area	Projects	Source	Status	MSI Plan Priority
Lincoln Memorial Circle	**Design Location A:** Redesign and improve bicycle and pedestrian connections to the Arlington Memorial Bridge within the Lincoln Memorial Circle.	NPS identified through planning documents and studies and field observations	Not yet started	***High, Recommended Design Location***
Jefferson and Madison Drives	**Design Location B:** Redesign and improve bicycle and pedestrian facilities on Madison Drive, between 12th and 15th Streets. This effort should balance tour bus loading, unloading, and parking, as well as any truck delivery needs. This design work could be applied across the corridors of Madison and Jefferson Drives.	NPS identified through planning documents and studies and field observations	Not yet started	***High, Recommended Design Location***
East Potomac Park (and West Potomac Park)	**Design Location C:** Redesign and improve bicycle and pedestrian facilities at Hains Point. The segment of Ohio Drive, from the start of the one-way loop towards Hains Point, could be applied across the corridor.	NPS identified through planning documents and studies and field observations	Not yet started	***High, Recommended Design Location***
East Potomac Park (and West Potomac Park)	**Design Location D:** Redesign and improve bicycle and pedestrian facilities at Ohio Drive, from Inlet Bridge (a.k.a. "Ohio Drive Bridge") traveling north towards West Basin Drive. Accommodate tour bus parking. This design work could be applied across the corridor and should be holistically developed to create a continuous and cohesive bicycle and pedestrian experience.	NPS identified through planning documents and studies and field observations	In progress	***High, Recommended Design Location***
Long Bridge bicycle/Pedestrian Bridge Connection	**Design Location E:** Redesign and improve bicycle and pedestrian facilities on Ohio Drive at the connection to the future Long Bridge Bicycle-Pedestrian Bridge.	NPS identified through planning documents and studies and field observations	Not yet started	***High, Recommended Design Location***

Focus Area	Projects	Source	Status	MSI Plan Priority
Lincoln Memorial Circle	Lincoln Memorial Circle (East and South) are identified as proposed permitted e-scooter parking locations. At Lincoln Memorial Circle East, the proposal includes a VVM kiosk bike rack. At Lincoln Memorial Circle South, the proposal includes two bike racks.	(NPS National Mall and Memorial Parks, 2021)	In progress; Pilot program occurring April-May 2021.	*High, categorized under Design Location A*
Lincoln Memorial Circle	At Arlington Memorial Bridge, investigate application for pavement wayfinding (eastbound), investigate feasibility of installing advance pedestrian crossing signs, and replacing rumble strips.	(Paul S. Sarbanes Transit in Parks Technical Center, 2014)	Not yet started	*High, categorized under Design Location A*
Lincoln Memorial Circle	At Parkway Drive, restripe crosswalk markings according to DDOT standards, replace rumble strips, and install pedestrian signs and crossing signs for eastbound and westbound traffic.	(Paul S. Sarbanes Transit in Parks Technical Center, 2014)	In progress; the crosswalk restriping has been completed.	*High, categorized under Design Location A*
Lincoln Memorial Circle	Perform a study to install signals, signage, and pavement markings that improve pedestrian and bicycle crossings.	(Paul S. Sarbanes Transit in Parks Technical Center, 2014)	Not yet started	*High, categorized under Design Location A*
Jefferson and Madison Drives	Madison Drive between 12th and 14th Streets, and at 9th Street: Allocate supplemental seasonal loading/unloading and parking spaces on north side of Madison Avenue; add seasonal loading/unloading and parking spaces on south side of Constitution Avenue; develop and install standard regulatory signs; standardize and coordinate enforcement.	(NPS, 2015)	Unknown	*High, categorized under Design Location B*
Jefferson and Madison Drives	Jefferson Drive at 7th Street: Allocate supplemental loading/unloading and parking spaces directly south of the museum on Independence Avenue; develop and install standard regulatory signs; standardize and coordinate enforcement	(NPS, 2015)	Unknown	*High, categorized under Design Location B*

Focus Area	Projects	Source	Status	MSI Plan Priority
Long Bridge bicycle/Pedestrian Bridge Connection	Connect the 14th Street Bridge to a proposed off-road facility on Boundary Channel Drive and connect Boundary Channel Drive to Long Bridge Drive.	(NPS, 2016)	In progress	*High, categorized under Design Location E*
Long Bridge bicycle/Pedestrian Bridge Connection	Support public access to, and along, regional waterfronts along the Potomac River, Anacostia River, and other tributaries. In particular, work with federal and local governments as necessary to: • Avoid creating physical barriers to the waterfront. • Design and locate bridges to minimally affect local riverine habitat, waterways, Shorelines, and valleys. • Improve wayfinding, signage, and pedestrian amenities on streets that lead to parks.	(NCPC, 2020)	In progress; Long-term goal	*High, categorized under Design Location E*
East Potomac Park (and West Potomac Park)	Redesign and restripe the tour bus drop off area at Thomas Jefferson Memorial for better pedestrian circulation.	(NPS, 2010)	Unknown; Recommendation likely superseded by 2015 Tour Bus Study recommendation	*High, categorized under Design Location D*
East Potomac Park (and West Potomac Park)	Support public access to, and along, regional waterfronts along the Potomac River, Anacostia River, and other tributaries. In particular, work with federal and local governments as necessary to: • Avoid creating physical barriers to the waterfront. • Design and locate bridges to minimally affect local riverine habitat, waterways, Shorelines, and valleys. • Improve wayfinding, signage, and pedestrian amenities on streets that lead to parks.	(NCPC, 2020)	In progress; Long-term goal	*High, categorized under Design Location C and D*
East Potomac Park (and West Potomac Park)	On West Basin Drive (at the FDR and MLK Memorials): Reallocate and accommodate tour bus loading/unloading, tour bus parking, private vehicle parking, parking for individuals with disabilities, NPS visitor transit, permit parking and local sightseeing buses to be responsive to seasonal modal surges; explore best uses for FDR one-way circle road; develop and install standard regulatory signs; standardize and coordinate enforcement.	(NPS, 2015)	In progress; Part of the re-pavement project in 2021.	*High, categorized under Design Location D*

Focus Area	Projects	Source	Status	MSI Plan Priority
East Potomac Park (and West Potomac Park)	Hains Point: Reallocate and separate usage areas; increase the number of tour bus parking spaces by allowing tour bus parking within the private vehicle area during peak season; clearly demarcate tour bus parking; install parking meters; develop and install standard regulatory signs; standardize and coordinate enforcement	(NPS, 2015)	Unknown	*High, categorized under Design Location C*
East Potomac Park (and West Potomac Park)	Better incorporate bicycle and pedestrian traffic at Hains Point.	NPS recommendation	Not yet started	*High, categorized under Design Location C*
East Potomac Park (and West Potomac Park)	West Basin Drive is identified as a proposed permitted e-scooter parking location. The proposal includes one bike rack and one hardscape.	(NPS National Mall and Memorial Parks, 2021)	In progress; Pilot program occurring April-May 2021	*High, categorized under Design Location D*
East Potomac Park (and West Potomac Park)	The FDR Memorial (South) is identified as a proposed permitted e-scooter parking location. The proposal includes one bike rack.	(NPS National Mall and Memorial Parks, 2021)	In progress; Pilot program occurring April-May 2021	*High, categorized under Design Location D*
East Potomac Park (and West Potomac Park)	Hains Point Playground in East Potomac Park is identified as a proposed permitted e-scooter parking location. There is no bike rack on site.		In progress; Pilot program occurring April-May 2021	*High, categorized under Design Location C*
Jefferson and Madison Drives	Improve the pedestrian circulation system and better connect the Washington Monument, and museums and other areas adjacent to the Mall.	(NPS, 2010)	In progress	*High, general goal*
Jefferson and Madison Drives	Provide strategic multimodal street connections or extensions to adjacent streets or the local street grid to and through installations to provide a continuous transportation network.	(NCPC, 2020)	Unknown; Long-term goal	*High, general goal*
Jefferson and Madison Drives	Create accessible routes; locate and design appropriate amenities, including retail, to be accessible to the local community, where possible.	(NCPC, 2020)	Unknown; Long-term goal	*High, general goal*
Jefferson and Madison Drives	Reduce vehicle travel lanes for ease of pedestrian crossing.	(Nelson\Nygaard, 2020)	Not yet started; Long-term goal	*High, general goal*
Other Transportation Issue Areas	Improve walkability and access to key destinations within the monumental core and downtown by enhancing the pedestrian quality of secondary and tertiary connections within and around the monumental core, such as 23rd Street, NW; 20th Street, NW; 12th Street, NW; 10th Street, NW; and 7th Street, NW.	(NCPC, 2020)	Unknown; Long-term goal	*High, general goal*

Design Analysis Overview

From the project prioritization list in Table 7, NPS park staff identified the appropriate design locations that fell within four of the five focus areas (see Figure 21). These design locations were indicative of many of the safety concerns that are present along corridors within NAMA. In addition, the design team considered the existing network, which can be seen in Figure 22.

The design team discussed each design location with NPS park staff in depth to develop conceptual solutions that considered the constraints of park policies, the park's context, and visitor and roadway user needs.

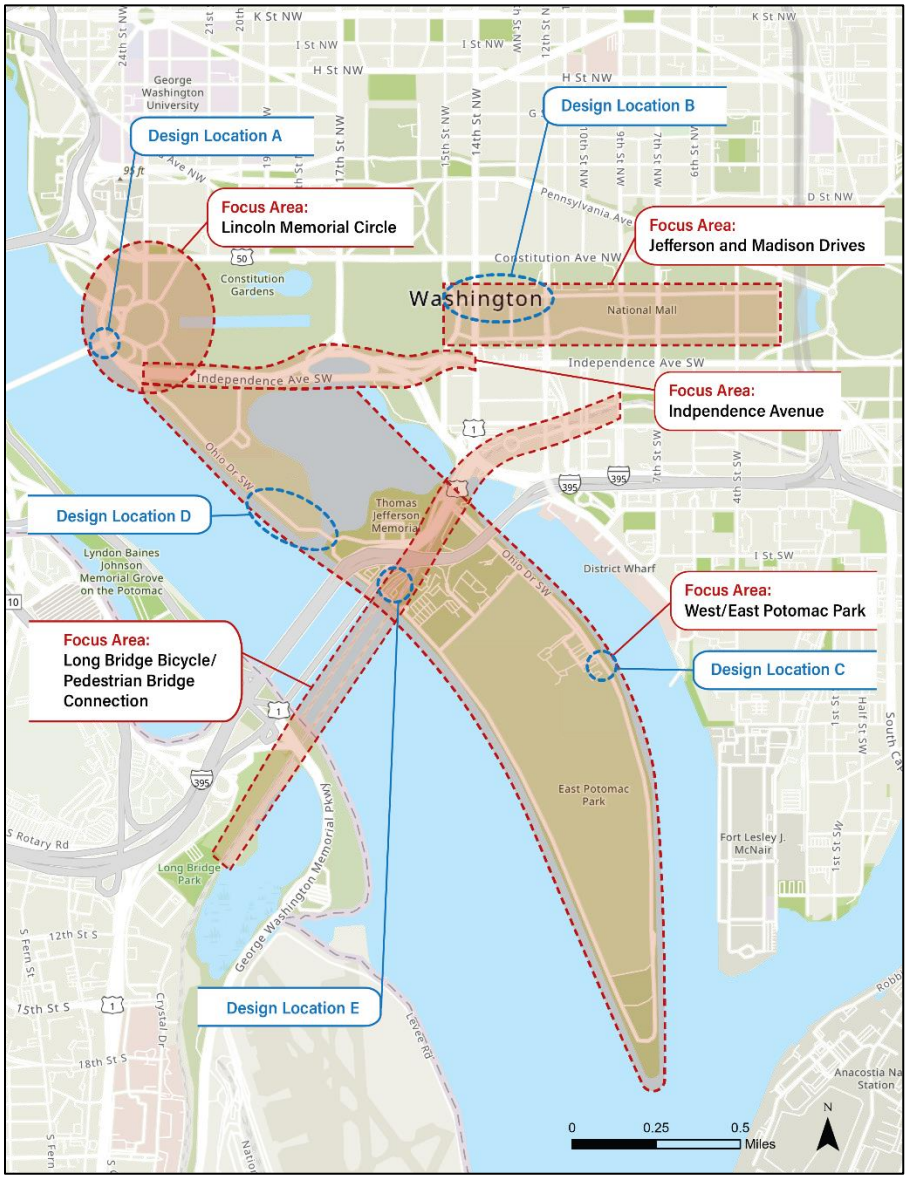

FIGURE 21: MAP OF FOCUS AREAS WITH COINCIDING DESIGN LOCATIONS.

FIGURE 22: MAP OF EXISTING BICYCLE ROUTES AND NETWORK IN NAMA (DDOT, BICYCLE LANES, 2022)

Roadway User Types

The team relied on a framework of typical roadway users to inform design concepts. The team utilized four personas, or fictional characters that represent larger user groups, developed by DDOT for the 15th Street Cycletrack project (see Figure 23). These user groups include:

- Pedestrians: Need dedicated pedestrian facilities to avoid conflicts with scooters and bicyclists on sidewalks and paths. Dedicated pedestrian facilities should connect people to transit access points.

- Bicyclists: Need dedicated bicycle facilities on roadways and connecting with off-street paths to avoid conflicts with motor vehicles. New facilities should consider the needs of novice bicyclists and other micromobility users, as well as experience, fast-traveling bicyclists.
- Motorists: Need clear infrastructure that simplifies and clarifies allowable movements, and separates non-motorized modes from vehicle travel.
- Visitors: Need clear communication and convenient routes to reach both familiar and unfamiliar destinations.

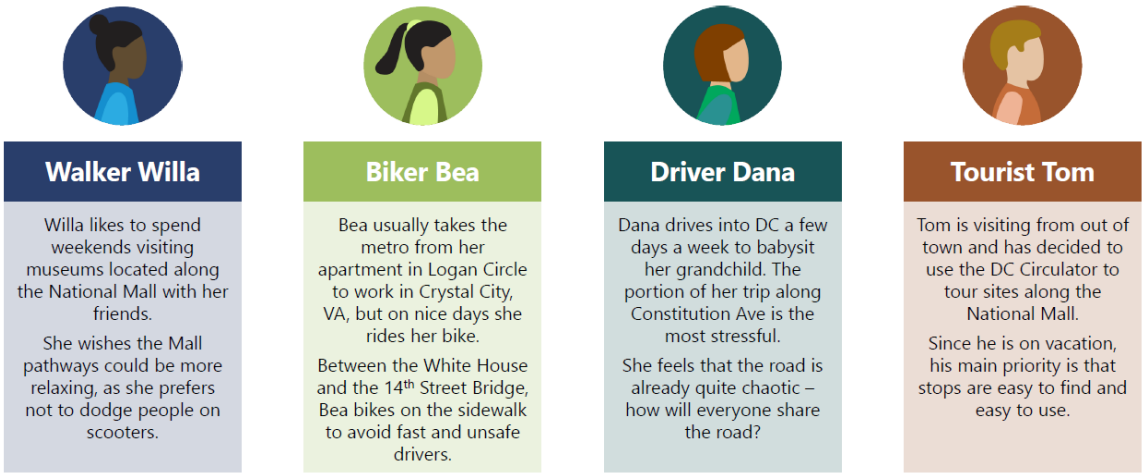

FIGURE 23: PERSONAS DEVELOPED FOR DDOT PRESENTATION OF THE 15TH STREET CYCLETRACK PROJECT (DDOT, 2021)

Considerations for Design Implementation

Most of the design locations have two concepts: the first concept could be implemented in a fairly short timeframe and at a lower cost than the second concept, which is more complex and could be implemented over a longer timeframe and at a higher cost. Implementation of a design concept will require NPS to continue their collaboration with stakeholders, such as DDOT, the Smithsonian Institution, etc., to engage with the public, and to develop preliminary engineering designs. NPS will consider relevant project timelines to correctly program these projects.

Design Location Analysis

For each design location, this report identifies issues, discusses potential interventions presented by stakeholders, and then provides detailed information for each concept (and options, if applicable).

The detailed information provided for concepts and options includes a preview image of the conceptual design and a table of information. Readers are encouraged to explore the Appendix that contains high resolution images of the concept design concepts.

Within each concept's table, the implementation row includes high level cost information, which is based on the level of analysis and the complexity of construction and installation. This row also discusses compliance with the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA). This plan attempts to base all concepts on the previous EIS (2010 NAMA Plan), but in some locations Environmental Assessments (EAs) may be necessary to advance some project elements. The public will likely expect an opportunity to review and comment on concepts, as was the

case with the DDOT project on 15th Street Cycletrack. Public comment is an important step to building support for projects and understanding the tradeoffs between certain concepts that can help with project implementation.

Design Location A

This project includes the redesign and improvement of bicycle and pedestrian connectivity for the Arlington Memorial Bridge at the Lincoln Memorial Circle.

Issue Identification

The Arlington Memorial Bridge at Lincoln Memorial Circle does not provide pedestrians, bicyclists, and other micromobility users with a connection to cross the bridge and access either the north or south side of the bridge. While it is a short distance, there are several car lanes with vehicles travelling at high speeds and no crosswalks for safe crossing between the north and south sides of the bridge. Tourists, unfamiliar with the area, tend to cross the roads intuitively and when they see a place that they would like to visit, they cross the street, rather than navigating the crosswalks and the built environment. There is a need to help all users more safely navigate this space, especially in accessing and riding Capital Bikeshares, which is heavily used in this area.

For Design Location A, the design team presented two different concepts that aim to improve connectivity across Arlington Memorial Bridge. These design concepts also include four additional options that will improve safety for all modes and provide a better connected network for bicyclists, pedestrians and other micromobility users. Figure 24 illustrates both concepts with all options as a part of the complete geography of Design Location A.

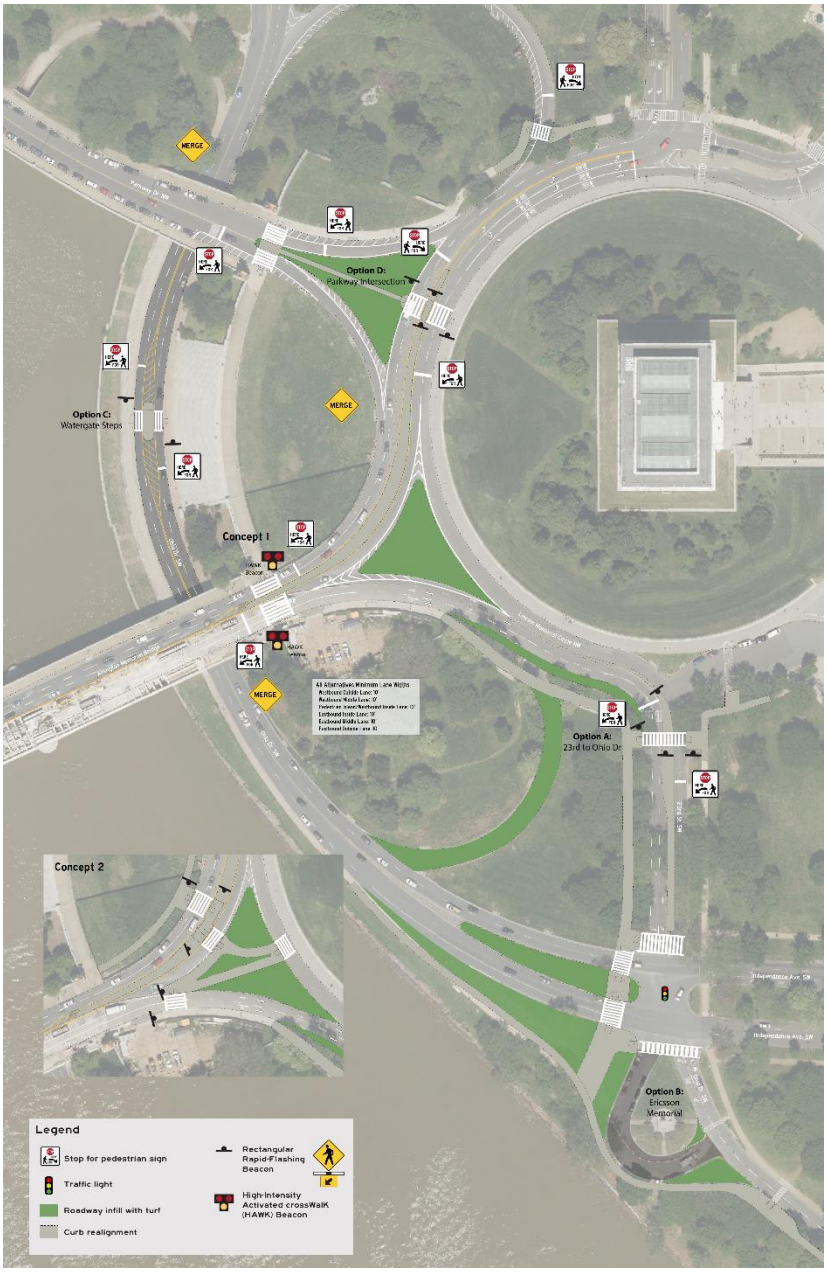

FIGURE 24: LOCATION A'S DESIGN FOR ALL CONCEPTS AND OPTIONS (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

Preliminary Stakeholder Feedback

As a part of stakeholder discussions, participants identified several potential interventions that could be used to improve connectivity at the Arlington Memorial Bridge and Lincoln Memorial Circle. Not all of the stakeholder feedback was incorporated into the design concepts, but each suggestion was considered and recorded; these include:

- **Install a signalized intersection across the Arlington Memorial Bridge**: a signalized intersection could provide pedestrians and bicyclists a designated time to cross the bridge, which would provide safe crossing.

    - Consider the examples of Ward Circle around American University and of Chevy Chase Circle. These locations have signalized intersections that are sensitive to the cultural resources in the area.
    - Consider the example of DDOT's Douglas Bridge project shows how a traffic circle also contains a bike path. In this example, the bike paths continue seamlessly.
- **Improve Bicycle and Pedestrian Crossing Infrastructure**: improve the bicycle and pedestrian connections leading up to the crossing at Arlington Memorial Bridge.
    - Utilize the grassy triangles along Lincoln Memorial Circle to provide passage across the Arlington Memorial Bridge; the design must consider impacts to the cultural landscape.
    - Implement lane reductions for unsignalized crosswalks to create single-lane crossing areas in some places.
    - Create a refuge island where the third lane of traffic is currently to provide a safe space for pedestrians and bicyclists as they cross the intersection.
    - Eliminate the Parkway Drive ramp that is located west of 23rd Street that enters the Lincoln Memorial Circle, which would stop traffic from Parkway Drive NW entering the Arlington Memorial Bridge. This would decrease the traffic movements that bicyclists and pedestrians would need to cross within the circle. Parkway Drive does not serve a major vehicle purpose and may not require access to Lincoln Memorial Circle.
- **Slow Traffic**: improve pedestrian and bicycle travel by designing roadways that decrease the speeds of motorized vehicles.
    - Continue to use rumble (or mumble) strips on bridge to slow traffic.
    - Reduce lanes of travel in Lincoln Memorial Circle and Arlington Memorial Bridge.
    - Eliminate the connection of Parkway Drive NW to Lincoln Memorial Circle.

Proposed Concepts

Location A provides two concepts, with four options that could be implemented with either concept. The primary differences between these concepts and design options are the length of time that it would take to implement them, the cost, and feasibility. The more complex set of concept and options provides more enhances vulnerable road user safety and access prioritization. Both concepts' design objectives include:

- Minimize conflicts between modes.
- Improve safety for pedestrians, bicyclists, micromobility users, and other vulnerable road users.
- Improve the area around the Lincoln Memorial Circle, using designs of Option A, B, C, and D, as optional designs that will create a more streamlined travel experience for motorists, pedestrians, bicyclists, and other users. Either concept should incorporate these options to enhance the cohesiveness of the travel experience.

The concepts' design rationales include:

- High volumes of pedestrians, bicyclists, micromobility users, and other vulnerable road users that require physical separation from high-volume and/or high-speed vehicular traffic.
- High travel speeds and vehicle congestion of motor vehicles that require roadway improvements for safety and efficiency.

- Lack of connectivity with crosswalks for bicyclists and pedestrians to the National Mall and other nearby areas of interest.
- Lack of signage and road markings that enhance the safe and efficient movement of bicyclists, pedestrians, and road users.
- Lack of High-Intensity Activated crosswalk (HAWK) beacons, Rectangular Rapid Flashing Beacons (RRFB), and other pedestrian safety features.

Table 8 compares the level of multimodal safety for each key design element as a part of Location A's existing configuration, concept 1, and concept 2. Dark green signifies a high level of safety, light green signifies a medium level of safety, and no color signifies low level of safety.

TABLE 8: COMPARISON OF PROPOSED INTERVENTIONS FOR LOCATION A'S EXISTING CONFIGURATION, CONCEPT 1, AND CONCEPT 2

Key Design Elements	Existing Configuration	Concept 1 with Options	Concept 2 with Options
High visibility crosswalks	None	**High**	**High**
Wide sidewalks	**High**	**High**	**High**
Improved pedestrian warning signage	None	**High**	**High**
High-Intensity Activated crossWalK (HAWK) Beacon	None	**High**	None
Rectangular Rapid Flashing Beacon (RRFB)	None	None	**Medium**
Improved pedestrian warning signage	None	**High**	**High**
High visibility road markings	**Medium**	**High**	**High**
Minimum 10' lane width	**Medium**	**High**	**High**
New sidewalks or paths for pedestrians and bicyclists	None	None	**High**

Concept 1

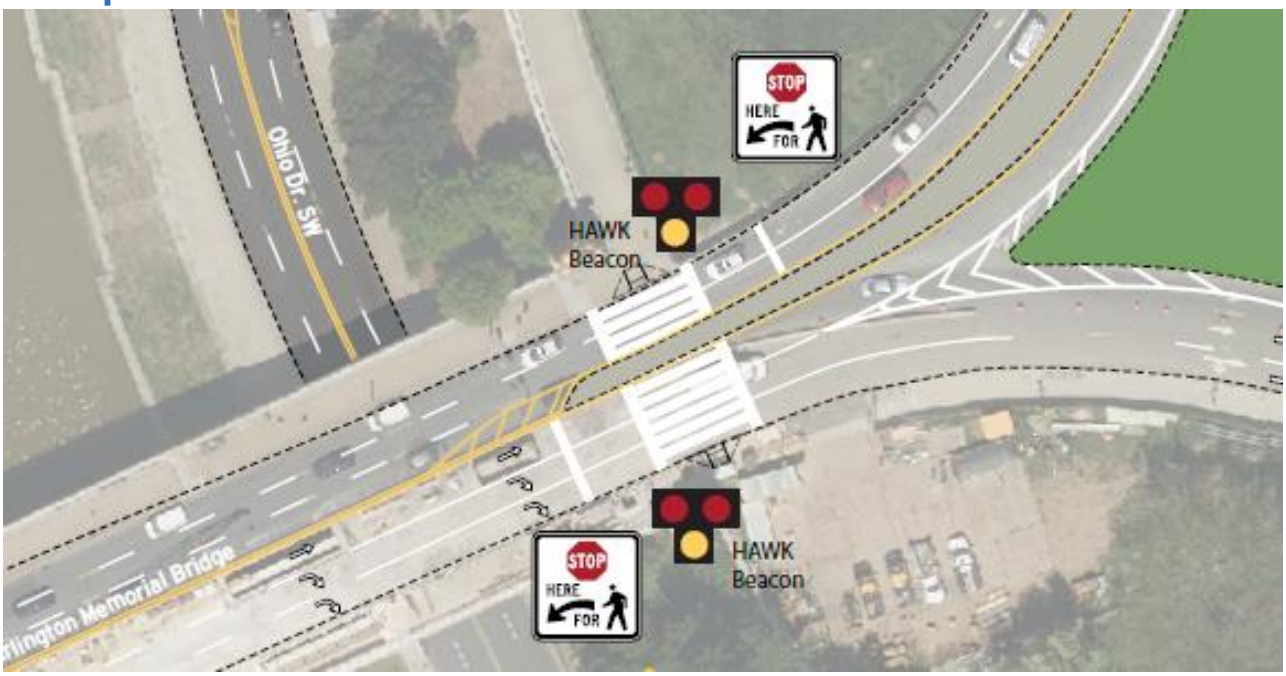

FIGURE 25: LOCATION A'S DESIGN CONCEPT 1 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION A, LINCOLN MEMORIAL CIRCLE	CONCEPT 1
MAJOR ADDITIONS:	Pedestrian Infrastructure: • Install a HAWK beacon. • Install a high visibility crosswalk, which are 10 foot in width and ADA accessible. • Install a 10 foot in diameter pedestrian refuge island. • Improve curb cuts for bicycle, pedestrians, and other vulnerable road users. Vehicle Movement Infrastructure: • Install highly visible traffic lane markings that will direct traffic around the Circle. • Reduce number of vehicular lanes with the installation of pedestrian refuge island. Signage Enhancements: • Install "Stop Here for Pedestrian" signs Additional Options: • This concept is paired with four additional design options to enhance the functionality of the right-of-way. To ensure the improvement of safety and connectivity, the following options should be considered for implementation. These options are supplements to Concept 1 and will create a cohesive travel experience. o Option A: 23rd to Ohio Drive o Option B: Ericsson Memorial o Option C: Watergate Steps o Option D: Parkway Intersection
MAJOR REMOVALS:	• One vehicular travel lane heading North around the Circle towards the Georgetown neighborhood. • Painted curbs were replaced with a pedestrian island and extended curb cuts.
IMPLEMENTATION:	• Moderate cost ($$): Moderate costs associated with construction of curbs, installation of HAWK beacon, construction of pedestrian refuge island, and traffic rerouting, in addition to lower-cost design interventions. • Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[6] NPS should also consider Section 106 of NHPA for this design location.
TIMEFRAME:	• Medium term: these interventions must undergo a traffic analysis before they are designed and installed.

ITEMIZED LIST:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• HAWK Beacon:
	  ○ 2 pedestrian signs
	  ○ 2 flashing lights
	  ○ 1 large post over entire crossing
	  ○ 2 pedestrian actuated signal buttons
	• Pedestrian Island: 10 foot width
	• Crosswalk: 1 unit, approximately 50 feet
	• Stop Here for Pedestrian signs: 2 signs

Concept 2

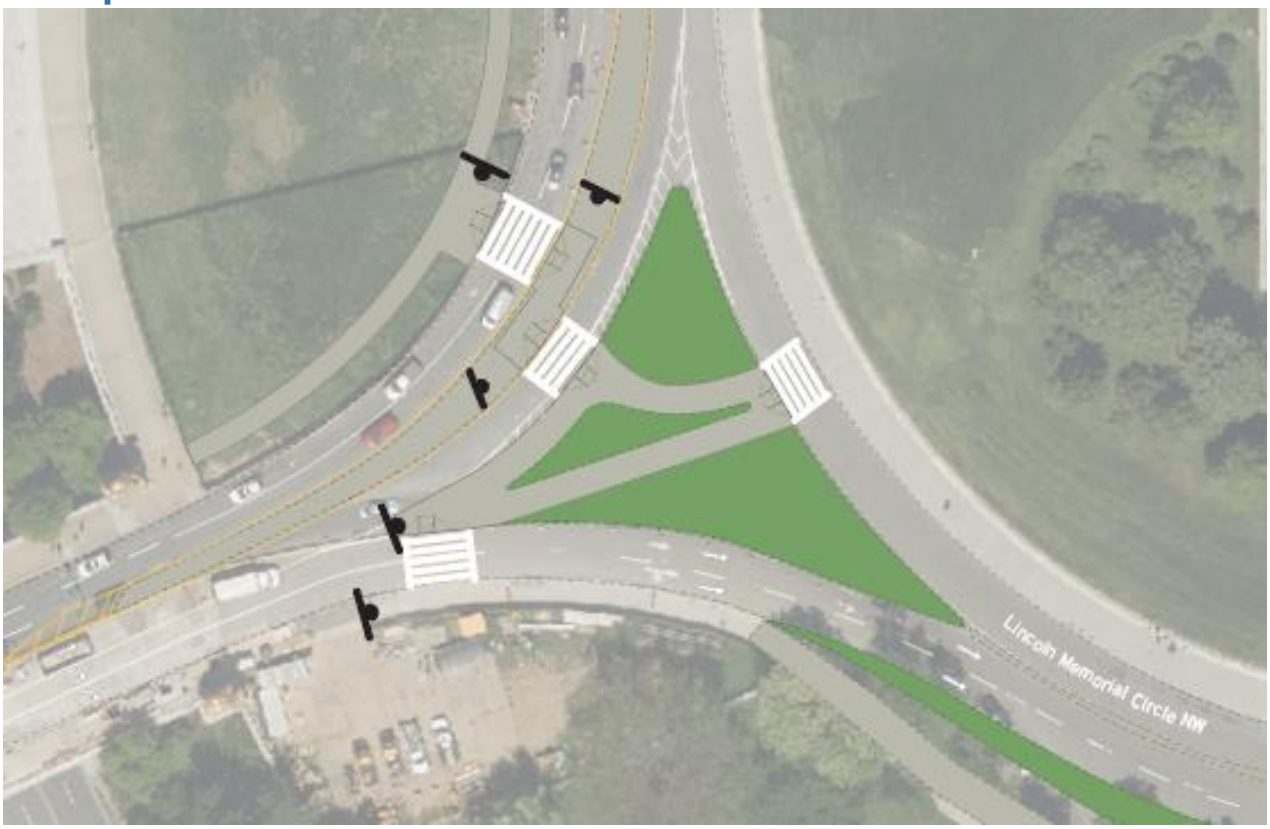

FIGURE 26: LOCATION A'S DESIGN CONCEPT 2 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

[6] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments. https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

LOCATION A, LINCOLN MEMORIAL CIRCLE	CONCEPT 2
MAJOR ADDITIONS:	Bicycle and Pedestrian Infrastructure: • Install RRFBs. • Install high visibility crosswalks. • Improve traffic markings with high visibility road markings. • Extend the grassy triangle and install paths to create a pedestrian refuge island, which will allow pedestrians and bicyclists to cross one direction of traffic at a time. • Install a 10-foot pedestrian island. Vehicle Movement Infrastructure: • Highly visible traffic lane markings that will direct traffic around the Circle. • Reduce number of vehicular lanes with the installation of pedestrian refuge island. • Highly visible "Merge" signage that can slow down vehicular speeds as it approaches the Lincoln Memorial Circle. Additional Options: • This concept is paired with four additional design options to enhance the functionality of the right-of-way. To ensure the improvement of safety and connectivity, the following options should be considered for implementation. These options are supplements to Concept 2 and will create a cohesive travel experience. o Option A: 23rd to Ohio Drive o Option B: Ericsson Memorial o Option C: Watergate Steps o Option D: Parkway Intersection
MAJOR REMOVALS:	• Painted road markings were replaced with a pedestrian island. • One vehicular travel lane heading northbound around the Circle towards the Georgetown neighborhood.

CONCEPT IMPLEMENTATION:	• Key differences from Concept 1 include:
	  ○ Arlington Memorial Bridge Crossing: Concept 2 uses the grassy triangle to create a multi-step crossing while Concept 1 uses a direct crossing.
	  ○ Traffic Signals/Signs: Concept 2 uses RRFBs to alert motorists of pedestrian crossing while Concept 1 uses a HAWK beacon to alert motorists.
	• High cost ($$$): High costs associated with construction of curbs, construction of new sidewalk, installation of RRFBs, traffic rerouting, in addition to lower-cost design interventions.
	• Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[7] NPS should also consider Section 106 of NHPA for this design location.

TIMEFRAME:	• Medium term: these interventions must undergo a traffic analysis before they are designed and installed.

ITEMIZED LIST:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• RRFB:
	  ○ 5 signs
	  ○ 5 flashing lights
	  ○ 6 pedestrian actuated signal buttons
	• Curb cuts: 5 units
	• Pedestrian/Bicyclist paved path: approximately 1,000 linear feet
	• Crosswalks: 4 units

[7] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

Options for Design Location A

OPTION A

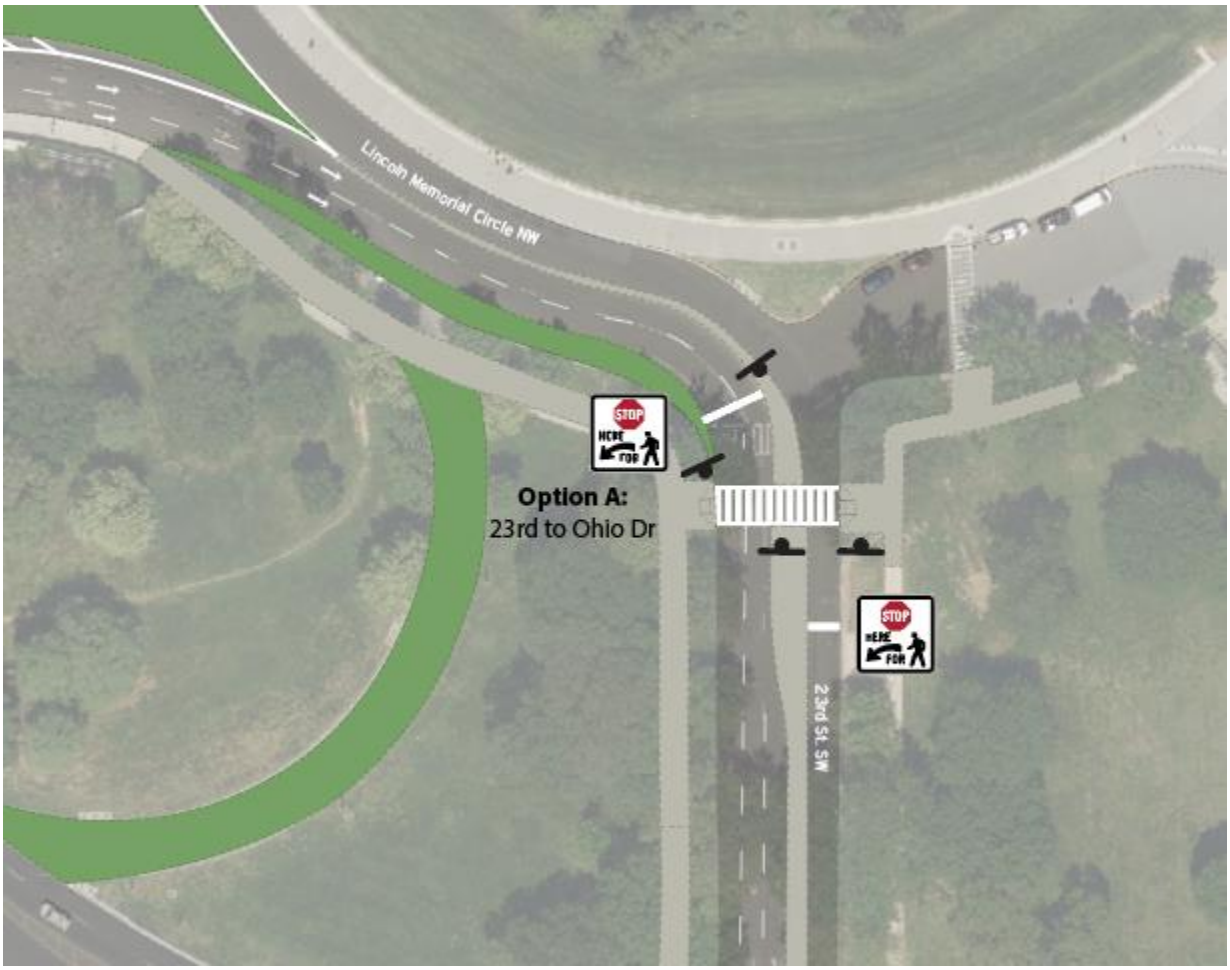

FIGURE 27: LOCATION A'S DESIGN CONCEPT FOR OPTION A (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION A, 23RD TO OHIO DRIVE	OPTION A
MAJOR ADDITIONS:	Pedestrian Infrastructure: • Install RRFBs. • Install high visibility crosswalks. • Improve traffic markings with high visibility road markings. • Install a high visibility path to increase pedestrian and bicyclist connectivity. • Install an 8- to 10-foot pedestrian refuge island, using the existing concrete median. • Install curb cuts to enhance the user experience. • Install a sidewalk on the west side of 23rd St. SW, which connects to Independence Avenue. • Curb realignment to better suit bicycle and pedestrian movement. Vehicle Movement Infrastructure: • Install curved center median to decrease vehicular speeds. • Install highly visible lane markings. • Note: Currently, 23rd street northbound is only for buses, bikes, and United States Park Police (USPP), which will continue as a part of these designs. Signage Enhancements: • Install “Stop Here for Pedestrian” signs
MAJOR REMOVALS:	• One lane from Lincoln Memorial Circle NW to Ohio Drive SW. • One slip lane and replaced with roadway infill and turf; reroute traffic to 23d St SW. • Painted road markings were removed and replaced with a raised median and pedestrian refuge island.
IMPLEMENTATION:	• High Cost ($$$): High costs associated with construction of curbs, construction of new sidewalk and pedestrian refuge island, and installation of RRFBs, in addition to lower-cost design interventions. • Compliance implications: Because this option will be implemented as a part of Concept 1 or Concept 2, NEPA documentation may be needed as a part of either concept.
TIMEFRAME:	• Long Term: Proposed interventions may require further analysis and engineering design, due to the elimination of roadway and addition of RRFBs.

ITEMIZED LIST:

*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.

- RRFB:
  - 4 signs
  - 4 flashing lights
  - 3 pedestrian actuated signal buttons
- Curb cuts: 2 units
- Expanded pedestrian refuge island: 1 unit
- Crosswalks: 1 unit

OPTION B

FIGURE 28: LOCATION A'S DESIGN CONCEPT FOR OPTION B (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION A, ERICSSON MEMORIAL	ERICCSON MEMORIAL, OPTION B
MAJOR ADDITIONS:	Pedestrian Infrastructure: • Install high visibility crosswalks. • Install a high visibility path to increase pedestrian and bicyclist connectivity. • Install pedestrian walk signals at the intersection of 23rd St. SW and Independence Ave. SW. Vehicle Movement Infrastructure: • Infill the roadway that feeds into the Ericsson Memorial Circle; this will direct traffic flow to make a right turn into the Ericsson Memorial Circle. • Improve traffic flow with high visibility road markings. • Ericsson Memorial Circle will guide vehicles to turn left on Ohio Drive SW. The direction of the turn on Ohio Drive SW will be determined in future planning. • Note: Currently, 23rd street northbound is only for buses, bikes, and USPP, which will continue as a part of these designs.
MAJOR REMOVALS:	• Infill of roadway that feeds into the Ericsson Memorial Circle. • Parking around Ericsson Memorial Circle.
IMPLEMENTATION:	• High Cost ($$$): High costs associated with construction of curbs, construction of new sidewalk, roadway infill, and traffic signal updates, in addition to lower-cost design interventions. • Compliance implications: Because this option will be implemented as a part of Concept 1 or Concept 2, NEPA documentation may be needed as a part of either concept.
TIMEFRAME:	• Long term: Proposed interventions may require further analysis and engineering design, due to the elimination of roadway and addition of pedestrian signals.

ITEMIZED LIST:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Pedestrian walk signals:
	  ○ 4 signals
	  ○ 6 pedestrian actuated signal buttons
	• Curb cuts: 6 units
	• Sidewalk extension: approximately 500 linear feet
	• Crosswalks: 4 locations

OPTION C

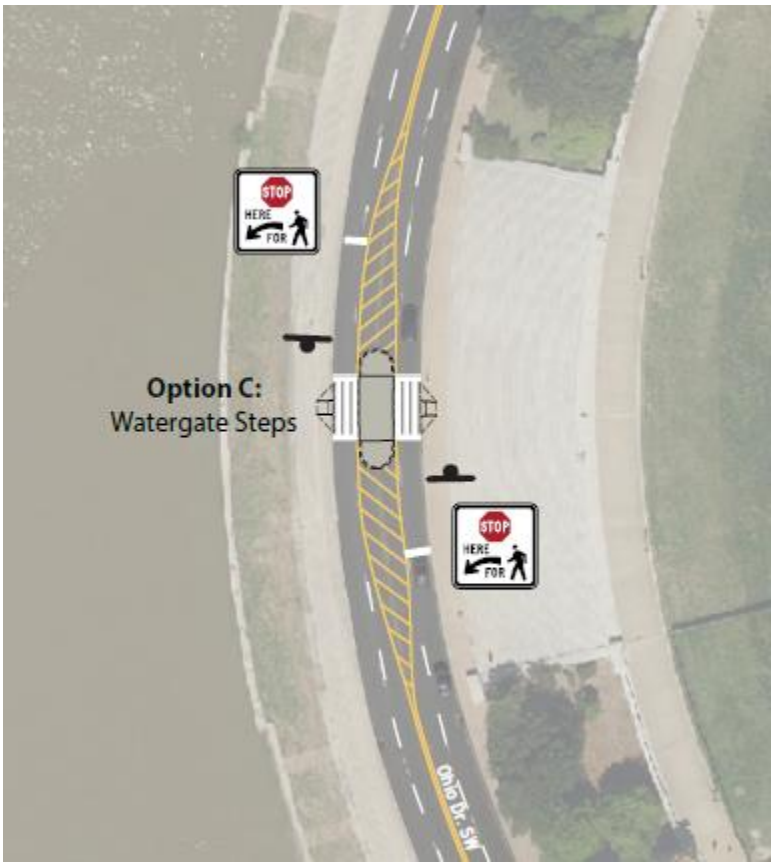

FIGURE 29: LOCATION A'S DESIGN CONCEPT FOR OPTION C (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION A, WATERGATE STEPS	OPTION C
MAJOR ADDITIONS:	Pedestrian Infrastructure: • Install RRFBs. • Install high visibility crosswalks. • Install a 14-foot wide pedestrian refuge island where lane reduction occurs. Vehicle Movement Infrastructure: • Install "Merge" signs in advance of lane reduction. • Improve traffic markings with high visibility road markings. • Highly visible center median, which will limit vehicular speeds. Sign Enhancements: • "Stop Here for Pedestrians" with stop bar pavement markings. • Highly visible "Merge" sign that can warn vehicles of oncoming traffic.
MAJOR REMOVALS:	• Reduction in both directions of travel lanes from 2 lanes to 1 lane to allow for pedestrian refuge island at the midpoint of the Watergate Steps.
IMPLEMENTATION:	• Moderate cost ($$): Moderate cost associated with construction of curbs, construction of pedestrian refuge island, installation of RRFBs, in addition to lower-cost design interventions. • Compliance implications: Because this option will be implemented as a part of Concept 1 or Concept 2, NEPA documentation may be needed as a part of either concept.
TIMEFRAME:	• Long term: these interventions may require further traffic analysis and engineering design, due to the reduction in travel lanes and addition of RRFBs.

ITEMIZED LIST:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• RRFB:
	  ○ 2 signs
	  ○ 2 flashing lights
	  ○ 2 pedestrian actuated signal buttons
	• Stop Here for Pedestrian sign: 2 signs
	• Merge sign: 2 signs
	• Crosswalks: 2 units
	• Curb cuts: 2 units
	• Pedestrian refuge island: 1 unit
	• Paint for pavement markings/coloring:
	  ○ Yellow goring pavement marking: approximately 250 linear feet

OPTION D

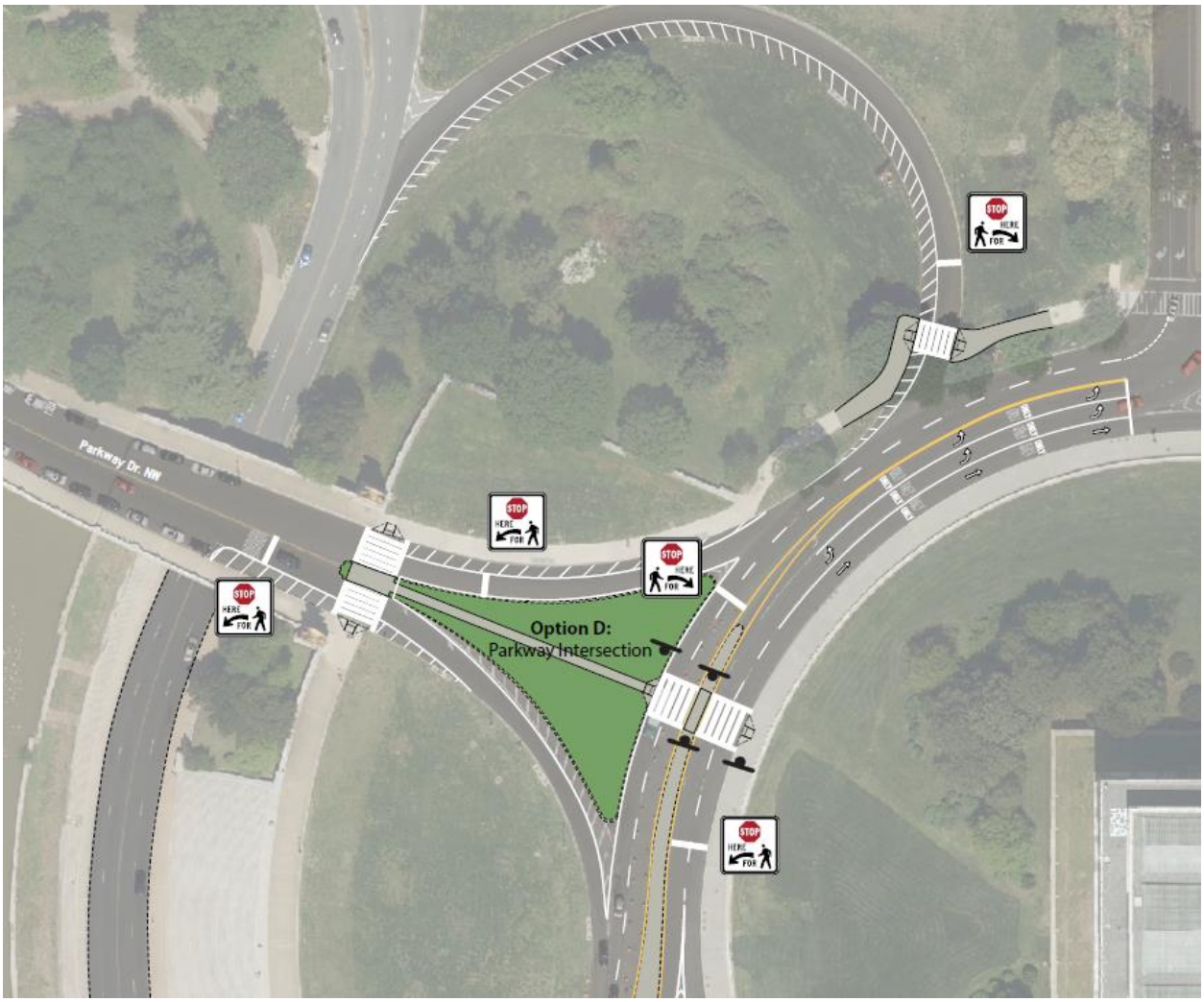

FIGURE 30: LOCATION A'S DESIGN CONCEPT FOR OPTION D (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION A, PARKWAY INTERSECTION	OPTION D
MAJOR ADDITIONS:	Pedestrian Infrastructure: • Install high visibility crosswalks. • Install RRFBs at the crosswalk within the Lincoln Memorial Circle. • Install a high visibility path through grassy triangle adjacent to Lincoln Memorial Circle to improve bicycle and pedestrian connectivity. Vehicle Movement Infrastructure: • Highly visible lane markings, including diagonal pavement markings, which will better direct traffic and slow down vehicles as they approach Lincoln Circle. Sign Enhancements: • "Stop Here for Pedestrians" with stop bar pavement markings. • Highly visible "Merge" sign that can warn vehicles of oncoming traffic.
MAJOR REMOVALS:	• Non-compliant parking along Parkway Drive was eliminated.
IMPLEMENTATION:	• Moderate cost ($$): Moderate cost associated with construction of curbs, construction of sidewalk, installation of RRFBs, in addition to lower-cost design interventions. • Compliance implications: Because this option will be implemented as a part of Concept 1 or Concept 2, NEPA documentation may be needed as a part of either concept.
TIMEFRAME:	• Long term: these interventions may require further environmental analysis and engineering design, due to the addition of the pedestrian refuge island, sidewalks, and RRFBs.

ITEMIZED LIST:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• RRFB:
	  ○ 4 signs
	  ○ 4 flashing lights
	  ○ 2 pedestrian actuated signal buttons
	• Crosswalks: 3 units
	• ADA accessible path grassy triangle: approximately 290 linear feet
	• Paint for pavement markings/coloring:
	  ○ White goring pavement marking: approximately 475 linear feet

Design Location B

This design location includes redesign and improvement of bicycle and pedestrian facilities on Madison Drive, between 12th and 15th Streets. This effort aims to balance improved bicycle and pedestrian infrastructure with tour bus loading, unloading, and parking, rideshare drop off and pick up, as well as any freight needs, which could include supply deliveries to kiosks and museums. A key partner for this design location is the Smithsonian Institution, who provides important feedback for design and implementation. This design work could be applied across the corridors of Madison and Jefferson Drives.

Issue Identification

Madison Drive does not have a dedicated space for bicyclists within the right-of-way, meaning that there is no modal separation. Some cyclists use the sidewalks, which are crowded with multiple users (pedestrians, scooterists, etc.). There is therefore a high potential for modal conflict and a need for greater modal separation on the roadway. Along Madison and Jefferson Drives, parking uses a significant portion of valuable right-of-way space that could be used for other modes. Sightlines for crossing the road are frequently blocked by buses and vehicles parked along the south side of Madison Avenue. Additionally, there are also uncontrolled mid-block crosswalks along these roadways.

Preliminary Stakeholder Feedback

As a part of stakeholder discussions, participants identified several potential interventions that could be used to improve travel on Madison Drive. Not all of the stakeholder feedback was incorporated into the design concepts, but each suggestion was considered and recorded; these include:

- **Eliminate Non-compliant Parking**: Reduce non-compliant parking, such as parking that obscures crosswalks, on Jefferson and Madison Drives. Parking lanes can be an effective tool to separate bike and pedestrian traffic and should have protected bike facilities with pick up/drop off areas at museums.
- **Add Bicycle and Scooter Parking**: DDOT and NPS are working to identify additional locations for bicycle and scooter parking (both on-street parking and in corrals), which can be helpful in narrowing the roadway and controlling speed.
    - Reserving parking spaces for bicyclists and micromobility users in the roadway (thereby prohibiting bus, truck, and other vehicle parking in these spaces) would also improve visibility, which is particularly needed around crosswalks.
    - The demand for scooters is high around the National Mall; the e-scooter pilot program has been successful in controlling bad scooter etiquette and can be used as a model for other places. Vertical signage has been useful for clearly marking and directing visitors to e-scooter corrals.

Proposed Concepts

The objectives and rationale for both design concepts for this location are similar, though implementation of the designs differs in terms of length and cost. The concepts' design objectives include:

- Improve on-street modal separation.
- Improve safety for pedestrians, bicyclists, micromobility users, and other vulnerable road users.
- Improve bike travel on Madison Drive and through intersecting streets.

- Provide additional bikeshare and bike parking spaces.

The concepts' design rationales include:

- Heavy bicycle, e-scooter, and pedestrian traffic on and around Madison Drive.
- Lack of on-street modal separation, causing safety concerns and crowded sidewalks.
- Lack of connection to the 15th Street Cycletrack.
- Crosswalk sight lines frequently blocked by buses, trucks, and other vehicles.

Table 9 compares the level of multimodal safety for each key design element as a part of Location B's existing configuration, concept 1, and concept 2. Dark green signifies a high level of safety, light green signifies a medium level of safety, and no color signifies low level of safety.

TABLE 9: COMPARISON OF PROPOSED INTERVENTIONS FOR LOCATION C'S EXISTING CONFIGURATION AND CONCEPT 1, AND CONCEPT 2

Key Design Elements	Existing Configuration	Concept 1	Concept 2
High visibility crosswalks	**Medium**	**High**	**High**
Wide sidewalks	**High**	**High**	**High**
Improved pedestrian warning signage	None	**High**	**High**
Protected bicycle lane	None	**Medium**	**High**
- Painted buffer for bicycle lane with flexposts and wheelstops	None	**Medium**	None
- Constructed curb buffer for bicycle lane	None	None	**High**
Bicycle storage: bikeshare corrals and bicycle racks	None	**High**	**High**
Individual parking spaces for individuals with disabilities	None	None	**High**
Bicycle connection from Madison Drive into 15th Street Cycletrack	None	**High**	**High**
Goring to limit parking adjacent crosswalks	None	**Medium**	**High**
Lane Reductions/ Road Diet	None	**Medium**	**High**
Curb space for rideshare pick up/drop off and the use of geofencing	None	**Medium**	**High**
Redirected tour bus parking to Constitution Ave	None	**Medium**	**High**
Midblock crosswalk improvements with pedestrian warning signage	None	**Medium**	**High**

Concept 1

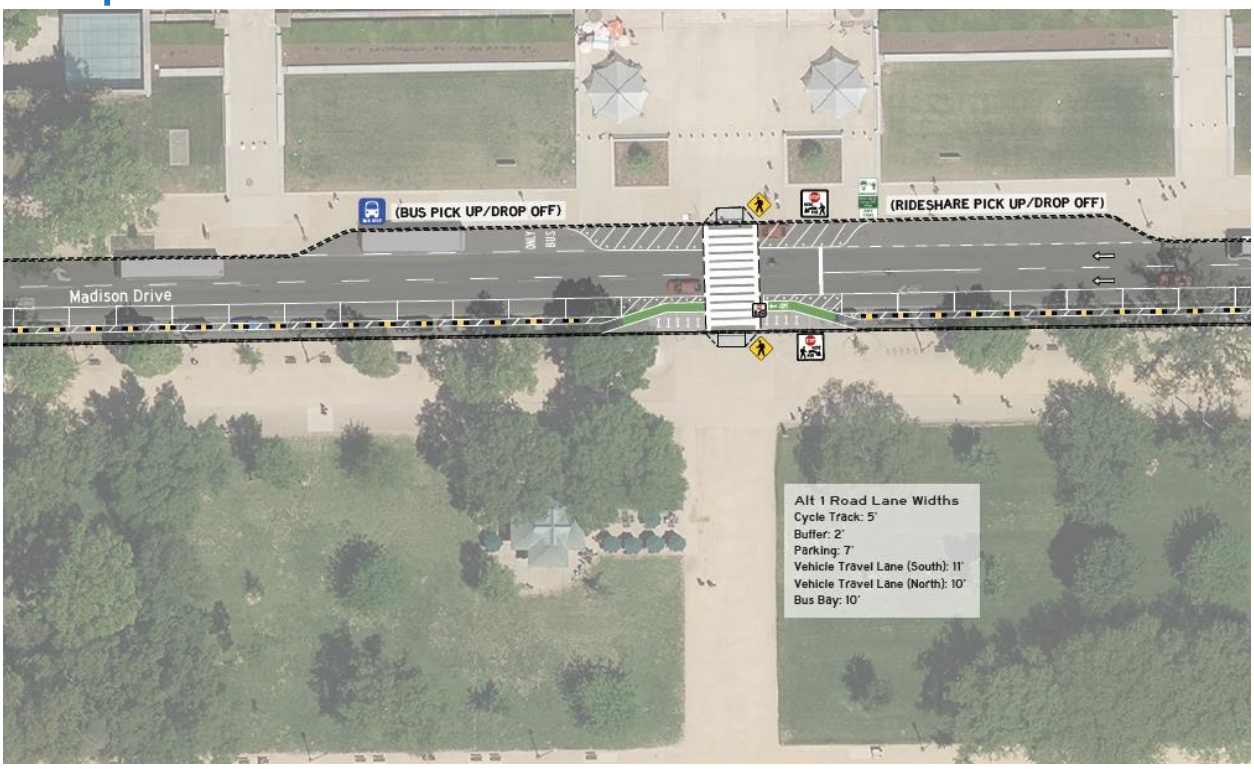

FIGURE 31: LOCATION B'S DESIGN CONCEPT 1 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION B, MADISON DRIVE	CONCEPT 1
MAJOR ADDITIONS:	Bicycle Infrastructure: • One-way westbound protected bike lane along south side of Madison Drive; protected with flex posts and wheel stops at areas of potential conflict. • Improved traffic signalization at Madison Drive and 15th Street: traffic light with protected left-turn phase for southbound vehicles at 15th Street and Madison; signalization for 15th Street Cycletrack and bike lane connection from Madison Drive. • Green paint guiding bike lane on Madison Drive through 15th Street and 14th Street intersections. • Bike parking corrals buffering east and west side of crosswalk (on south side of Madison Drive) in front of National Museum of American History. Bike lane maneuvers around bike corrals to the north as it moves through crosswalk. Vehicle Movement Infrastructure: • Rubber speed bumps at north and south corners of Madison Drive at 15th Street intersection. • Painted curb extensions at 15th and 14th Street intersections. • Goring around one crosswalk and at bus pull-in/out area to prevent parking. • "Wait here" pavement paint for vehicles before a bike box at intersection of Madison Drive and 14th Street. Infrastructure for Shared Transport: • "Only bus" pavement paint bus pull-in between 14th and 15th Streets and on west side of crosswalk in front of National Museum of American History (north side of Madison Drive). • Ride share pick-up/drop-off only area on east side of crosswalk in front of National Museum of American History (north side of Madison Drive). • Capital Bikeshare station between crosswalks at 12th Street and Madison Drive (on south side of Madison Drive). Bike lane maneuvers around bike share station to the north. Signage Enhancements: • "Stop here for pedestrians" and pedestrian crossing signage at crosswalks. • Bus stop, circulator stop, and rideshare signage at pull-in areas.

MAJOR REMOVALS:	• One 15th Street northbound vehicle travel lane. • One Madison Drive westbound vehicle travel/turn lane approaching intersection with 14th Street. • Non-compliant vehicle parking on south side of Madison Drive approaching intersection with 14th Street. • Non-compliant vehicle parking on south side of Madison Drive within 12th Street intersection.
IMPLEMENTATION:	• Moderate cost ($$): Several low-cost solutions that extend over three blocks (approximately .30 miles). • Compliance implications: All proposed interventions will occur in the existing right-of-way. NPS may refer to 2010 National Mall Plan and EIS for NEPA documentation related to this location. NPS may consider holding public comments to align with DDOT's standards for public outreach.[8] NPS should also consider Section 106 of NHPA for this design location.
TIMEFRAME:	• Short term: Proposed interventions could be designed and implemented as part of repaving project. • 15th Street Cycletrack (connecting with bike lane at intersection of 15th Street and Madison Drive) expected to be completed in 2022.

ITEMIZED LIST*:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Traffic signal upgrades:
	  ○ 1 traffic signal with protected left turn phase
	  ○ 1 bicycle signalization
	• Crosswalk: 12 units (all already exist but would require repaint)
	• Flex post: Approximately 65
	• Wheel stop: Approximately 85
	• Painted curb extension: 6 curbs
	• Signage
	  ○ Yellow pedestrian (yield) sign: 6 signs
	  ○ "Stop here for pedestrian" sign: 8 signs
	  ○ Bus stop/Circulator signs: 4 sign
	  ○ Ride share pick-up/drop off sign: 1 sign
	• Paint for pavement markings/coloring:
	  ○ Full bike lane, including green painted portions: Approximately 2,000 linear feet
	  ○ Green painted portions of bike lane: Approximately 450 linear feet
	  ○ Wait here for pedestrians/bike box: 1 unit
	• Bike parking corral: 2 corrals
	• Capital Bikeshare station: 1 unit

Concept 2

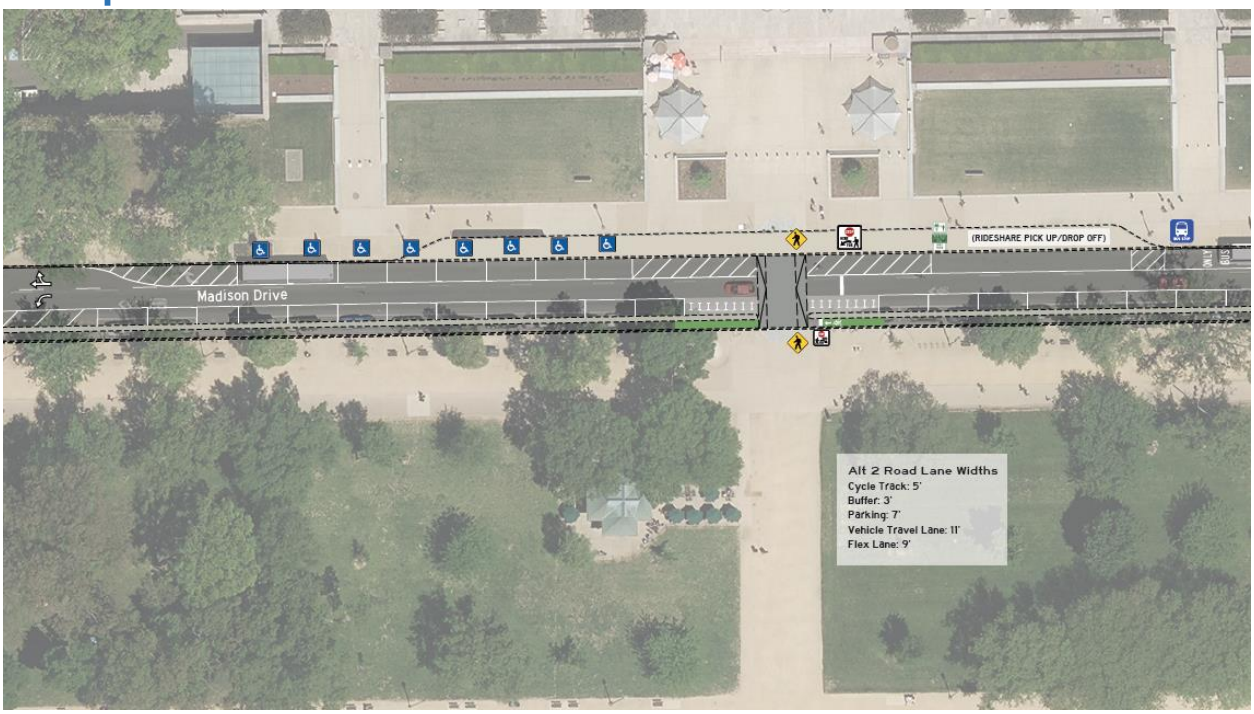

FIGURE 32: LOCATION B'S DESIGN CONCEPT 2 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

[8] NPS and contractors should review Chapter 3 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Categorical Exclusions.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

LOCATION B, MADISON DRIVE	CONCEPT 2
MAJOR ADDITIONS:	Bicycle Infrastructure: • One-way westbound protected bike lane along south side of Madison Drive; protected with concrete curb. • Improved traffic signalization at Madison Drive and 15th Street: traffic light with protected left-turn phase for southbound vehicles at 15th Street and Madison; signalization for 15th Street cycletrack and bike lane connection from Madison Drive. • Green paint guiding bike lane on Madison Drive through 15th Street and 14th Street intersections. • Bike parking corrals buffering east and west side of crosswalk (on south side of Madison Drive) in front of National Museum of American History. Bike lane remains along the curb on the south side of Madison Drive as it moves through crosswalk. Vehicle Movement Infrastructure: • Constructed curb extensions at 15th, 14th, and 12th Street intersections. • "Wait here" pavement paint for vehicles before a bike box at intersection of Madison Drive and 14th Street. • Goring around most crosswalks, at bus pull-in/out area and stops, and buffering handicap parking spaces. • Raised crosswalk at intersection in front of National Museum of American History. Infrastructure for Shared Transport: • "Only bus" pavement paint bus pull-in between 14th and 15th Streets and on east side of rides share in front of National Museum of American History (north side of Madison Drive). • Ride share pick-up/drop-off only area on east side of crosswalk in front of National Museum of American History and further east toward 12th Street (north side of Madison Drive). • Handicap parking spaces on north side of Madison Drive. • Capital Bikeshare station between crosswalks at 12th Street and Madison Drive (on south side of Madison Drive). Bike lane remains along the curb on south side of Madison Drive as it proceeds through intersection. Signage Enhancements: • "Stop here for pedestrians" and pedestrian crossing signage at crosswalks. • Bus stop, circulator stop, and rideshare signage at pull-in areas. • Signage for handicap-only parking spaces.

MAJOR REMOVALS:	• One 15th Street northbound vehicle travel lane. • One Madison Drive westbound vehicle travel lane between 12th and 14th Streets. • One Madison Drive westbound vehicle travel/turn lane approaching intersection with 14th Street. • Non-compliant vehicle parking on south side of Madison Drive approaching intersection with 14th Street. • Non-compliant vehicle parking on south side of Madison Drive within 12th Street intersection.

CONCEPT IMPLEMENTATION:	• Key differences from Concept 1 include:
	  ○ Bike lane protection: Concept 2 uses concrete curb while Concept 1 uses flex posts and rubber wheel stops.
	  ○ Lane reduction/road diet: Concept 2 removes one lane of vehicle traffic on Madison Drive between 12th and 14th Streets.
	  ○ Accessible parking: Concept 2 proposes individual handicap-only parking spaces.
	  ○ Multimodal safety: Concept 2 proposes more goring around crosswalks and parking areas to improve sight lines.
	  ○ Shared transport: Concept 2 offers additional space for ride share and bus pick up/drop off.
	  ○ Implementation: Concept 2 proposes longer-term design interventions such as constructed curb extensions, a raised crosswalk, and constructed curb bike lane protection.
	• High cost ($$$): High costs associated with construction of curbs, bike lane protection, and raised crosswalk, in addition to lower-cost design interventions.
	• Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[9] NPS should also consider Section 106 of NHPA for this design location.

TIMEFRAME	• Long term: Proposed interventions will require construction activities and potentially NEPA processes. • 15th Street Cycletrack, which connects with bike lane at intersection of 15th Street and Madison Drive, is expected to be completed in 2022.

[9] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

ITEMIZED LIST*:

*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.

- Traffic signal upgrades:
  - 1 traffic signal with protected left turn phase
  - 1 bicycle signalization
- Concrete curb for bike lane protection: Approximately 2,000 linear feet
- Concrete curb extensions: 8 curbs
- Raised crosswalk: 1 unit
- Signage
  - Yellow pedestrian (yield) sign: 6 signs
  - "Stop here for pedestrian" sign: 6 signs
  - Bus stop/Circulator sign: 3 signs
  - Ride share pick-up/drop-off sign: 2 signs
  - Handicap parking sign: 8 signs
- Paint for pavement markings/coloring
  - Full bike lane, including green painted portions: Approximately 2,080 linear feet
  - Green painted portions of bike lane: Approximately 389 linear feet
  - Wait here for pedestrians/bike box: 1 unit
- Bike parking corral: 2 corrals
- Capital Bikeshare station: 1 station

Design Location C

This project includes redesign and improvement of bicycle and pedestrian facilities near Hains Point; this segment of Ohio Drive SW, from the start of the one-way loop towards Hains Point, could be applied across the corridor.

Issue Identification

On the one-way loop that approaches Hains Point, both pedestrians and bicyclists travel in the roadway with vehicles due to a lack of sidewalks along Ohio Drive SW and the closure of the seawall pedestrian path. Ohio Drive SW does not have on-street modal separation for the different road users, and NPS has identified a need for a short term, inexpensive solution, while the NPS address the longer-term, more expensive seawall project. The NPS has identified the issue of high vehicle speeds along the 2-lane roadway, since cars frequently travel above the 15-mph speed limit, creating safety concerns for pedestrians and bicyclists sharing the road with vehicles. Furthermore, many experienced bicyclists or bicycling groups travel at high speeds and do not obey traffic laws; the USPP has found it difficult to enforce the speed limit for bicyclists. Additionally, many tour buses drop visitors at the National Mall and travel down to Hains Point to wait in the playground lot until they must pick-up their tours. Frequently, tour buses travel in the middle of the road to avoid the cherry blossom trees, but these buses have also caused damage to these trees.

Preliminary Stakeholder Feedback

As a part of stakeholder discussions, participants identified several potential interventions that could be used to improve travel on Ohio Drive SW towards Hains Point. Not all of the stakeholder feedback was incorporated into the design concepts, but each suggestion was considered and recorded; these include:

- **Full or Partial Closure of Hains Point**: In the past, Hains Point has closed to vehicles (or closed one lane of traffic to vehicles and opened it to bicycles/pedestrians) during the busy or peak tourist season (particularly Cherry Blossom season). A similar approach could be used during the weekends when Hains Point experiences high visitation.
- **Reduce Traffic Lanes**: Consider whether 2 lanes of traffic are needed; 2-lanes in the same direction are unusual. Moving traffic to one lane would increase safety (and reduce the double-threat risk for bikers/pedestrians). The other traffic lane could be used as a combined bicycle and pedestrian lane inexpensively using paint and posts. Smoothing turns may also increase safety for the recreational cyclists that travel at higher speeds.
- **Add Bicycle Facilities**: Consider adding bicycle parking around Hains Point. Consider other bicycle facilities to accompany bicycle infrastructure.
- **Relocate Bus parking**: Relocate tour bus parking or overlay parking from the playground parking lot into paid parking on Ohio Drive (river side).

Proposed Concepts

One design concept is proposed for this location. The objectives of the proposed intervention include:

- Improve on-street modal separation.
- Improve safety for pedestrians, bicyclists, micromobility users, and other vulnerable road users.
- Decrease speeds of motorized vehicles.
- Redirect tour buses to idle/wait in West Potomac Park.

The rationale for the concept's design includes:

- Lack of modal separation on Ohio Drive SW. Pedestrians, bicyclists, and vehicles share the roadway, which has led to conflicts in the past.
- Lack of dedicated pedestrian and bicycle infrastructure.
- Closure of the waterfront path creates need for short-term intervention to improve pedestrian safety.
- Vehicles travel above posted speeds.
- Experienced cyclists travel at high speeds.

Table 10 compares the level of multimodal safety for each key design element as a part of Location C's existing configuration and concept 1. Dark green signifies a high level of safety, light green signifies a medium level of safety, and no color signifies low level of safety.

TABLE 10: COMPARISON OF PROPOSED INTERVENTIONS FOR LOCATION C'S EXISTING CONFIGURATION AND CONCEPT 1

Key Design Elements	Existing Configuration	Concept 1
High visibility crosswalks	**Medium**	**High**
Pedestrian warning signage	**Medium**	**High**
Pedestrian sidewalks and paths	None	**High**
Protected bicycle lane	None	**Medium**
Bicycle corrals	None	**Medium**
Goring to buffer vehicle turns	None	**Medium**
Lane reduction	None	**High**
Signage directing buses away from Hains Point	None	**Medium**

Concept 1

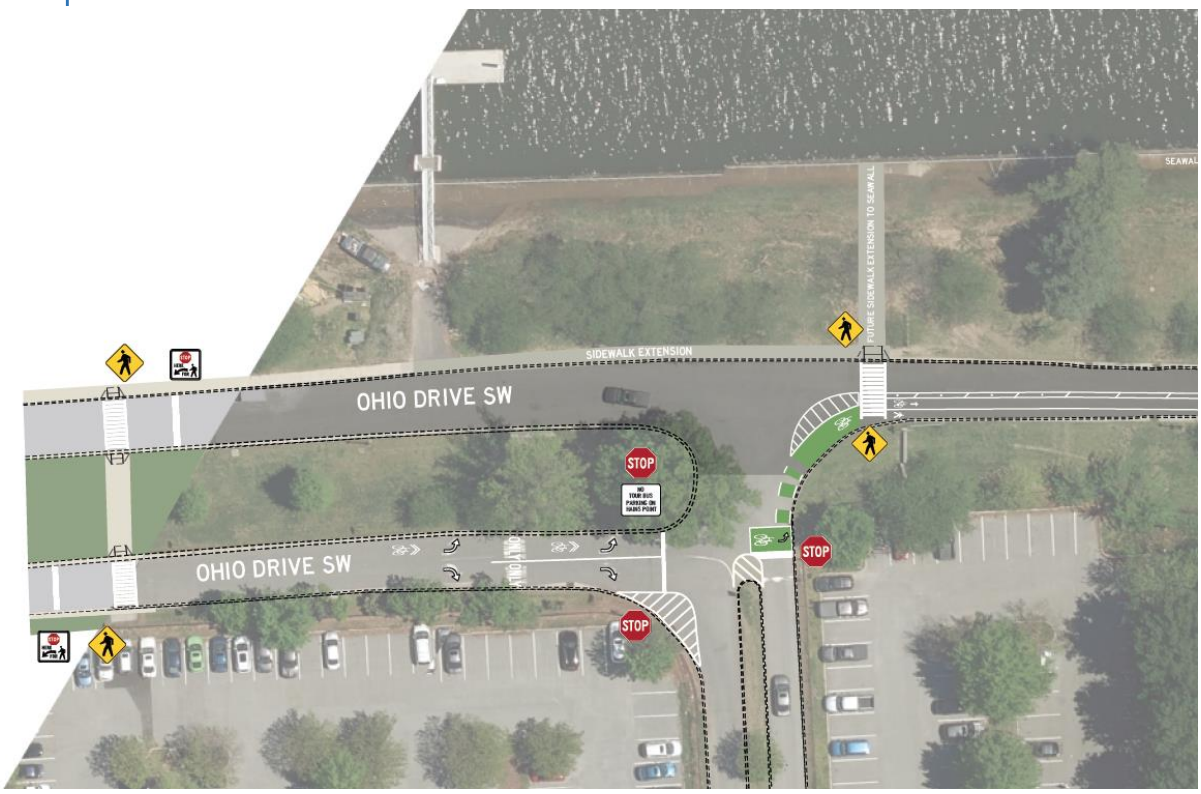

FIGURE 33: LOCATION C'S DESIGN CONCEPT 1 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION C, OHIO DRIVE SW (ONE-WAY LOOP ENTRANCE)	**CONCEPT 1**
MAJOR ADDITIONS:	Bicycle Infrastructure: • One-way southbound protected bike lane along the inside of the Ohio Drive SW loop; bike lane protected with flex posts at potential conflict points. • Green painted pavement and bike box to guide bicycles to bike lane around Ohio Drive loop. • Bike parking corrals in bump-out; conceptly, bump-out is filled in with turf. • Bicycle sharrows on Ohio Drive loop (southbound, before transition to one-way traffic) Pedestrian Infrastructure: • Pedestrian path along Ohio Drive SW loop (along curb), buffered by one-way bike lane. • High visibility crosswalks on Ohio Drive SW. • Extended sidewalk along east side of Ohio Drive to connect existing boat dock to proposed crosswalk (eventual connection to seawall path). Vehicle Movement Infrastructure: • Goring to buffer and slow vehicle turns. • Stop bars at crosswalks north of Ohio Drive loop (northbound and southbound traffic, before transition to one-way traffic). Signage Enhancements: • "Stop here for pedestrians" signage at crosswalks north of Ohio Drive SW loop (northbound traffic, before transition to one-way traffic). • Pedestrian warning signage at new crosswalk at Ohio Drive SW loop. • "No tour bus parking on Hains Point" signage at Ohio Drive loop (southbound traffic, before transition to one-way traffic).
MAJOR REMOVALS:	• One vehicle travel lane (currently, there are two lanes in the same direction on the Ohio Drive SW loop).
IMPLEMENTATION:	• Low cost ($): Several low-cost design interventions within relatively small geographic area. *These improvements could be applied over a 2.5-mile corridor.* • Compliance implications: All proposed interventions will occur in the existing right-of-way. NPS may consider holding public comments to align with DDOT's standards for public outreach.[10]

TIMEFRAME:	• Short term: Proposed interventions could be designed and implemented as part of repaving project. • Eventual re-opening of waterfront path as part of longer-term seawall project.

ITEMIZED LIST*:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Constructed sidewalk extension: 1 unit
	• Crosswalk: 1 unit
	• Flex post: Approximately 15 posts (located only at conflict zones)
	• Signage
	  ○ Yellow pedestrian (warning) sign: 2 signs
	  ○ "Stop here for pedestrian" sign: 2 signs
	  ○ Tour bus redirect sign: 1 sign
	• Turf infill (at bump out): 450 square feet (potential)
	• Paint for pavement markings/coloring:
	  ○ Green painted portions of bike lane: Approximately 75 linear feet
	  ○ Crosswalk stop bar: 2 bars
	  ○ Bicycle sharrows: 2 sharrows
	• Bike parking corrals: 1 corral

Design Location D

This project includes redesign and improvement of bicycle and pedestrian facilities at Ohio Drive SW, from Inlet Bridge traveling north towards West Basin Drive. This design work could be applied across the corridor.

Issue Identification

Ohio Drive SW, north of the Inlet Bridge, lacks infrastructure for pedestrians, who are a heavy user group of this area. Pedestrian sightlines, particularly north of the bridge, are obstructed, and this stretch also lacks crosswalks for safe passage from the trail to the baseball fields. Vehicles tend to drive at speeds higher than the posted speed limit, because there are three driving lanes. At times of special events or high visitation, buses sit idle in this corridor and this heavy bus parking obscures sightlines for bicyclists or pedestrians on either side of the roadway.

On the Inlet Bridge, there is two-way traffic and a pedestrian sidewalk, but the space is constrained. At times, there is a high volume of pedestrians in the area (and tour buses), especially in the spring or during Cherry Blossom season. Visitors frequently stand in middle of road to take pictures. The curb for pedestrians is very tall to step into roadway.

[10] NPS and contractors should review Chapter 3 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Categorical Exclusions.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

Preliminary Stakeholder Feedback

As a part of stakeholder discussions, participants identified several potential interventions that could be used to improve travel on Ohio Drive SW north of Inlet Bridge. Not all of the stakeholder feedback was incorporated into the design concepts, but each suggestion was considered and recorded; these include:

- **Improve Bicycle and Pedestrian Infrastructure**: Install a two-way cycletrack by removing one lane of vehicle traffic. Install a sidewalk on the side where there isn't currently a sidewalk.
- **Provide Bicycle Facilities**: Consider additional bicycle facilities to accompany bicycle infrastructure. Baseball fields require additional bike parking.
- **Provide Pedestrian Crossings**: Protect bicyclists and pedestrians crossing to baseball fields with crosswalks from riverside to baseball fields.

Proposed Concepts

The objectives and rationale for both design concepts for this location are similar. The concepts' design objectives include:

- Improve on-street modal separation.
- Improve crosswalk safety and frequency.
- Improve pedestrian and bicycle connectivity.
- Improve safety for pedestrians, bicyclists, micromobility users, and other vulnerable road users.
- Reduce vehicle travel speeds.
- Continue to provide bus parking.

The rationale for the concepts' design includes:

- Lack of modal separation on Ohio Drive SW.
- Lack of sidewalks along the inside of the road, next to the baseball fields.
- Lack of dedicated pedestrian and bicycle infrastructure.
- Few crosswalks along the entire corridor.
- Vehicles travel above posted speeds.

Table 11 compares the level of multimodal safety for each key design element as a part of Location D's existing configuration, concept 1, and concept 2. Dark green signifies a high level of safety, light green signifies a medium level of safety, and no color signifies low level of safety.

TABLE 11: COMPARISON OF PROPOSED INTERVENTIONS FOR LOCATION D'S EXISTING CONFIGURATION, CONCEPT 1, AND CONCEPT 2

Key Design Elements	Existing Configuration	Concept 1	Concept 2
High visibility crosswalks	**Medium**	**High**	**High**
Pedestrian warning signage	**Medium**	**High**	**High**
Protected bicycle lane	None	**Medium**	**High**
Bicycle corrals	None	**Medium**	**High**
Individual parking spaces for individuals with disabilities	None	**High**	**Medium**
Goring to limit parking adjacent crosswalks and buffer vehicle turns	None	**Medium**	**High**
Lane Reductions/ Road Diet	None	**Medium**	**High**
Pedestrian sidewalks and paths	**Medium**	**High**	**High**
Signage to guide bicycle movement	None	**High**	**Medium**

Concept 1

FIGURE 34: LOCATION D'S DESIGN CONCEPT 1 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION D, OHIO DRIVE SW NORTH OF INLET BRIDGE	**CONCEPT 1**
MAJOR ADDITIONS:	Bicycle Infrastructure: • Two-way protected bike lane on west side of Ohio Drive SW beginning at Inlet Bridge; bike lane protected by flexposts and wheel stops. • Green painted squares with white sharrows to guide bicycle traffic across Inlet Bridge into and out of two-way bike lane (where bike traffic merges with vehicle traffic), and green paint to guide bicycle crossing at West Basin Drive intersection. • Bike corrals near Inlet Bridge. Pedestrian Infrastructure • Painted goring adjacent to curb extensions at crosswalks. • Widened crosswalk north of Inlet Bridge. • Two additional crosswalks between Inlet Bridge and West Basin Drive intersection. • Extended sidewalk from Inlet Bridge to West Basin Drive intersection. Vehicle Movement Infrastructure: • Goring adjacent to crosswalks and along curves to prevent parking that may impact sight lines. • Stop bars painted ahead of crosswalks. • Parking along east side of Ohio Drive. Infrastructure for Shared Transport: • “Bus only” pavement paint at pull-in north of West Basin Drive intersection. Signage Enhancements: • Signage to guide bicycle traffic, including “bicycles may use full lane,” “bicycles use crosswalk,” “bikes merge,” and a stop sign at bike lane/vehicle lane merge. • Handicap parking signs. • “Stop here for pedestrians” and pedestrian warning signage at crosswalks.
MAJOR REMOVALS:	• One northbound vehicle travel lane on Ohio Drive. • Vehicle parking on west side of Ohio Drive between Inlet Bridge and West Basin Drive intersection

IMPLEMENTATION:	• Moderate cost ($$): Several low-cost solutions and the new construction of a sidewalk that extend over a 0.5 mile corridor. • Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[11]
TIMEFRAME:	• Moderate term: Many of the proposed interventions could be designed and implemented as part of repaving project; sidewalk extension is a longer-term construction project that could happen at different times.

ITEMIZED LIST*:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Flex post: Approximately 67 posts
	• Wheel stop: Approximately 100 wheel stops
	• Crosswalk: 3 units
	• Signage
	  ○ Yellow pedestrian (warning) sign: 6 signs
	  ○ “Stop here for pedestrian” sign: 10 signs
	  ○ Handicap parking sign: 9 signs
	  ○ Bike “Stop here for pedestrian” sign: 5 signs
	  ○ Bikes May Use Full Lane sign: 2 signs
	  ○ Bikes Use Crosswalk: 1 sign
	• Paint for pavement markings/coloring:
	  ○ Full bike lane: approximately 2,200 linear feet
	  ○ Green paint to guide bicycle movement: approximately 150 linear feet
	  ○ Bicycle marking with arrow: 14 markings
	  ○ Sharrow: 5 sharrows
	  ○ Bus Only pavement marking: 2 markings
	• Bike parking corrals: 1 corral

[11] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments. https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

Concept 2

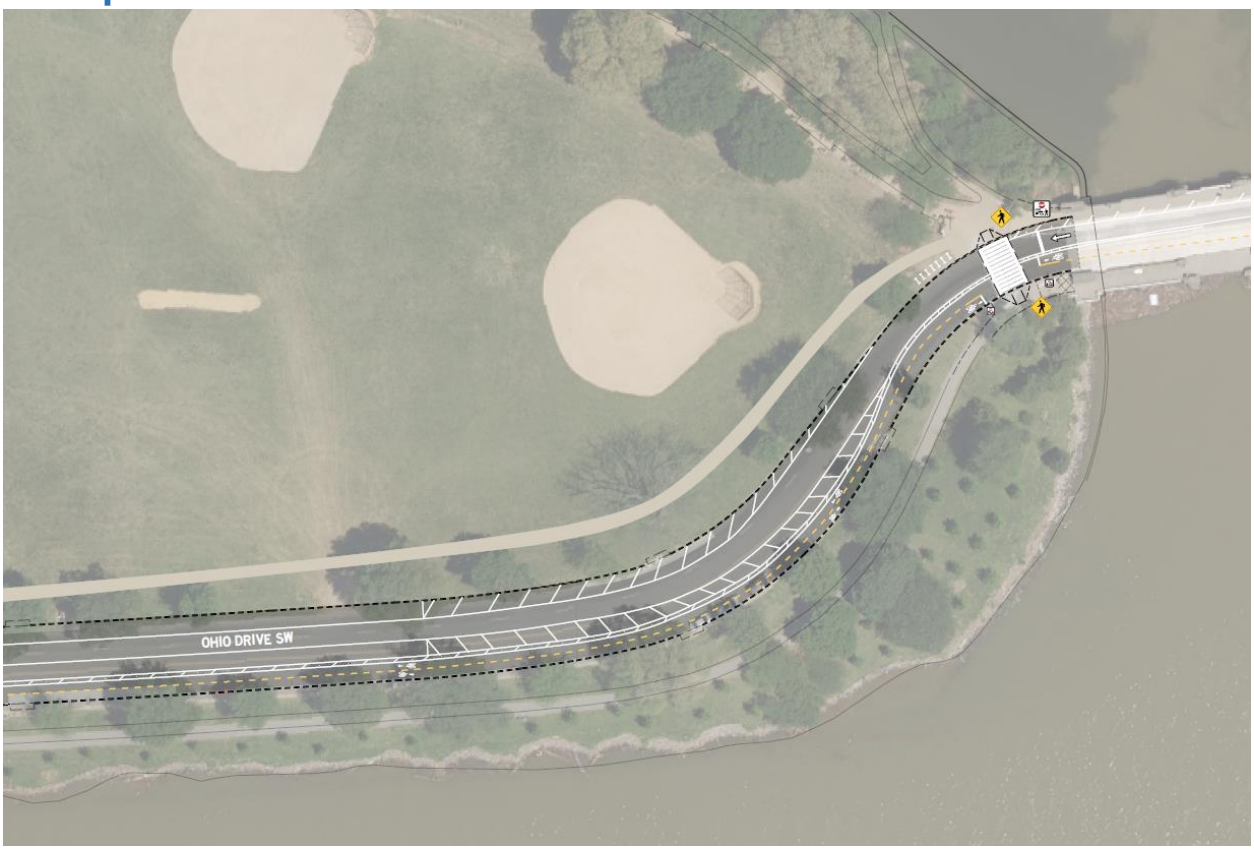

FIGURE 35: LOCATION D'S DESIGN CONCEPT 2 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION D, OHIO DRIVE SW NORTH OF INLET BRIDGE	**CONCEPT 2**
MAJOR ADDITIONS:	Bicycle Infrastructure: • Two-way protected bike lane on west side of Ohio Drive beginning at Inlet Bridge; bike lane buffered by parking lane and protected by flexposts at potential conflict areas. • Green paint to guide bicycle crossing at West Basin Drive intersection, with dedicated painted turn areas for bikes into/out crosswalks. • Bike corrals near Inlet Bridge and new crosswalks. Pedestrian Infrastructure • Painted goring adjacent to curb extensions at crosswalks. • Widened crosswalk north of Inlet Bridge. • Two additional crosswalks between Inlet Bridge and West Basin Drive intersection. • Extended sidewalk from Inlet Bridge to West Basin Drive intersection. Vehicle Movement Infrastructure: • Use pavement markings to communicate roadway reconfiguration travel to one lane of one-way directional travel. • Goring to reduce vehicle lanes around curves and to prevent parking that may impact pedestrian sight lines. • Stop bars painted ahead of crosswalks. • Continue to provide parking along east and west sides of Ohio Drive. Infrastructure for Shared Transport: • “Bus only” pavement paint at pull-in north of West Basin Drive intersection. Signage Enhancements: • Handicap parking signs. • “Stop here for pedestrians” and pedestrian yield signage at crosswalks. Reconfigure roadway traffic circulation to one-way directional travel. See Appendix for more detail.
MAJOR REMOVALS:	• Two vehicle travel lanes on Ohio Drive SW.

IMPLEMENTATION:	• High cost ($$$): High costs associated with construction of new sidewalk, reconfiguration of roadway, installation of flex posts, in addition to lower-cost design interventions. • Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[12]
TIMEFRAME:	• Long term: Proposed interventions must undergo a traffic analysis before they are designed and installed.

ITEMIZED LIST*:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Crosswalk: 3 units
	• Flex posts: Approximately 90 posts
	• Signage
	  ○ Yellow pedestrian (warning) signs: 6 signs
	  ○ “Stop here for pedestrian” signs: 3 signs
	  ○ Bike “Stop here for pedestrian” sign: 5 signs
	  ○ Handicap parking signs: 10 signs
	• Paint for pavement markings/coloring:
	  ○ Full bike lane: approximately 2,175 linear feet
	  ○ Green paint to guide bicycle movement: approximately 70 linear feet
	  ○ Bicycle marking with arrow: 18 markings
	  ○ Bus Only pavement marking: 2 markings
	• Bike parking corrals: 3 corrals

[12] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

Design Location E

This project includes the redesign and improvement of bicycle and pedestrian facilities on Ohio Drive SW at the connection to the future Long Bridge Bicycle-Pedestrian Connection.

Issue Identification

Ohio Drive SW will be the connecting roadway to the Long Bridge Bicycle/Pedestrian connection, which will link Arlington, Virginia to East Potomac Park and D.C. Currently at this location, there is no dedicated bicycle and pedestrian infrastructure that provides access to the National Mall and greater D.C. from this bridge. This bridge is anticipated to carry a majority of bicyclists and pedestrians that currently use the 14th Street Bridge. This area lacks clear and comprehensive signage and wayfinding to direct these anticipated pedestrians and bicyclists.

Preliminary Stakeholder Feedback

As a part of stakeholder discussions, participants identified several potential interventions that could be used to improve travel along Ohio Drive SW at the Long Bridge bicycle/pedestrian connection. Not all of the stakeholder feedback was incorporated into the design concepts, but each suggestion was considered and recorded; these include:

- **Provide Signage and Placemaking**: wayfinding and signage are necessary to help pedestrians and bicyclists understand and navigate this area. This future connection is seen as the gateway or trailhead and the value of connections to Hains Point and other points north.
    - Virginia Passenger Rail Authority (VPRA) will prepare and implement the interpretation plan regarding the history and significance of the Long Bridge. Additionally, VPRA will design, fabricate, and install physical wayside signs, considering signage for Rock Creek Parkway, Francis Case Bridge, path to Banneker Circle, and path to Wharf/10th Street. NPS's input on its plans is necessary to help make these efforts successful.
    - Redevelop the areas around the landing of the bridge.
    - Develop more kayak docks and parking for these docks.
- **Develop Bicycle and Pedestrian Infrastructure**:
    - Provide bicycle and pedestrian infrastructure to accommodate the growing number of users within this corridor.
    - Provide a bike lane to both sides of the bridge as a part of the DDOT bicycle network.
    - Consider adding Capital Bikeshare stations around this location.

Proposed Concepts

The objectives and rationale for both design concepts for this location are similar to the other locations on Ohio Drive SW. The concepts' design objectives include:

- Improve on-street modal separation.
- Improve crosswalk safety.
- Improve pedestrian and bicycle connectivity, especially at new Long Bridge bicycle/pedestrian connection.
- Improve safety for pedestrians, bicyclists, micromobility users, and other vulnerable road users.
- Reduce vehicle travel speeds.

The rationale for the concepts' design includes:

- Lack of modal separation on Ohio Drive SW.
- Lack of dedicated pedestrian and bicycle infrastructure.
- Vehicles travel above posted speeds.

Table 12 compares the level of multimodal safety for each key design element as a part of Location D's existing configuration and concept 1. Dark green signifies a high level of safety, light green signifies a medium level of safety, and no color signifies low level of safety.

TABLE 12: COMPARISON OF PROPOSED INTERVENTIONS FOR LOCATION E'S EXISTING CONFIGURATION, CONCEPT 1, AND CONCEPT 2

Key Design Elements	Existing Configuration	Concept 1	Concept 2
High visibility crosswalks	None	**High**	**High**
Pedestrian warning signage	None	**High**	**High**
Protected bicycle lane	None	**Medium**	**High**
Bicycle corrals	None	**Medium**	**Medium**
Goring to protect bicycle lanes and buffer vehicle turns	None	**Medium**	**High**
Lane Reductions/ Road Diet	None	**Medium**	**High**
Pedestrian sidewalks and paths	**Medium**	**Medium**	**Medium**
Connections to pedestrian paths	None	**High**	**High**
Signage to guide bicycle movement	None	**High**	**High**

Readers should note that the drawings from the Combined Final Environmental Impact Statement/ Record of Decision and Final Section 4(f) Evaluation (DDOT, DRPT, and FRA, 2020) will likely change with feedback from stakeholders, such as NPS, before a final design is chosen for implementation. The following concepts were developed with the most current information provided to the design team, but some elements from the conceptual designs may require updating when the bridge designs are finalized. Other elements from the conceptual designs that improve connectivity and modal separation can be applied to the future design of this roadway.

Concept 1

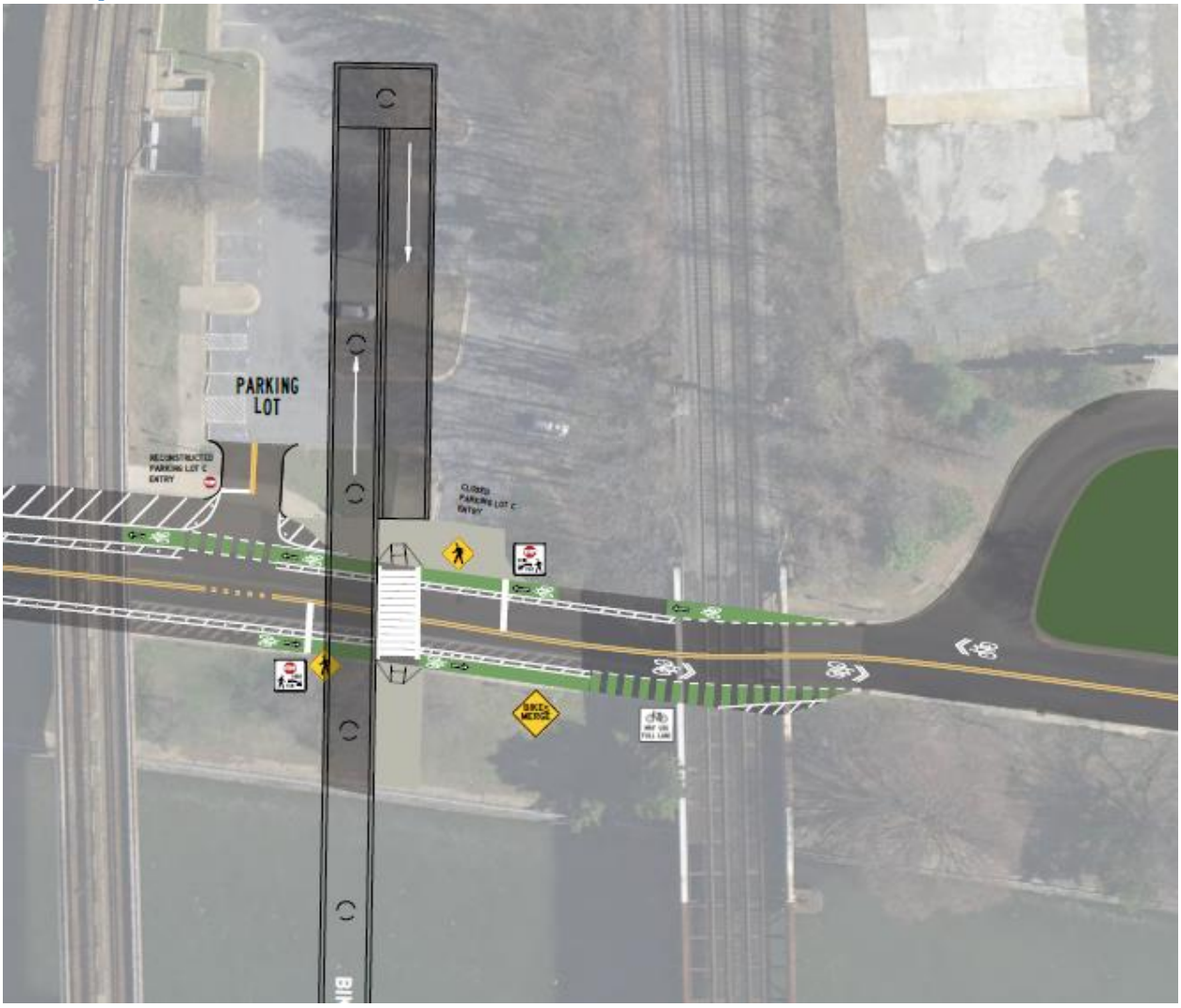

TABLE 13: LOCATION E'S DESIGN CONCEPT 1 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION E, LONG BRIDGE BICYCLE/PEDESTRIAN CONNECTION	CONCEPT 1
MAJOR ADDITIONS:	Bicycle Infrastructure: • Two-way protected bike lanes on east- and west- side of Ohio Drive SW. • Green paint to guide bicycles at crosswalks and at driveway locations where bicyclists should be more visible. • Improved bicycle pavement markings for turn into George Mason Memorial. • Provide bicycle sharrow pavement markings. Improve Pedestrian Infrastructure: • Provide high visibility crosswalks at locations where pedestrians will cross roadway. • Provide pedestrian warning signage for motorists. Vehicle Movement Infrastructure: • Stop bars painted ahead of crosswalks. Signage Enhancements: • Provide bicycle merging and warning signage. • Provide "Stop here for pedestrians" and pedestrian warning signage at crosswalks. Note: The design team developed Concept 1 with the most current information provided on the bridge design. This bridge design will go through several iterations before the before it is finalized. Some elements from the conceptual designs may require and update and other elements that improve connectivity and modal separation can be applied to the future design of this roadway.
MAJOR REMOVALS:	• None
IMPLEMENTATION:	• Moderate cost ($$): Several low-cost solutions that extend over 0.5 mile corridor. • Compliance implications: All proposed interventions will occur in the existing right-of-way. NPS may consider holding public comments to align with DDOT's standards for public outreach.[13]
TIMEFRAME:	• Short term: Proposed interventions could be designed and implemented as part of repaving project.

[13] NPS and contractors should review Chapter 3 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Categorical Exclusions.
https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

ITEMIZED LIST*:

*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.

- Flex post: Approximately 70 posts
- Crosswalk: 5 units
- Signage
  - Yellow pedestrian (warning) sign: 4 signs
  - "Stop here for pedestrian" sign: 4 signs
  - Bikes May Use Full Lane sign: 5 signs
  - Stop sign: 10 signs
- Paint for pavement markings/coloring:
  - Full bike lane: approximately 1,200 linear feet
  - Green paint to guide bicycle movement: approximately 250 linear feet
  - Bicycle marking with arrow: 20 markings
  - Sharrow: 20 sharrows

Concept 2

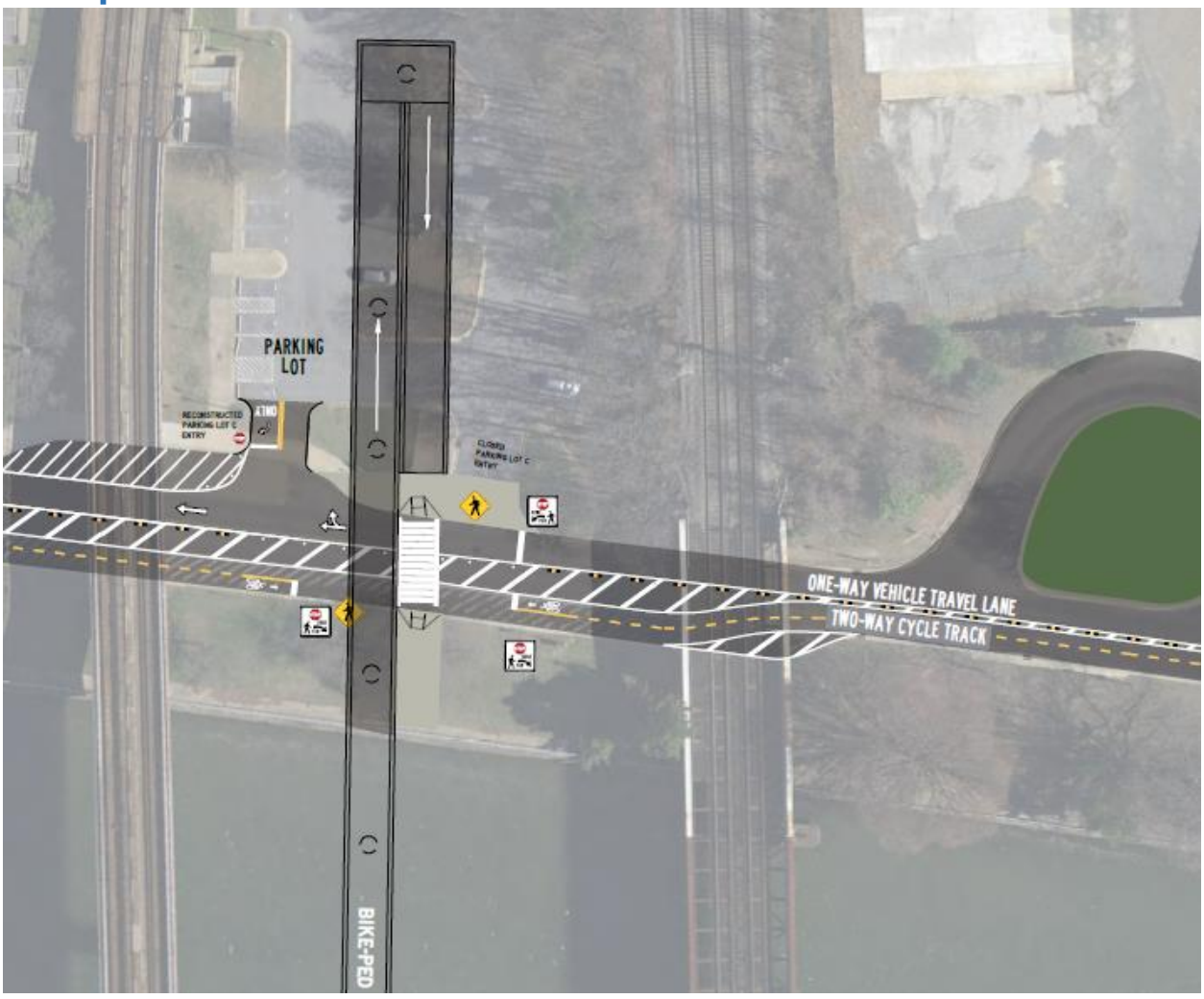

TABLE 14: LOCATION E'S DESIGN CONCEPT 2 (SEE APPENDIX FOR COMPLETE GEOGRAPHY AND ADDITIONAL DETAIL)

LOCATION E, LONG BRIDGE BICYCLE/PEDESTRIAN CONNECTION	**CONCEPT 2**
MAJOR ADDITIONS:	Bicycle Infrastructure: • Two-way cycletrack, protected by flex posts and wheel stops, along the riverside of Ohio Drive SW. • Green paint to guide bicycles at turns. • Improved bicycle pavement markings for turn into George Mason Memorial. • Bike corral at the George Mason Memorial. Improve Pedestrian Infrastructure: • High visibility crosswalk provided at bridge landing. Alternatively, pedestrian crossing could be provided as a raised crosswalk. • Provide high visibility crosswalks at locations where pedestrians will cross roadway. • Provide pedestrian warning signage for motorists. Vehicle Movement Infrastructure: • Provide stop signs at 3-way stop at George Mason Memorial and at parking lot exits. • Provide stop bars painted ahead of crosswalks. • Provide goring to narrow vehicle lane and reduce vehicle speeds. Signage Enhancements: • Provide bicycle merging and warning signage. • Provide “Stop here for pedestrians” and pedestrian warning signage at crosswalks. Reconfigure roadway traffic circulation to one-way directional travel. See Appendix for more detail. Note: The design team developed Concept 2 with the most current information provided on the bridge design. This bridge design will go through several iterations before the before it is finalized. Some elements from the conceptual designs may require and update and other elements that improve connectivity and modal separation can be applied to the future design of this roadway.
MAJOR REMOVALS:	• One vehicle travel lane on Ohio Drive SW.

IMPLEMENTATION:	• High cost ($$): Reconfiguration of the roadway paired with several low-cost solutions that extend over 0.5 mile corridor. • Compliance implications: All changes will occur in the pre-existing right-of-way, but impacts to historical view shed resources, environment, and traffic may require further analysis.[14]
TIMEFRAME:	• Long term: Proposed interventions must undergo a traffic analysis before they are designed and installed.

ITEMIZED LIST*:
 	
*LIST INCLUDES ONLY THE AREA SHOWN IN CONCEPTUAL DRAWINGS, NOT THE ENTIRETY OF THE CORRIDOR ON WHICH THE DESIGN MAY BE IMPLEMENTED. NUMBERS ARE APPROXIMATIONS.
	• Flex post: Approximately 30 posts
	• Wheel stop: Approximately 80 posts
	• Crosswalk: 5 units
	• Raised crossing: 1 unit (alternate option)
	• Signage
	  ○ Yellow pedestrian (warning) sign: 6 signs
	  ○ “Stop here for pedestrian” sign: 6 signs
	  ○ Stop sign: 11 signs
	• Paint for pavement markings/coloring:
	  ○ Full bike lane: approximately 2,700 linear feet
	  ○ Bicycle marking with arrow: 26 markings

[14] NPS and contractors should review Chapter 4 in the National Park Service NEPA Handbook to learn more about the elements of the NEPA process for Environmental Assessments. https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

Conclusion

After an in-depth synthesis of planning documents and transportation data, the research team analyzed the five focus areas, which revealed a complex transportation environment. Utilizing the project priority list and the specialized knowledge of the NPS partners, the research team narrowed its scope to five design locations and prepared conceptual designs that addressed the complex issues of these areas.

The different solutions proposed for these five design locations were developed to address the characteristics and issues specific to that location, but all designs aim to improve the safety of travel for all users, including vulnerable roadway users, as well as improve efficiency of travel. All designs propose modal separation to minimize conflict by creating dedicated spaces for different modes and clarifying roadway movements for travelers.

Implementation of these concepts will require NPS to continue their collaboration with stakeholders, such as DDOT, the Smithsonian Institution, etc., and to develop preliminary engineering designs. NPS would be advised to also hold a period for public engagement to receive feedback on these preliminary designs to ensure the public's needs are met.

As a part of this plan's implementation, NPS will consider relevant project timelines to correctly program these projects (see Table 15). By planning five years into the future, NPS can take proactive steps to share these prepared conceptual designs with contractors to build an understanding of how to balance modal use in contractors' engineering designs.

TABLE 15: PROJECT TIMELINE FOR RELEVANT PROJECTS NEAR OR AT THE DESIGN LOCATIONS

Project	2022	2023	2024	2025	2026
Cycle track and Pedestrian Path at Hains Point (Location C) *Ohio Drive SW from golf course entrance into one-way to Inlet Bridge*	Design - early 2022 (DDOT) Construction - late 2022 (DDOT)				
Cycletrack in West Potomac Park (Location D) *West Basin Drive, Ohio Drive SW from Independence Avenue to Inlet Bridge*	Design (FHWA/ DDOT)	Construction (FHWA)			
15th Street resurfacing		Construction (FHWA)			
Jefferson and Madison Drives (Location B)		Design (DDOT)	Construction (FHWA)		
Lincoln Circle Redesign (Location A)	Design - late 2022 (FHWA)	Design (FHWA)	Construction - late 2024 (FHWA)		
Long Bridge Bicycle and Pedestrian Connection (Location E) *Ohio Drive SW from Inlet Bridge to Buckeye Drive SW*				Design (FHWA)	Construction (FHWA)

Note: this table is a conceptual framework of what implementation of these projects could look like over a 5-year period. The projects and/or timelines within Table 15 could change.

Works Cited

Arlington County Department of Environmental Services. (2022). *BikeArlington Counter Dashboard*. Retrieved from Bike Arlington: https://counters.bikearlington.com/

Arlington County DOT. (2021, May). Bicycle and Pedestrian Counts Performed in April 2021 to May 2021. Virginia.

Capital Bikeshare. (2020, May). *Capital Bikeshare Development Plan Update.* Retrieved from Capital Bikeshare: https://www.capitalbikeshare.com/blog/capital-bikeshare-development-plan

Capital Bikeshare. (2021). DDOT Capital Bikeshare E-bike Trips Heatmaps.

Capital Bikeshare. (2022). *Capital Bikeshare System Map*. Retrieved from Capital Bikeshare: https://secure.capitalbikeshare.com/map/

City of DC. (2016). *Comprehensive Plan for the National Capital - Lower Anacostia Waterfront/Near Southwest Area.* Retrieved from Planning DC: https://planning.dc.gov/sites/default/files/dc/sites/op/publication/attachments/Chapter%2519%2520Comp%2520Plan%2520Updates%2520Opti.pdf

DCST. (2020). *Decongestion Pricing Study Request for Proposals.* Retrieved from DC Sustainable Transportation Coalition: https://dcstcoalition.org/files/DCST_Decongestion_Pricing_Study_RFP.pdf

DDOT. (2010, August). *15th Street Separated Bike Lane Pilot Project Interim Results and Next Steps.* Retrieved from NACTO: https://nacto.org/wp-content/uploads/2011/02/15th-Street-NW-Separated-Bike-Lane-Pilot-Project-Interim-Results-and-Next-Steps.pdf

DDOT. (2018, October 30). *Pedestrians Get More Time to Cross Busy Streets Under Mayor Bowser's Vision Zero Initiative*. Retrieved from DDOT Releases: https://ddot.dc.gov/release/pedestrians-get-more-time-cross-busy-streets-under-mayor-bowsers-vision-zero-initiative

DDOT. (2020, December 11). *20 by 22 Bikeways.* Retrieved from DDOT 20 by 2022 Bikeways: https://ddot.dc.gov/sites/default/files/dc/sites/ddot/page_content/attachments/2020%2C%202021%2C2022%20map_12-11-20.pdf

DDOT. (2021). *15th Street Cycletrack Public Meeting Presentation.* Washington D.C.

DDOT. (2021, December). *The District of Columbia's Multimodal Long-Range Transportation Plan.* Retrieved from Move DC: https://movedc-dcgis.hub.arcgis.com/

DDOT. (2021). *Virginia Avenue NW*. Retrieved from DDOT Wiki: https://wiki.ddot.dc.gov/display/BPP/Virginia+Avenue+NW

DDOT. (2022). *Bicycle Lanes*. Retrieved from DDOT Bicycle Lane Program: https://ddot.dc.gov/page/bicycle-lanes

DDOT. (2022). *DC Automated Bicycle and Pedestrian Counters*. Retrieved from DDOT: https://ddot.dc.gov/page/dc-automated-bicycle-and-pedestrian-counters

DDOT Truck and Bus Map. (2022). *DC Truck and Bus Map*. Retrieved from goDCgo: http://godcgo.com/dc-truck-and-bus-map/

DDOT, DRPT, and FRA. (2020, August). *Long Bridge Project - Final EIS/ROD Document.* Retrieved from Long Bridge Project: http://longbridgeproject.com/feisrod/

DDOT-SOP. (2018, April). Signal Optimization Project.

Evelo Electric Bicycles. (2022). *Intro to Electric Bikes - What They Are & How They Work*. Retrieved from Evelo Electric Bicycles: https://evelo.com/pages/electric-bikes-101

FHWA and NPS. (2021). *National Capital Region Safety Summary.*

LDA Consulting. (2017, February 24). *2016 Capital Bikeshare Member Survey Report.* Retrieved from Capital Bikeshare: https://d21xlh2maitm24.cloudfront.net/wdc/CABI-2016MemberSurveyReport-FINAL.pdf?mtime=20170302144201

Merlin, L., Yan, X., Xu, Y., & Zhao, X. (2021). A segment-level model of shared, electric scooter origins and destinations. *Transportation Research Part D: Transport and Environment*.

National Capital Region TPB. (2018, October). *Visualize 2045: A Long-Range Transportation Plan for the National Capital Region.* Retrieved from Metropolitan Washington Council of Governments: https://www.mwcog.org/assets/1/28/Visualize_2045_Plan_Final_Draft_October_2018.pdf

National Capital Region TPB. (2021, July 29). *Traffic Counts - Historic AADT by Count Station*. Retrieved from Metropolitan Washington Council of Governments: https://rtdc-mwcog.opendata.arcgis.com/datasets/mwcog::traffic-counts-historic-aadt-by-count-station/about

National Capital Regional TPB. (2015, January). *Bicycle and Pedestrian Plan for the National Capital Region.* Retrieved from Metropolitan Washington Council of Governments: https://www.mwcog.org/documents/bicycle-and-pedestrian-plan/

NCPC. (2013, March). *Streetscape Manual - Interagency Initiative for National Mall Road Improvement Program.* Retrieved from NCPC Documents: https://www.ncpc.gov/docs/Mall_Streetscape_Manual_March2013.pdf

NCPC. (2020, November). *Comprehensive Plan for the National Capital.* Retrieved from National Capital Planning Commission: https://www.ncpc.gov/plans/compplan/

NCPC. (2020). *Streetscape Framework and Lighting Policy*. Retrieved from National Capital Planning Commission - Monumental Core Projects: https://www.ncpc.gov/initiatives/moncore/

Nelson\Nygaard, N. K. (2020, January). *15th Street Safety Improvements - Project Overview.* Retrieved from 15th Street Protected Bike Lane Public Meeting #1: https://ddot.dc.gov/release/15th-street-protected-bike-lane%C2%A0public-meeting-1

NPS. (2009). *National Mall Wayfinding and New Pedestrian Guides*. Retrieved from National Park Service: https://parkplanning.nps.gov/projectHome.cfm?projectID=24465

NPS. (2010). *National Mall Plan.* U.S. Department of the Interior. District of Columbia: Author. Retrieved from https://www.nps.gov/nationalmallplan/national%20mall%20plan.html

NPS. (2015, June). *National Mall and Memorial Parks Tour Bus Study.* Retrieved from NPS Documents: https://www.nps.gov/nationalmallplan/Documents/Trans/NationalMall_TourBusStudy_FinalReport_June%202015.pdf

NPS. (2016, August). *NCR Paved Trail Plan.* Retrieved from NPS National Capital Regional Office: https://parkplanning.nps.gov/document.cfm?documentID=74623

NPS. (2020). *Arlington Memorial Bridge Rehabilitation*. Retrieved from National Park Service - George Washington Memorial Parkway: https://www.nps.gov/gwmp/learn/management/amb-rehabilitation.htm

NPS. (2020, December 4). *More than a bridge: National Park Service completes full rehabilitation of Washington's ceremonial entrance*. Retrieved from NPS George Washington Memorial Parkway: https://www.nps.gov/gwmp/learn/news/more-than-a-bridge-national-park-service-completes-full-rehabilitation-of-washington-dc-s-ceremonial-entrance.htm

NPS. (2020, September 21). *National Park Service adds safety features in Memorial Circle*. Retrieved from NPS George Washington Memorial Parkway: https://www.nps.gov/gwmp/learn/news/national-park-service-adds-safety-features-in-memorial-circle.htm

NPS. (2021). *Dockless Scooter Parking*. Retrieved from NPS National Mall and Memorial Parks: https://www.nps.gov/nama/planyourvisit/dockless-scooter-parking.htm

NPS George Washington Memorial Parkway. (2021). *Memorial Circle Transportation Plan and Environmental Assessment*. Retrieved from National Park Service (PEPC) Planning, Environment & Public Comment: https://parkplanning.nps.gov/projectHome.cfm?projectId=51448

NPS NAMA. (2021). *15th Street, 12th Street, and Jefferson Drive Resurfacing (30 Percent) Engineering Plan.* Washington D.C.: National Park Service.

NPS National Mall and Memorial Parks. (2020). NPS NAMA GIS Curb Use Data.

NPS National Mall and Memorial Parks. (2021, April). NAMA E-Scooter Pilot Parking Proposal. Professional Services.

NPS National Mall and Memorial Parks. (2021). Resurfacing and Restoration of Ohio Drive and West Basin Drive.

Paul S. Sarbanes Transit in Parks Technical Center. (2014, September). *Road Safety Audit for the Lincoln Memorial Circle.* Retrieved from Western Transportation Institute: https://westerntransportationinstitute.org/wp-content/uploads/2018/02/TRIPTAC_TA-LincolnMall_RSA.pdf

Strava. (2019-2020). *Pedestrian and Bicycle Strava Data from 2019-2020*. Retrieved from https://www.strava.com

Strava Metro. (2020). *Frequently Asked Questions*. Retrieved from Strava Metro FAQ: https://metro.strava.com/faq

Voigt, E. (2021, April 27). Email from Eliza Voigt to Minh Tran. *Hains Point*.