CONNECTING NATIONAL LANDING

Connecting Communities Through Travel Choices

VDOT Virginia Department of Transportation

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1401 E. Broad St.
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Connecting National Landing

Basic Project Information	
Project Name	Connecting National Landing
Project Sponsor	Virginia Department of Transportation
Was an application for USDOT discretionary grant funding for this project submitted previously?	No
A project will be evaluated for eligibility for consideration for all three programs, unless the applicant wishes to opt-out of being evaluated for one or more of the grant programs	__ Opt-out of Mega? __ Opt-out of INFRA? X Opt-out of Rural?
Project Costs	
MPDG Request Amount	Exact Amount in year-of-expenditure dollars: $97,000,000
Estimated Other Federal funding (excl. MPDG)	Estimate in year-of-expenditure dollars: $37,000,000
Estimated Other Federal funding (excl. MPDG) further detail	Other Federal funding from Federal Formula dollars: $37,000,000 Other Federal funding being requested from other USDOT grant opportunities? $0 From what Program(s)?: N/A
Estimated non- Federal funding	Estimate in year-of-expenditure dollars: $230,500,000
Future Eligible Project Cost (Sum of previous three rows)	Estimate in year-of-expenditure dollars: $364,500,000
Previously incurred project costs (if applicable)	Estimate in year-of-expenditure dollars: $7,500,000
Total Project Cost (Sum of 'previous incurred' and 'future eligible')	Estimate in year-of-expenditure dollars: $372,000,000

Basic Project Information	
INFRA: Amount of Future Eligible Costs by Project Type	**1.** A highway freight project on the National Highway Freight Network: $0 **2.** A highway or bridge project on the National Highway System: $238,000,000 **3.** A freight intermodal, freight rail, or freight project within the boundaries of a public or private freight rail, water (including ports), or intermodal facility that is a surface transportation infrastructure project necessary to facilitate direct intermodal interchange, transfer, or access into or out of the facility: $0 **4.** A highway-railway grade crossing or grade separation project: $0 **5.** A wildlife crossing project: $0 **6.** A surface transportation project within the boundaries or functionally connected to an international border crossing that improves a facility owned by fed/state/local government and increases throughput efficiency: $0 **7.** A project for a marine highway corridor that is functionally connected to the NHFN and is likely to reduce road mobile source emissions: $0 **8.** A highway, bridge, or freight project on the National Multimodal Freight Network: $0
Mega: Amount of Future Eligible Costs by Project Type	**1.** highway or bridge project on the National Multimodal Freight Network: $0 **2.** A highway or bridge project on the National Highway Freight Network: $0 **3.** A highway or bridge project on the National Highway System: $238,000,000 **4.** A freight intermodal (including public ports) or freight rail project that provides public benefit: $0 **5.** A railway highway grade separation or elimination project:$0 **6.** An intercity passenger rail project: $0 **7.** A public transportation project that is eligible for assistance under Chapter 53 of title 49 and is a part of any of the project types described above: $105,100,000 **8.** A grouping, combination, or program of interrelated, connected, or dependent projects of any of the projects described above $306,000,000

Basic Project Information	
Rural: Amount of Future Eligible Costs by Project Type	**1.** A highway, bridge, or tunnel project eligible under National Highway Performance Program: $0 **2.** A highway, bridge, or tunnel project eligible under Surface Transportation Block Grant: $0 **3.** A highway, bridge, or tunnel project eligible under Tribal Transportation Program: $0 **4.** A highway freight project eligible under National Highway Freight Program: $0 **5.** A highway safety improvement project, including a project to improve a high-risk rural road as defined by the Highway Safety Improvement Program: $0 **6.** A project on a publicly owned highway or bridge that provides or increases access to an agricultural, commercial, energy, or intermodal facility that supports the economy of a rural area: $0 **7.** A project to develop, establish, or maintain an integrated mobility management system, a transportation demand management system, or on-demand mobility services: $0

Project Location	
State(s) in which the project is located	Virginia
INFRA: Small or Large project	Large
Urbanized Area in which project is located, if applicable	Washington, DC (Northern Virginia)
Population of Urbanized Area (According to 2010 Census)	4,517,691 (2,166,805 within VA)
Is the project located (entirely or partially) in Area of Persistent Poverty or Historically Disadvantaged Community?	No
Is the project located (entirely or partially) in Federal or USDOT designated areas	No
Is the project currently programmed in the: ■ TIP ■ STIP ■ MPO Long Range Transportation Plan ■ State Long Range Transportation Plan ■ State Freight Plan	 Yes Yes Yes Yes No

Table of Contents

Project Description

The Virginia Department of Transportation is seeking federal grant funding of $97 million to complete the $372 million financing plan for the Connecting National Landing project. These transportation improvements will help advance the integrated transportation and land use plan developed by Arlington County in 2010 – the Crystal City Sector Plan, by providing more travel choices for the community.

The award-winning **Crystal City Sector Plan** laid out a 40-year community-based vision to transform Crystal City into a more inviting, lively, and walkable community with more ground-floor retail, better quality office space, and more housing options.

The Plan was adopted following an extensive community-based planning effort that included more than 90 public meetings over four years. It encourages new development by providing density and other incentives, improving streets, sidewalks, and other public infrastructure, upgrading open spaces, and increasing transit options.

The Plan outlines seven key goals for the revitalization of Crystal City:

- Enhance multimodal access and connectivity;
- Incorporate sustainable and green building principles into all urban and architectural design;
- Create a high-quality public realm that strengthens the sense of place;
- Provide a mix of uses balancing office, residential, retail, cultural, and civic uses among several defined neighborhood centers;
- Relate architectural and urban design to the human scale;
- Preserve the integrity of the single-family neighborhood to the west; and
- Ensure Crystal City's long-term economic sustainability.

One of the key improvements identified to realize the community vision was the transformation of Route 1 into an urban boulevard linking Crystal City's east and west neighborhoods. Route 1 between 12th Street S and 20th Street S in the Crystal City area of Arlington County is currently an elevated freeway that forms a barrier between destinations to the east and west. While Crystal City and Pentagon City are evolving from auto-centric places to higher-density, urban places that people can access by a variety of modes—walking, biking, transit, or driving—many stakeholders now desire to convert this half-mile long segment of urban freeway to embrace Route 1 as a city street with storefronts and building entrances. This urban boulevard will knit the urban fabric of Crystal City as part of the larger National Landing area.

A shift in travel behavior is critical to the success of the Route 1 urban boulevard. Connecting National Landing also includes improvements to the Crystal City Metro station and implementation of a robust Travel Demand Management (TDM) plan that is expected to reduce peak period single-occupancy vehicle (SOV) trips by 30%. Connecting National Landing improvements balance vehicle throughput and corridor levels of service with those of environmental sustainability, walkability, and redevelopment potential while considering a safe environment for all users.

- **Multimodal safety and reliability and congestion reduction:** Ultimately, a safe transportation network for people walking, biking, taking transit, and driving benefits the daily quality of life for its users. The Route 1 corridor will serve all users, which is tied to

Arlington's Vision Zero Plan. Lower speeds and traffic volumes will improve safety in the corridor for vulnerable users.

- **State of good repair:** Connecting National Landing will remove two bridge structures from the VDOT inventory along Route 1, reducing long-term maintenance costs. Modifications to the I-395 interchange will remove a bridge that is both structurally deficient and fracture critical while avoiding future replacement or rehabilitation costs, with the added benefit of extending the urban boulevard to the north that will contribute to lower speeds.
- **Economic impacts, freight movement, and job creation:** This project has the potential to spur development with a connected pedestrian grid and supports the movement of area employees, including the new Amazon headquarters, and associated mixed-use development in the area. It increases the accessibility to job centers through the proposed access improvements. Connecting National Landing will create approximately 6.5 acres of excess right-of-way which may result in more than $10M of developable land.
- **Climate change, resiliency, and the environment:** This project will result in reduced greenhouse gas (GHG) emissions including nearly 200,000 fewer tons of CO2 and more than 60 fewer tons of NOx. New transit services, as well as enhanced opportunities for walking and biking, are more environmentally friendly than single-occupant vehicle trips. As presented to the Commonwealth Transportation Board in December 2021, VDOT is committed to implementing a robust Travel Demand Management (TDM) strategy consistent with the results of the ongoing TDM study for this area. Planned improvements to the Crystal City metro station also support the necessary mode shift and provide the corresponding GHG emissions reductions.
- **Equity, multimodal options, and quality of life:** More travel choices will be made available creating more walkable neighborhoods that result in a higher quality of life. The downtown area can become reconnected to create space for public transit, walking, and cycling. Arlington County supports affordable housing options that will provide opportunities for existing and future residents of all income levels. Just recently, Arlington County preserved more than 1,300 affordable apartment homes in the Barcroft Apartment community. A review of transit accessibility along Route 1 showed the potential for nearly 15,000 members of disadvantaged populations (i.e., minority, limited English proficiency, low-income) within a three-mile radius of Connecting National Landing to have better access to the potential economic benefits of this area with this project in place.
- **Innovation areas:** This project provides innovative project delivery, technology, and financing solutions, such as a progressive design-build strategy, a pilot safety project to implement near-miss crash technology in National Landing, and value capture through land sales for either funds or in-kind support (tax increment financing) of Connecting National Landing elements.

This project satisfies all the merit criteria outlined in the federal grant opportunity, especially the priorities of providing economic, state of good repair, environmental, equity benefits, and innovation.

Transforming the grade-separated Route 1 to an at-grade urban boulevard is consistent with the national trend to remove urban freeways to create more vibrant street spaces, healthier environments, and increased economic opportunities. This project includes multiple components to improve multimodal connectivity and accommodations along Route 1 to meet the changing transportation needs of this growing urban activity center.

The following section describes the components of the project. For this project to be successful, the Commonwealth has made large investments designed to alleviate traffic congestion and assist with travel mode shift. Connecting National Landing will successfully achieve the necessary mode shift by designing an at-grade urban boulevard that discourages cut-through traffic while improving access to transit facilities and other multimodal travel options for people living, working, and visiting National Landing. A robust TDM strategy is included in this application to complement the roadway design changes and to accommodate future travel on the corridor. These investments are anticipated to contribute to *a peak period mode shift of 30%, corresponding to a 30% reduction in vehicle miles traveled (VMT) during the peak period along Route 1*. Although additional VMT reductions are expected throughout the rest of the day, the BCA used in this application took a conservative approach and did not include those benefits.

Figure 1 shows an overview of the significant transit and mobility improvements in the National Landing area that are outside the scope of this grant funding request but are interconnected and can be leveraged to recognize the benefits of this grant application. This suite of projects represents the significant investments in the area complementing the environmental and economic benefits of the Connecting National Landing grant request.

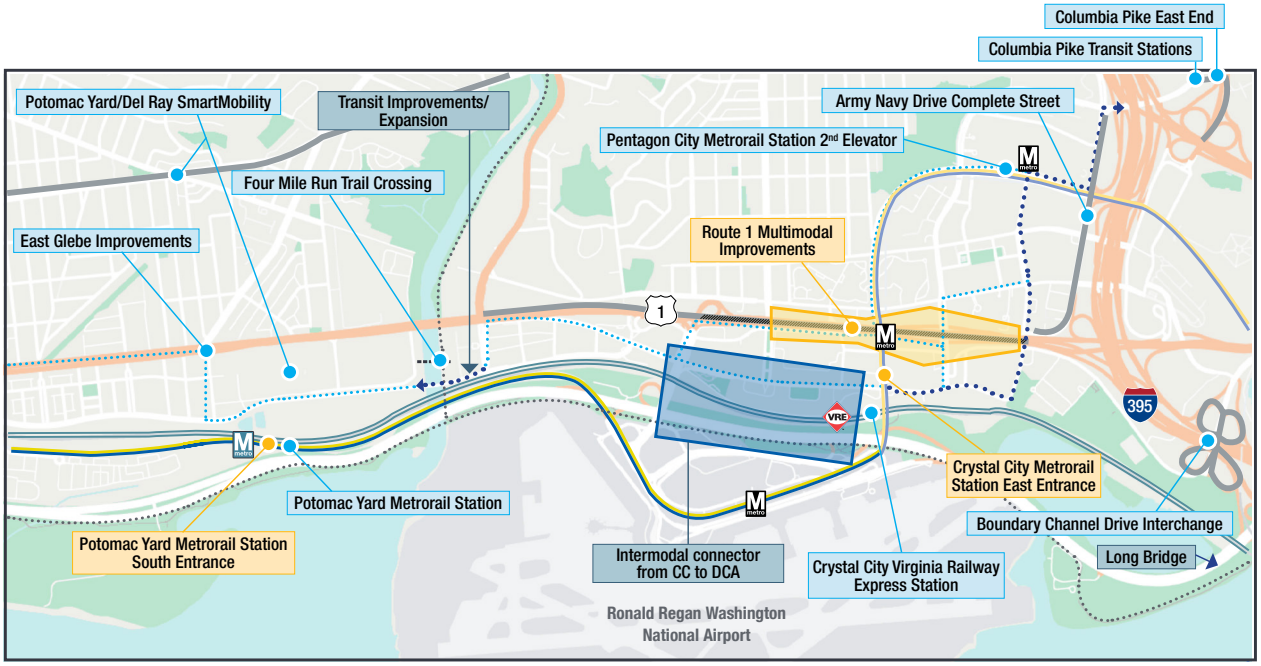
Project Components for Grant Funding

Route 1 Urban Boulevard Improvements	■ Transforming the grade-separated Route 1 to an at-grade configuration. ■ Walkable access along Route 1 between 15th Street S and 23rd Street S to buildings, parks, and public transportation facilities (bus, metro, commuter rail, and Reagan National Airport). ■ Wide, high-visibility pedestrian crosswalks and bicycle crossings of Route 1, with pedestrian refuges and shorter crossing distances than exist today. ■ Accommodations for vehicles and buses while providing opportunities for wide sidewalks and other amenities along Route 1 that will embrace future economic development by activating the Route 1 street frontage. ■ Robust TDM program that increases the frequency of existing transit and potentially introduces new services, incentives for multimodal travel, partnerships with large employers, and other strategies to promote multimodal trips.
I-395 Bridge Conversion to At-Grade Intersection	■ The grade-separated bridge from I-395 southbound to Route 1 southbound will be converted to an at-grade intersection. ■ Replaces a structurally deficient, fracture-critical bridge.
Crystal City Metro Station Second Entrance	■ Construct a second at-grade entrance to the underground metro station. ■ Increase ADA accessibility to transit systems.

Background transportation network improvements (not for grant funding) but key to the success of the urban boulevard concept:

- **Potomac Yard Metrorail Station**
  - Construction has begun to construct a new Metrorail station approximately 1.5 miles south of the Route 1 multimodal improvements.
- **Intermodal Connector from Crystal City to the Ronald Reagan Washington National Airport (DCA)**
  - Currently in the planning stages, this intermodal connector is intended to link Crystal City with Ronald Regan Washington National Airport to strengthen pedestrian and micromobility connections between the airport and Crystal City.
- **Transitway Extension to Pentagon City**
  - The Transitway will serve local travel demand within the corridor, including Amazon's HQ2 headquarters, enhance connections to Metrorail and improve connections to Columbia Pike. It will provide needed transportation capacity to support anticipated infill residential and office development in Crystal City and Pentagon City, particularly PenPlace, Pentagon Centre, and Metropolitan Park.
- **Virginia Rail Express (VRE) Crystal City Station**
  - In the final design stage, these station improvements to the VRE station include adding capacity and the relocation of the station. This station has the potential to be connected to the Intermodal Connector between Crystal City and DCA.

Figure 1 Local Projects



Existing Infrastructure

- Above Ground Metro
- Below Ground Metro
- Virginia Railway Express (VRE)
- Metroway Bus Route
- Pedestrian/Bike Trail
- Existing Metro Station

Proposed Investments to Support Amazon's New HQ

- Projects Funded in Part with New State Support
- Projects Funded Primarily by Localities*
- Roadway Improvements
- Route 1 Improvements
- New Metroway Bus Route
- New Pedestrian/Bike Trail
- New Metro Station

*Includes some already existing commitments of state and federal funds

Transportation Challenge

Support booming economic development in the area from the new Amazon headquarters and other new developments, address safety concerns for vulnerable roadway users, increase transportation options, and reduce greenhouse gas emissions.

Route 1 (Richmond Highway) is a major north-south arterial and part of the National Highway System. Regionally, Route 1 is a primary arterial road connecting Washington, D.C., Arlington County, the City of Alexandria, and southern suburbs including Fairfax and Prince William counties. Route 1 carries more than 45,000 vehicles per day in the Crystal City and Pentagon City areas.

With Arlington County's successful implementation of land use plans and multimodal transportation improvements, Crystal City and Pentagon City **have attracted major new development projects, including Amazon's second headquarters (HQ2)**. In late 2018, with the announcement of an agreement to bring Amazon's new corporate headquarters to Crystal City, the Commonwealth of Virginia identified improvements to Route 1 as part of a transportation incentive package to be partially funded by the Commonwealth. These improvements are necessary to support the travel demands of new workers and residents associated with the HQ2 development as well as future spin-off development. However, these improvements rely on a fundamental shift away from single-occupant vehicles (SOV) to other multimodal options. Although Route 1 was identified as a priority, the Commonwealth's commitment to Amazon extends beyond just improving safety, accessibility, and the pedestrian experience crossing Route 1. The project components of Connecting National Landing will address the following goals:

- **Safety:** *Connecting National Landing improves multimodal safety for pedestrians, bicyclists, micro-mobility modes, transit, and vehicles along and across Route 1*. Safer streets mean fewer injuries—but also more healthful, active travel. Ultimately, a safe transportation network for people walking, biking, taking transit, and driving benefits the daily quality of life for its users. The Route 1 corridor will serve all users and is tied to Arlington's Vision Zero Plan. Lower speeds and reduced traffic volumes will improve safety in the corridor for all users.
- **Multimodal accessibility and accommodation:** *Connecting National Landing increases multimodal accessibility and accommodation along and across Route 1.* More travel choices will be made available through travel demand management strategies, which will create more walkable neighborhoods resulting in healthier communities. Rather than rebuilding a high-speed interstate ramp at I-395, the downtown area can become reconnected to create space for public transit, walking, and cycling.
- **Transit effectiveness:** *Connecting National Landing makes transit more accessible, reliable, and convenient.* Accommodating multimodal travel choices is critical to the success of the Route 1 corridor and the efficient operation of National Landing. VDOT is committed to implementing a robust TDM strategy that is consistent with the results of the ongoing TDM study. Additionally, adding a second entrance to the Crystal City Metro Station will directly improve transit accessibility and reliability.
- **Vehicular operations:** *Connecting National Landing maintains an appropriate level of vehicular operation and accommodation along Route 1 and on intersecting streets: 15th Street, 18th Street, 20th Street, and 23rd Street.* Acceptable levels of service for vehicular operations will be maintained through the TDM program implementation. A mode shift of 30% is expected to reduce future peak period Design Year 2040 traffic volumes below the 2019 volumes.

- **Environmental:** *Connecting National Landing preserves, protects, and enhances the built, natural, visual, and social environments.* Not only will an at-grade solution promote more walking and biking trips, but the new transit service will also provide for more environmentally friendly trips. This project will result in reduced greenhouse gas (GHG) emissions with a predicted CO2 reduction of nearly 150,000 metric tons and over 45 metric tons of NOx reduction. New transit services and a robust TDM program allow for more environmentally friendly than single-occupant trips.
- **Urban fabric:** *Connecting National Landing integrates Route 1 within the context of Crystal City and Pentagon City as a multimodal urban boulevard design consistent with the context of the surrounding existing and future built environment.* This project has the potential to spur development with a connected pedestrian network, supports the movement of Amazon employees, and improve access to associated mixed-use developments in the area while reducing vehicle dependency. It also increases accessibility to job centers with the proposed access improvements. The Route 1 urban boulevard project will create approximately 6.5 acres of excess right-of-way which could result in more than $10M of developable land.

Project History

VDOT is committed to transforming Route 1 into a multimodal urban boulevard thereby providing transportation options for all roadway users. To date VDOT has spent $4M on the Route 1 Multimodal Improvements Study to support this project; Arlington County has spent $3.5M on the Crystal City Metro entrance project for land use and transportation has occurred in the National Landing area since 2010. **Table 1** details milestones that have led to the development of the Connecting National Landing improvements that are included in this grant application.

Table 1 Project Milestones

Year	Milestone
2010	Crystal City Sector Plan was adopted after more than 90 public meetings in four years. This plan includes transforming “Jefferson Davis Highway (Route 1) into an asset of the overall multimodal transportation network.”
2014	Crystal City Station Access and Second Entrance Study completed in February 2014.
2016	Arlington County added the metro station second entrance into the Transit Development Plan and Capital Improvement Plan.
2018	Amazon announces its second headquarters in Crystal City.
2019	The conceptual design for the second entrance to the Metro Station report was completed in November 2019.
2020	Reimagine Route 1 was published in September 2020 by the National Landing Business Improvement District to summarize the “bold vision” for transforming Route 1.
2021	Route 1 Multimodal Improvements Feasibility Study Phase 1 completed.
2022	Route 1 Multimodal Improvements Feasibility Study Phase 2 continues.

Project Location

The project area is a 0.75-mile segment along Route 1 from I-395 to 23rd Street S in the Crystal City area of Arlington County. Regionally, Route 1 is a primary arterial road connecting Washington, D.C., Arlington County, the City of Alexandria, and southern suburbs including Fairfax and Prince William counties. National Landing area comprises Crystal City, Potomac Yard, and Pentagon City. The Route 1 corridor is within Crystal City, approximately 0.3 miles east of Pentagon City and approximately 1.5 miles north of Potomac Yard, making it a critical transportation corridor of the National Landing area. The project location is shown in **Figure 2**. Route 1 within the project limits is currently a six-lane grade-separated principal arterial as identified in the VDOT functional roadway classification map.

Although the project area is not located in an Area of Persistent Poverty, a Historically Disadvantaged Community, nor a Federally designated community development zone, a review of StreetLight origin-destination data showed nearly 50% of trips through the study area originated from census tracts meeting these definitions.

Figure 2 Project Location

Project Parties

The Virginia Department of Transportation (VDOT) is the lead applicant for this grant application with the support of Arlington County. VDOT has a long history of strategically and effectively utilizing federal transportation funds, exhibited most recently with the use of $165 million in federal FASTLANE grant funding on the Atlantic Gateway project. VDOT successfully embraces partnership to achieve significant outcomes and has worked with the following entities to advance this project:

- Arlington County
- Washington Metropolitan Area Transit Authority
- National Landing Business Improvement District
- Amazon

Grant Funds, Sources, and Uses of All Project Funding

The improvements identified in Connecting National Landing are estimated to cost $372 million. VDOT is committed to the success of this project and has incurred the following expenses to date outlined in **Table 2**.

Table 2 Previous Incurred Cost

Task	Incurred Cost
Route 1 Multimodal Improvements Study	$4,000,000
Crystal City Metro Station Second Entrance	$3,500,000

Connecting National Landing includes a network of components to meet the overall project goal of improving multimodal connectivity and accommodations along Route 1. The future project component eligible costs are outlined in **Table 3**.

Table 3 Project Funding Sources (in millions)

Task	Federal Grant	Other Federal	State/Local	Total Cost (Rounded)
Route 1 Urban Boulevard	$44		$136	$180
TDM Strategies **Not Eligible for Grant Funding*			$22	$21.5
I-395 Southbound Ramp Conversion	$39		$19	$58
Crystal City Metro Station Second Entrance	$14	$37	$54	$105

The Route 1 urban boulevard improvements include converting the urban freeway to two at-grade intersections, pedestrian and bicycle accommodations, and landscaped medians through the corridor. The detailed cost estimate, including a 40% total contingency for this the Route 1 urban boulevard project, is included in **Appendix A**. The cost estimate for the I-395 bridge conversion is based on Concept 4 of the proposed ramp replacement concepts that are included in **Appendix A**. The Crystal City Metro Station second entrance cost estimate is also included in **Appendix A**. The estimated total project costs eligible for the federal grant are summarized in **Table 4**.

Table 4 Cost Summary

Project Component (Cost Estimate Year)	Total Amount (Nominal) (Cost Estimate Year)	Total Amount (Real) (2020)
Route 1 Urban Boulevard	$177,300,000	$131,800,000
I-395 Bridge Conversion	$58,000,000	$47,800,000
Crystal City Metro Second Entrance	$105,100,000	$88,000,000
Total	**$340,400,000**	**$267,600,000**

Project Outcome Criteria

Safety

Connecting National Landing will enhance safety by reducing the number, rate, and consequences of fatal and serious injury crashes among transportation users along the Route 1 Corridor by lowering speeds and shifting single-occupant vehicles (SOV) trips to other modes of travel. This project takes a multi-pronged approach to reducing crashes and improving safety.

- Lowering speeds by converting the grade-separated highway to multiple at-grade intersections
- Shifting travel to non-SOV modes which will lower crash rates
- Protecting vulnerable roadway users
- Implementing a near-miss pilot program

Most travel on Route 1 in the project area is currently completed by SOVs. The multimodal improvements included in Connecting National Landing, like pedestrian zones and bicycle facilities, will enhance safe and healthy alternatives to SOV travel in addition to protecting non-motorized travelers. Crash data summarized in the Route 1 Multimodal Improvements Study were reviewed in preparation of this application to identify trends to supporting the recommended improvements. A summary of the crash severities identified in the Route 1 study area from north of 12th Street to south of 26th Street is shown in **Table 5**. Based on an evaluation of this data, a majority of the crashes occur in the northbound direction near the I-395 interchange ramp area and in the southbound direction between 12th Street S and 15th Street S. Additionally, crashes are concentrated at signalized intersections, especially at the 20th and 23rd Street intersections. Seven crashes involving pedestrians or bicyclists occurred at the 23rd Street S intersection. The detailed existing conditions crash analysis can be found in the existing conditions report linked on the Route 1 website.

Table 5 Study Area Crash Severity Summary

Year	Severity				Total
	Fatality	Severe Injury	Visible Injury	PDO	
2015	0	1	9	25	35
2016	0	2	11	19	32
2017	0	0	6	10	16
2018	0	0	7	15	22
2019	0	0	5	12	17
2020[1]	0	0	2	1	3
Total	0	3	40	82	125

1 Crash data for 2020 was only collected between January 1, 2020, to February 28, 2020, due to COVID-19

To address the safety challenges at the intersection of Route 1 and 23rd Street it is important to reduce vehicular speeds from the I-395 interchange area through 12th Street to 23rd Street is crucial. Connecting National Landing includes a multifaceted approach to improving safety for motorized and non-motorized users—one proven strategy to improve safety is to reduce vehicular speeds. Converting the grade-separated urban freeway to two at-grade intersections at 15th and 18th streets is designed to lower speeds and improve safety for vehicles and vulnerable roadway users.

Following Arlington County's Vision Zero Action Plan, the Route 1 urban boulevard project is dedicated to constructing a complete street where human life and health are prioritized by allocating space for multiple travel modes. This project will provide safer transportation options for vulnerable roadway users, as defined by FHWA, by giving separate space for walking, biking, and other transportation modes. These users are expected to increase as growth happens in the area from the 25,000 jobs created by Amazon; 7,800 new residential units, and a 400% increase in dining, shopping, and entertainment options as noted in the National Landing Business Improvement District (BID).

The proposed improvements are anticipated to reduce high crash areas along the corridor, most notably at the I-395 merge area and at the 23rd Street intersection. A detailed crash prediction analysis of the proposed improvements and their estimated potential crash reduction is available in the Future Build Conditions Report on the Route 1 website. By lowering the speed limit, future crashes are expected to improve in terms of number and severity.

Figure 3 Future Crash Comparison to No Build

State of Good Repair

This project is consistent with VDOT's Transportation Asset Management Plan, and addresses current and projected vulnerabilities. If left unimproved, these vulnerabilities will threaten future transportation network efficiency, mobility of goods, mobility and accessibility of people, and economic growth. Connecting National Landing will significantly reduce long-term maintenance costs by replacing a structurally deficient, fracture-critical bridge on the interstate system.

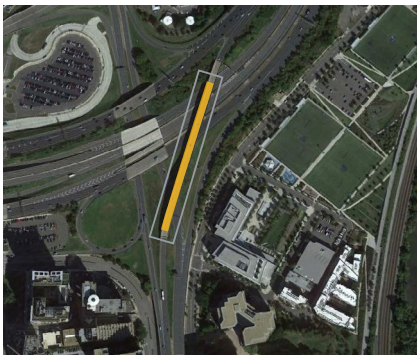


Figure 4 I-395 Southbound Ramp

At-grade roadways are easier and less costly to maintain than ones with bridge structures. The conversion of Route 1 to an urban boulevard will remove two bridges on the national highway system. Conversion of the I-395 southbound ramp (highlighted in **Figure 4**) to an at-grade intersection will remove a structurally deficient bridge from the national highway system. The removal of these bridges will avoid future replacement or rehabilitation costs, while also extending the urban boulevard to the north contributing to lower travel speeds.

Economic Impacts, Freight Movement, and Job Creation

Connecting National Landing improves multimodal transportation systems that incorporate affordable transportation options such as public transit to improve mobility of people and goods, improves access to employment centers and job opportunities, improves economic strength by increasing the economic productivity of land, capital, or labor, and supports integrated land use, economic development, and transportation planning to improve the movement of people and goods and local fiscal health. It accomplishes all of this by providing multimodal access, increasing access to the WMATA rail system and capacity of the metro station entrance, and reducing barriers to multimodal travel.

The National Landing area comprised of Pentagon City, Crystal City, and Potomac Yard is quickly expanding economic development with over $8 billion in private investments in the pipeline according to the National Landing BID. It is anticipated that the area will include 7,800 new residential units, 550 new affordable housing units, over 25,000 jobs from Amazon alone, and a 400% expansion in commercial space. The Route 1 urban boulevard and the Crystal City Metro entrance will support this expansion by providing transportation options ultimately helping the United States compete in a global economy by encouraging the location of important industries, such as Amazon and future innovations and technology in the U.S.

Increased accessibility will allow residents to travel to job centers without the need for an SOV. The multimodal improvements will provide low-cost transportation alternatives through active transportation and transit improvements. These travel modes will offer reliable access to National Landing employment centers.

The Crystal City Sector Plan outlines steps to ensure integrated land-use, economic development, and transportation plans are taken into consideration for all projects in Crystal City. Connecting National Landing takes major steps to achieve these goals outlined in the plan.

The Route 1 urban boulevard improvements will create approximately 6.5 acres of excess right-of-way that can support development. An analysis showed that the land could be valued at more than $3 billion (as identified in a study prepared by HR&A in 2021). The excess right-of-way is shown in **Figure 5**. This additional potential excess right-of-way provides more acreage for development adjacent to the future multimodal urban boulevard.

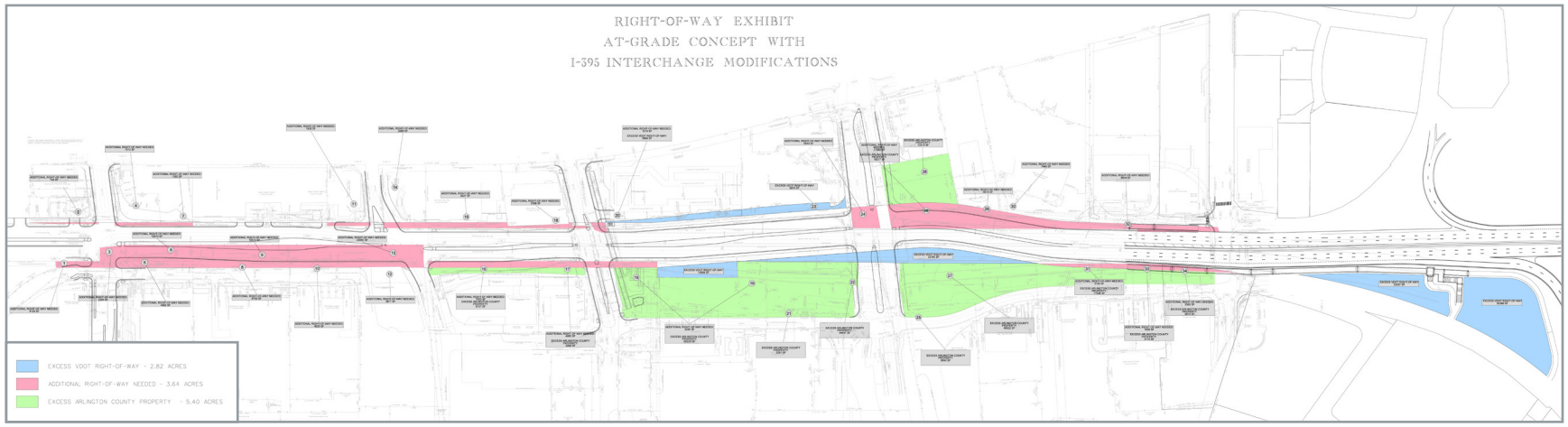


Figure 5 Excess Right-of-Way

Climate Change, Resiliency, and the Environment

The project will improve air quality by reducing greenhouse gas emissions through increased non-SOV travel along Route 1. These greenhouse gas emission reductions are expected to be nearly 150,000 metric tons of CO2 and more than 45 metric tons of NOx. The Commonwealth has made and is committing in this grant application to make additional investments to shift peak period travel modes by 30% along Route 1 to make the improvements in this project a success. Connecting National Landing will add active transportation options and increased access to transit options that are inherently beneficial to environmental quality.

Arlington and VDOT are committed to environmental sustainability; the Crystal City Sector Plan includes a specific policy about environmental standards stating that Arlington County will "design, construct, and manage all public and private spaces, streets, infrastructure, and buildings to help the Crystal City Plan meet selected certification standards under the United States Green Building Council's (USGBC) LEED Neighborhood Development program." Another document reviewed for this project is the Livability 22202 Action Plan, developed by various Crystal City civic associations, that identifies an action to foster environmental sustainability. The Action Plan directs projects in the Arlington County 22202 zip code to include a healthy tree canopy to improve air quality and natural open space. The Action Plan also prioritizes extending the multimodal transportation network with a specific need identified to "design and implement better and safer connections across Route 1."

The transportation sector is one of the largest contributors to greenhouse gas emissions. Transforming the grade-separated Route 1 urban freeway to at-grade intersections with pedestrian and bicycle accommodations will encourage more walking and biking trips. Pedestrian zones will be lined with trees and are expected to create an urban tree canopy that encourages travelers to walk or bike. The transformation of Route 1 to an urban boulevard is also expected to reduce future peak period year 2040 VMT to be equal to or less than year 2019.

Connecting National Landing will move people in a variety of modes that will increase the use of lower-carbon travel. One of the project goals is to preserve, protect, and/or enhance the built, natural, visual, and social environment. This project is expected to reduce greenhouse gas emissions through active transportation options and the promotion of increased ridership with the new entrance to the Crystal City Metro Station.

The Route 1 urban boulevard includes $21.4M to implement TDM solutions which will contribute to a reduction in greenhouse gas emissions. Due to eligibility requirements, while the TDM is a key component of the Route 1 urban boulevard, no grant funds are requested for this component. VDOT is committed to implementing the results of the ongoing Route 1 Multimodal Improvements Feasibility Study Phase 2 Travel Demand Management (TDM) recommendations. In addition to the urban boulevard design, the TDM strategies will support mode shift from SOV to a variety of other transportation options such as transit, ridesharing, walking, and/or biking. The Route 1 Multimodal Improvements Study predicted year 2040 pedestrian volumes would double at 18th Street. TDM strategies may include education, access, or incentives to switch modes to a more environmentally friendly alternative that also decreases congestion. Additionally, the second entrance to the Crystal City Metro station will support the mode shift goal by providing additional capacity for the ingress and egress from a notoriously congested Metro stop.

Finally, the improvements outlined in the VDOT Route 1 Multimodal Improvements Study will reduce the amount of paved surface that reduces stormwater runoff. A stormwater management assessment feasibility study was completed by VDOT for the project area and concluded that the existing system is adequate to drain the area of the project and that the proposed improvements will improve the current conditions. The at-grade design will reduce the overall flow as compared to existing conditions due to the significant reduction in impervious areas. Due to this reduction, the design is not anticipated to require major BMP facilities. The water quality and quantity needs can be met through the mix of reducing impervious areas for water quantity and purchasing nutrient credits to meet the water quality requirements.

Equity, Multimodal Options, and Quality of Life

Connecting National Landing seeks to address automobile dependency as a barrier to success by reinventing the Route 1 corridor. The construction of bicycle and pedestrian infrastructure, as well as a renewed focus on multimodal travel options, will increase affordable and accessible transportation choices by creating new connections and opportunities for underserved communities. A review of transit accessibility along Route 1 showed the potential for nearly 15,000 members of disadvantaged populations (i.e., minority, limited English proficiency, low-income) within a three-mile radius of Connecting National Landing to have better access to the potential economic benefits of this area with this project in place. The project will improve transportation options to essential services along the Route 1 corridor—there are two daycare centers, three medical offices, two physical therapy offices, and over twenty restaurants that will benefit from improved transportation options in the area. There are twenty bus stops in the vicinity of the project area and the Crystal City Metro entrance that people cannot currently walk or bike to across Route 1.

The urban density of the surrounding area is anticipated to decrease auto-centric travel, especially with the announcement of Amazon's second headquarters in Crystal City. The HQ2 development will create demand for more transportation options and leave the existing Route 1 facility vulnerable to extreme congestion with increasing travel demand. New and/or expanded multimodal access through pedestrian, bicycle, transit, and other micro-mobility transportation options is essential to the future safety and capacity of the corridor. Critical to the success of these multimodal options will be the inclusion of affordable housing within National Landing. Amazon has already committed more than $380M to preserve and create up to 1,300 affordable homes in Arlington.

Connecting National Landing multimodal improvements have engaged diverse communities and integrated their feedback into the planning and development of this project. The Crystal City Sector Plan was adopted in 2010 after more than 90 public meetings over four years. The Route 1 Multimodal Improvements Study has an extensive public engagement plan that started in December 2020 and is expected to be completed by December 2022. The public engagement plan includes community meetings, opportunities for virtual and mail-in comments, and strategic partnerships with community stakeholders in all phases of this project. The second entrance to the Crystal City Metro Station has incorporated public involvement since February 2021 that included question and answer sessions, a Washington Metropolitan Area Transit Authority Compact public hearing, and an Arlington County board meeting.

Redesigning Route 1 to include at-grade intersections removes the physical barrier to walking and biking and strengthens National Landing community connectivity.

The reallocation of roadway space will create a place where the community will want to connect. Wide sidewalks, benches, tree canopies, and lighting will contribute to placemaking for the unique character of National Landing, which creates healthier and more walkable neighborhoods resulting in a higher quality of life.

Innovation Areas

This project incorporates innovation in delivery, finance, and technology. It provides multiple innovative solutions, such as a progressive design-build strategy, a pilot safety project to implement near-miss crash technology in National Landing, and value capture through land sales for either project funds or in-kind support of National Landing elements.

Project Delivery

This project is being delivered using an innovative contracting method known as Progressive Design-Build (PDB) which facilitates involvement of the design-build team during the earliest stages of project development, ensuring they are part of the project team developing design solutions. This contracting method promotes the greatest amount of collaboration between the three key players in a construction contract – the owner, the designer and the contractor. The progressive design-build process results in the expedited project delivery due to short procurement time, avoidance of the duplication of preliminary engineering efforts and use of early work packages during the final design development process.

Application of Near-Miss Technology

VDOT has successfully used Innovation and Technology Transportation Fund (ITTF) dollars to conduct pilot projects and proposes to implement near-miss crash technology in National Landing using ITTF dollars again. Near-miss crash technology involves using video analytics to track near-miss crashes and record other critical data. Tracking this data, especially for pedestrians and cyclists, can provide insights on improvements to bring Arlington County closer to achieving its vision zero plan. This pilot program will be modeled after the successful implementation of traffic-cam monitoring in Bellevue, WA. The Video-based Network-wide Conflict and Speed Analysis to Support Vision Zero in Bellevue (WA) the United States concluded that intersection conflicts, or near-crash events, were an accurate predictor of where future crashes will occur. Bellevue used Transoft solutions to implement video-based analytics to help predict, diagnose, and address roadway safety challenges. The Connecting National Landing near-miss project will be followed up with a technology evaluation to address identified safety issues. The project's data collection plan is outlined in **Appendix D**, per the Mega data collection requirements outlined in the Notice of Funding Opportunity.

Project Financing

VDOT will also promote innovation through project financing. Value capture through land sales and/or a density bonus, which is an incentive-based tool to permit developers to increase the maximum allowable development on a site in exchange for either funds or in-kind support for specified public policy goals, will be applied in this area. Arlington County created a Tax Increment Financing Area (TIF) for Crystal City, Potomac Yard, and Pentagon City in 2010 as an implementation tool for the Crystal City Sector Plan. Since that time, the TIF has served as an important means of paying for infrastructure improvements that further the revitalization of National Landing. Arlington County has committed to use $6.4 million of tax increment financing toward the Crystal City Second Metro Entrance project component.

Additionally, the Crystal City Metro Entrance is being delivered as part of a public-private partnership between Arlington County and JBG SMITH. This collaborative arrangement is consistent with the Public-Private Education Facilities and Infrastructure Act of 2002 (PPEA). Funding for this project is being provided by state grants, regional funds, and local commercial real estate tax revenues dedicated to transportation.

Benefit-Cost Analysis

A benefit-cost analysis (BCA) was prepared to demonstrate how a modest investment in the corridor will create real and long-term benefits for the region. The benefits of the project consist of:

- A decrease in peak period traffic volumes and congestion, as a direct result of strategic, targeted, and specific TDM strategies that will shift mobility preferences from personal vehicle to carpool/ vanpool, shared mobility, walking, bicycle, and transit options
- Long term health and fitness benefits associated with a greater emphasis on active transportation
- An additional decrease in peak period traffic due to the improved transit accessibility with the proposed second entrance
- A reduction in the likelihood and severity of vehicle, pedestrian, and bicycle crashes, related to reduced traffic volumes and travel speeds along the Route 1 corridor and the removal of a challenging ramp merge area along Route 1
- A decrease in mileage dependent vehicle emissions and mobile source water runoff, which can reduce the impact of climate change
- An increase in the use and safety of multimodal mobility options
- A reduction in annual inspection, maintenance, rehabilitation, and repair costs for substandard bridge structures that are approaching the end of their useful life
- Greater community connectivity and cohesion through the removal of a grade separated facility
- An increase in area property values, commercial retail activity, and development potential due to increased walkability, reduced congestion and delay, and enhanced connectivity

In order to focus the methodology of this BCA on real and measurable changes associated with the project, the affected population considered in the analysis are the residents, employees, and visitors of Crystal City.

All roadway users will benefit from improved connectivity and access and reduced congestion. Additionally, the community surrounding the corridor will benefit from the improved economic competitiveness of the area, quality of life improvements, and health and recreation benefits.

The BCA considered an analysis period between 2023 and 2052, which considers the period during which initial project costs will be expended and during which 23 to 27 years of operation will be achieved (depending on project component).

The benefit-cost ratio (BCR) for this network of improvement is 2.99 assuming a 7% discount rate. The substantial positive impacts of the project in 2020 dollars and assuming a 7 percent discount rate are monetized at $536M in benefits. The results of the analysis are summarized in **Table 6** and the detailed benefit-cost analysis is included in **Appendix B.**

The BCA demonstrates the economic merit of the project with key considerations under each project outcome criteria.

Table 6 Benefit Cost Analysis Summary

Item	Undiscounted	7% Discounted
Benefits	$1,387,281,186	$535,750,580
Costs	-$267,621,292	-$179,102,601
Overall B/C Ratio	5.18	2.99
Net Present Value	$1,119,659,894	$356,647,978

Benefits of the project that are not quantified, but no less important in elevating the safety, opportunity, and development potential of Connecting National Landing:

- **Fuel consumption:** Mode shift from single-occupancy vehicles (SOVs) to active transportation modes will result in less fuel consumption travelers. Each 1% shift from automobile to active travel typically reduces fuel consumption 2-4% and can lessen the risks of climate change based on case study research.
- **Reduced household transportation user costs:** Households in auto-dependent communities devote 20% of household income more to transportation than communities with complete streets. The project will enhance transportation choice, emphasizing low cost alternatives for short trips.
- **Improved equity:** The combined benefits of the project will allow different populations (children, elderly, and economically, socially, or physically disadvantaged people) to fairly use and share in public resources by increasing accessibility, connectivity, and affordability. More than 50% of older Americans who do not drive stay home on a given day because they lack transportation options.
- **Non-peak period mode shift:** Additional VMT-dependent benefits that occur outside of the peak period.

Project Readiness and Environmental Risk

Technical Feasibility

Connecting National Landing has included extensive studies to understand the best improvements and their effects on the surrounding community. The completed studies include the Route 1 Multimodal Improvements Phase 1 Study, the Crystal City Station Access and Second Entrance Study, and the Crystal City Metrorail Station Second Entrance Conceptual Design and Feasibility Study. The Route 1 Multimodal Improvements Phase 2 Study, which includes an evaluation of the TDM plan, was started in December 2021 and is expected to be completed by February 2023. From these studies, the recommended improvements are included in this project. A detailed list of the work associated with this project is outlined below. **Appendix E** includes a scroll plot of the conceptual roadway design plans and concept sketches for the Crystal City Metro entrance.

- At-grade Crystal City Station access and second entrance
- Pedestrian zones along Route 1
- Street trees and landscaping
- Bicycle facilities
- Removing turn lanes from targeted intersections
- Removing two Route 1 bridges
- Removing one I-395 bridge
- Constructing an at-grade ramp terminal from I-395 southbound to Route 1

Project Schedule

VDOT is dedicated to meeting the obligation and construction date requirements of this grant application. The obligation of funds will be completed by September 30, 2025, and construction is anticipated to start before March 30, 2027, for all project components.

Crystal City Metro Station Second Entrance Schedule

Task	Date
Develop 30% Design Drawings	May-October 2022
Approve Guaranteed Maximum Price (GMP)	October 2022
NEPA Approval	April 2023
Final Design	October 2022 – September 2023
Construction	May 2023 – August 2025

Route 1 Urban Boulevard & I-395 Bridge Conversion Schedule

Task	Date
Refined Concept Design	August 2022
Procurement of Progressive Design-Build Contract	January - July 2023
Proof of Concept/NEPA Approval	July 2024
Project Development/Approval of Plans	December 2025
Final Design and Construction	January 2026 – December 2029

Required Approvals

Environmental Permits and Reviews

Connecting National Landing anticipates all environmental approvals and permits for the construction of the project to begin by the dates outlined in the project schedule.

State and Local Approvals

- In March 2022 Crystal City Metro Station's second entrance sought approval from the Arlington County Board for the at-grade entrance.

Environmental Studies

- Stormwater Management Assessment Report for Route 1

Assessment of project risks and mitigation strategies

Risk Category	Risk Name	Description	Probability of Occurrence	Severity of Impact	Mitigation Strategies
Management	Program Management	Implementing this large multi-modal program will compete with other state transportation programs and projects for executive oversight and project management resources	High	Moderate	The Commonwealth of Virginia and the Virginia Department of Transportation have a long history of delivering complex projects on time or early and within budget. They will use proven contract language that aligns contract interests of the contractor and owner, and their experienced contract staff as they come off other projects being completed to expertly manage the project to successful completion.
Financial	Loss of Public Funding	Unanticipated circumstances may reduce portions of the public funding stream	Low	Moderate	Multiple public funding sources leveraged help reduce the impact of the loss of any funding source. MPDG grant is critical to the success of this project.
Environmental	Environmental	Completion of the NEPA process and obtaining permits could potentially result in delays	Low	Low	The project has defined and agreed on a schedule and process for NEPA compliance. Work has been initiated with permitting agencies to reduce delays. The footprint of the project along the existing alignment is smaller in proposed than existing and enhances the natural features and environment along the corridor making this a least impact project from conception.

Risk Category	Risk Name	Description	Probability of Occurrence	Severity of Impact	Mitigation Strategies
Construction	Business Disruption	Businesses located near the project site could be impacted by construction activities and congestion	Low	Low	A project phasing plan and a plan to maintain access during construction have been developed and will continue to be refined during the final design. The successful maintenance of traffic developed by the study team gives high confidence to this not becoming an issue. Most buildings face away from Route 1 today.
Maintenance of Traffic		Existing highway traffic must be maintained during construction which will complicate the delivery process	High	High	A detailed MOT plan which allows for the continuous flow of traffic northbound and southbound at all times with a minimum of 6 travel lanes has already been developed as a part of the active Route 1 study. Additionally, VDOT has a succussful history of completing major highway projects with similar complexity such as I-66 and I-495.
Safety	Emergency Vehicles	Construction activities could impact the efficiency of evacuations, if needed during construction	Low	Moderate	Due to the proposed MOT plan two-way traffic patterns are to be maintained at all times and allow for emergency vehicles to operate the corridor and respond in a timely manner. Measures will be incorporated to allow for incident management.

Risk Category	Risk Name	Description	Probability of Occurrence	Severity of Impact	Mitigation Strategies
Operations & Maintenance	Stormwater	Management of stormwater post-construction will be substantial	Moderate	Low	Measures will be incorporated into the design to address stormwater management issues. The resulting benefits of the outcome are immense. The stormwater system upgrades to the system will increase resiliency, reliability, and redundancy.

Statutory Project Requirements

23 U.S.C. 117 INFRA	49 U.S.C. 6701 Mega	23 U.S.C. 173 Rural	Connecting National Landing
(1) The project will generate national, or regional economic, mobility, or safety benefits	(1) The project is likely to generate national or regional economic, mobility, and safety benefits	(1) The project will generate regional economic, mobility, or safety benefits	This projects supports the regional economic development of the Amazon headquarters, residential developments, and commercial developments in the National Landing area. Safety in the area will be increased by lowering vehicle speeds and reducing VMT while increasing access to multimodal travel options. INFRA – Yes Mega – Yes Rural – N/A
2) The project will be cost effective	(3) The project will be cost effective	(3) The project will be cost effective	This project results in substantial positive impacts in 2020 dollars and assuming a 7 percent discount rate are monetized at $536M in benefits. The predicted benefit-cost ratio is 2.99. INFRA – Yes Mega – Yes Rural – N/A
3) The project will contribute to 1 or more of the national goals described under Section 150	No statutory requirement	(3) The project will contribute to 1 or more of the national goals described under Section 150	This network of projects will contribute to reducing traffic crashes, maintaining the highway infrastructure in a state of good repair, and will assist in reducing congestion on highways. INFRA – Yes Mega – N/A Rural – N/A

23 U.S.C. 117 INFRA	49 U.S.C. 6701 Mega	23 U.S.C. 173 Rural	Connecting National Landing
4) The project is based on the results of preliminary engineering	No statutory requirement	(4) The project is based on the results of preliminary engineering	The following activities have been completed as of the date of application submission: ■ Topographic Surveys ■ Metes and Bounds Surveys ■ Geotechnical Investigations ■ Hydrologic Analysis ■ Utility Engineering ■ Traffic Studies ■ Financial Plans ■ Revenue Estimates ■ General estimates of the types and quantities of materials ■ Feasibility Study INFRA – Yes Mega – Yes Rural – N/A
5) With respect to related non-federal financial commitments, 1 or more stable and dependable sources of funding and financing are available to construct, maintain, and operate the project, and contingency amounts are available to cover unanticipated cost increases	(4) With respect to non-federal financial commitments, 1 or more stable and dependable sources are available to construct, operate, and maintain the project, and to cover cost increases	No statutory requirement	Please refer to Grant Funds Section for a table of funding sources and project components. Detailed cost estimates are included in **Appendix A**. This project has multiple funding sources because it is widely supported in Virginia. The Letters of Support are included in **Appendix C** INFRA – Yes Mega – Yes Rural – N/A

23 U.S.C. 117 INFRA	49 U.S.C. 6701 Mega	23 U.S.C. 173 Rural	Connecting National Landing
6) The project cannot be easily and efficiently completed without other Federal funding or financing available to the project sponsor	(2) The project is in significant need of Federal funding	No statutory requirement	If the project is not awarded there would be a gap in funding sources to complete all the components of this multimodal project. Adjustments in scope, schedule, and cost would have to happen in order to carry the project forward. INFRA – Yes Mega – Yes Rural – N/A
7) The project is reasonably expected to begin no later than 18 months after the date of obligation of funds for the project	(5) The applicant have, or will have, sufficient legal, financial, and technical capacity to carry out the project	(5) The project is reasonably expected to begin not later than 18 months after the date of obligation of funds for the project	Please refer to the project schedule section for a schedule for all the project components. INFRA – Yes Mega – Yes Rural – N/A

Appendix A

Cost Estimates

SYIP PROJECTS
DETAILED PROJECT COST ESTIMATE SUMMARY
(Version: April 2021)

Portal ID:		Project UPC:	115882
Prepared By:	HDR & Kimley-Horn (CEC, CMY, MRP, TAS)	Milestone	Creation/Pre Scope
Reviewed By:	Kimley Horn (RJM)	Date:	5/13/2021
County/City/Town:	Arlington County (00)	Tier Level	2
Project Complexity Classification	Most Complex (Major)		

Green Cells require input. Allowance / Contingency are not necessarily required. All others are auto calculating. Estimate to be entered based on current dollars and inflation will be applied external from this workbook.

Copy Creation/Pre Scope Estimate to Tracking Tab | Copy Public Hearing/PI Estimate to Tracking Tab | Copy Pre Adv Conference Estimate to Tracking Tab | Copy Final Scoping/PFI | Copy Field Inspection

Preliminary Engineering Phase [5]

Ensure Phase Contingency Row and Discipline Risk type column cells are not both selected

Project Estimate Component

Discipline	Source	Base($)	Allowance*	Risk Type	Contingency % (Value of Risk)	Total	Base, Allowance and Contingency Assumptions
Roadway	Norms	$ 12,201,400	$ -	Type 1 Percentage	20%	$ 14,641,680	In the original provided estimate, VDOT used ICVT to develop PE estimate which totalled $20,400,000. VDOT then included a 20% contingency due to the public involvement that will be required including the possibility of preparing separate work packages if progressive design build is used as the delivery method. This version of the worksheet (edited the KH/HDR team) makes the PE Base$ 20% of the Total Bid Items (not including contingency on these items), which assumes this cost includes potential DB Design Team PE efforts and NEPA. Contingency is for the points listed above.
SUBTOTAL PE PHASE ESTIMATE		**$ 12,201,400**	**$ -**			**$ 14,641,680**	
		Phase Contingency % (Value of Risk)		**Select**		$ -	
TOTAL PE PHASE ESTIMATE						***$ 14,641,680***	

PE Phase Dates (XX/XX/XXXX)	
PE Base Estimate Date	5/13/2021
Start Date	7/1/2022
End Date	7/1/2024

Right-of-Way & Utilities Phase [6]

Ensure Phase Contingency Row and Discipline Risk type column cells are not both selected

Discipline	Source	Base ($)	Allowance*	Risk Type	Contingency % (Value of Risk)	Total	Base, Allowance and Contingency Assumptions
Right-of-Way Acquisition	Pre-Scoping Plans	$ 1,600,000		Type 1 Percentage	60%	$ 2,560,000	Much of the work may be performed within existing RW. Approximate calculations are 4,000 SF x $400/sf = $1,600,000.00 Value of excess right-of-way and RW swap services are not included in this price. Contingency is for the potential issues of dealing with RW in an urban environment.
SUBTOTAL RW PHASE ESTIMATE		**$ 1,600,000**	**$ -**			**$ 2,560,000**	
		Phase Contingency % (Value of Risk)		**Select**		$ -	
TOTAL RW PHASE ESTIMATE						***$ 2,560,000***	

Phase dates (XX/XX/XXXX)	
RW Base Estimate Date	5/13/2021
Start Date	7/1/2024
End Date	7/1/2026

Construction Phase [7]

Ensure Phase Contingency Row and Discipline Risk type column cells are not both selected

Discipline	Source	Base ($)	Allowance*	Risk Type	Contingency % (Value of Risk)	Total	Base, Allowance and Contingency Assumptions
Mobilization/Constr. Survey	Pre-Scoping Plans	$ 3,509,000		Type 1 Percentage	40%	$ 4,912,600	Calculated per the guidelines in Road & Bridge Specifications
MOT	Pre-Scoping Plans	$ 11,996,000		Type 1 Percentage	40%	$ 16,794,400	40% contingency seem reasonable based on the overall total cost. Significant Temporary Support of Excavation will be required to facilitate Maintenance of Traffic
Roadway	Pre-Scoping Plans	$ 5,763,000		Type 1 Percentage	60%	$ 9,220,800	Base cost based on quantities of major items. 60% contingency was selected as the MLE value.
Hydraulics / SWM	Profess. Judgement	$ 6,469,000	$ 250,000	Type 1 Percentage	60%	$ 10,750,400	Expressed as a percentage of the total Roadway / Structures items. Contingency is due to experience and the usual difficulties in providing drainage within an urban environment. SWM will not be necessary for Water Quantity, per calculations by ALA in the VRRM spreadsheet dated 4/8/2021. SWM for Water Quality will preferably be addressed through nutrient credit purchase (not included in this line item. If nutrient credits are unavailable, an allowance is included to achieve the reductions through alternative means.
In-plan Utilities	PCES	$ 5,233,000		Type 1 Percentage	60%	$ 8,372,800	Cost was developed in coordination with VDOT Utilities and Arlington County Water, Sewer, Streets Bureau. Assumes installation of utilities in future proposed roadway to maximize developable area.
Traffic	Pre-Scoping Plans	$ 6,078,000		Type 1 Percentage	50%	$ 9,117,000	See Workbook for assumptions. Includes signing, pavement markings, ITS, lighting, landscaping, and signals.
Structures/Bridges	Pre-Scoping Plans	$ 10,409,000		Type 1 Percentage	60%	$ 16,654,400	60% contingency was selected due to close proximity of existing buildings and retaining walls.
Earthwork/Geotech	Pre-Scoping Plans	$ 11,550,000		Type 1 Percentage	60%	$ 18,480,000	Calculations derived from 3D Model Volume to Volume Measurements. Project is a surplus requiring disposal. Further coordination with VDOT is required to determine potential / likely disposal locations. 60% was selected due to typical increases in cost of geotech related items during the project development process and since no geotech work has been performed.
Environmental/Soundwalls	Select	$ -		Type 1 Percentage	0%	$ -	
Other	Select	$ -		Type 1 Percentage	0%	$ -	
	Total Bid Items	**$ 61,007,000**	**$ 250,000**			**$ 94,302,400**	
Incidental-Claims & Work Orders (5-10% of Total Bid Items)	10	$ 6,100,700		Select	0%	$ 9,430,240	**Note: For Tier 1 projects, typically 5%. For Tier 2 projects, typically 10%.**
Railroad Flagging/Coordination				Select		$ -	
State Forces		$ 1,000,000		Type 1 Percentage	50%	$ 1,500,000	Norms
State Police		$ 1,000,000		Type 1 Percentage	50%	$ 1,500,000	Norms
Nutrient Credit Purchase		$ 61,500		Type 1 Percentage	50%	$ 92,250	See COMP Workbook. Quantities based on VRRM spreadsheet dated 4/8/2021
WMATA Permitting Conditions		$ 250,000		Type 1 Percentage	50%	$ 375,000	Design intent is to avoiding Metro tunnel, vent shaft, and other elements. Even with this low risk, WMATA's Joint Development of Adjacent Construction (JDAC) processes will need to be followed, including paying for WMATA to review plans/participate in project. Project will need a Reimbursable Project Agreement to fund WMATA staff time.
Contract Requirements (Incentive/Disincentive; 5% max)	5	$ 3,050,350		Select	0%	$ 3,202,868	Norms
Fuel and Asphalt Adjustment	2	$ 1,220,140		Select	25%	$ 1,525,175	Norms
Total Bid and Non-Bid Items		**$ 73,689,690**	**$ 250,000**			**$ 111,927,933**	
Construction Engineering (Inspection)	Environmental Inspection			Select		$ -	
	VDOT or Locality	$ 10,676,225		Select		$ 10,676,225	17.5% of Total Bid Items
	VDOT Oversight			Select		$ -	
	Total CEI	**$ 10,676,225**	**$ -**			$ 10,676,225	
SUBTOTAL CN PHASE ESTIMATE		$ 84,365,915	$ 250,000			**$ 122,604,157.50**	
		Phase Contingency % (Value of Risk)		**Select**		$ -	
TOTAL CN PHASE ESTIMATE						***$ 122,604,158***	

Phase dates (XX/XX/XXXX)	
CN Base Estimate Date	5/13/2021
Start Date	7/1/2026
End Date	7/1/2029

TOTAL PROJECT COST ESTIMATE (excluding inflation) $ 139,805,838

SYIP Total Project Cost Estimate Summary (including inflation)

Phase	Base ($) *	Allowance*	Contingency ($) *	Total Phase*	Inflation**	Total ***
PE Phase Estimate	$ 12,201,400	$ -	$ 2,440,280	$ 14,641,680	1.0927	$ 15,999,359
RW Phase Estimate	$ 1,600,000	$ -	$ 960,000	$ 2,560,000	1.1593	$ 2,967,742
CN Phase Estimate	$ 84,365,915	$ 250,000	$ 37,988,243	$ 122,604,158	1.2912	$ 158,303,116
Total Estimate	***$ 98,167,315***	***$ 250,000***	***$ 41,388,523***	***$ 139,805,838***		***$ 177,270,216***

* Use combined Base, Allowance and Contingency Costs into SMART Portal or PCES workbook.
** Obtain Inflation costs from SMART Portal or PCES workbook and enter into highlighted cells.
*** Total Costs shall match with total costs in SMART Portal or PCES.

Concept 4 -2 Phase Intersection, Accomodation of 10th Street Improvements					
Feature	Size/Qty	Unit	Unit Cost	Extended	Notes
Sidewalk (10' Wide)	0	SY	$350	$0	
Pedestrian Zone (16' Wide)	2300	SY	$400	$920,000	Wider sidewalk shown on east side of Route 1
Curb and Gutter	13830	LF	$30	$414,900	assumed straight connection under bridges for curb/gutter, assumed curb and gutter on bridge and ramp
Landscaping	3680	SY	$200	$736,000	
Asphalt Pavement	2.43	CPLM	$1,200,000	$2,916,000	included all lane miles (multiplied distance by # of lanes)
Asphalt Pavement 1-lane ramps w/ shldrs	0.08	CPM	$3,700,000	$296,000	Connector to Route 1 S
Asphalt Pavement 2-lane ramps w/ shldrs	0.34	CPM	$5,900,000	$2,006,000	Route 1 S to 395; Route 1 N to 395
Asphalt Pavement 3-lane ramps w/ shldrs	0.07	CPM	$7,100,000	$497,000	assumed 3 lanes until merged to two lanes and that portion is included in the 2 lane ramp line item
Structure Widening	0	SF	$500	$0	
New Bridge Structure	12500	SF	$1,000	$12,500,000	
Concrete Barrier	1840	LF	$350	$644,000	assumed barrier only on ramp between and I-395 Henry G. Shirley Memorial Hwy and proposed ramp
Retaining Wall	7510	CY	$50	$375,500	assumed a retaining wall on ramp between I-395 Henry G. Shirley Memorial Hwy and I-395 express lanes between where ramp ties into existing and proposed roadway
SWM	1	EA	$250,000	$250,000	assumed a storm pond will be added
Pavement Demolition	7590	SY	$20	$151,800	
Structure Demolition	5810	SY	$100	$581,000	
Signal Modification	0	EA	$202,500	$0	assumed no modification to exisiting signals
New Signal - 2 Phase	1	EA	$450,000	$450,000	1 new signal
				$22,739,000.00	

	Preliminary Engineering					
	Preliminary Engineering (25%)	LS	1	$ 5,684,750	$	5,684,750
	Environmental Mitigation/Permitting (2.5%)	LS	1	$ 568,475	$	569,000
				Total Preliminary Engineering Phase	**$**	**6,254,000**
	Right of Way					
	Right of Way				$	-
	Utilities (5%)	LS	0	$ 1,136,950	$	-
				Total Right of Way Phase	**$**	**-**
	Contingency					
	75% Contingency on CN and PE Phases				$	21,745,000
				Total Contingency	**$**	**21,745,000**

Total Project Cost in FY2022 Dollars	**$**	**50,800,000**
Total Project Cost in FY2026 Dollars	**$**	**58,000,000**
Total Project Cost in FY2028 Dollars	**$**	**64,200,000**

Crystal City Metro Station East Entrance
Above-Grade Option Estimate
Reorganization of Costs 11/9/21

Interim Agreement	
Item Description	**Late 2020 Estimate**
JBGS Team Preliminary Engineering (30%)	$ 3,573,805.00
JBGS Team Support of Excavation Amendment	$ -
JBGS Team Preliminary Engineering (30%) Optional Task: Design-Build Bridging Documents	$ 232,600.00
JBGS Team Preliminary Engineering (30%) Optional Task: Emergency Ventilation/Smoke Management	$ 539,968.00
JBGS Team Preliminary Engineering (30%) Optional Task: Col-Location Space	$ 60,000.00
Sub-Total	**$ 4,406,373.00**

Design (Comprehensive Agreement Phase, 30% to 100%)	
Item Description	**Late 2020 Estimate**
Final Design and Construction Docs	$ 5,600,000.00
Independent Inspections (original 2018 County estimate)	$ 250,000.00
Arlington County Design Contingency	$ 920,000.00
Construction Administration Services (A&E consultant) (from July 2018 County estimate)	$ 600,000.00
Sub-Total	**$ 7,370,000.00**

Management and Oversight	
Item Description	**Late 2020 Estimate**
County Project Management, Administration, Technical Support - Design	$ 400,000.00
County Project Management, Administration, Technical Support - Construction	$ 400,000.00
County Real Estate Appraisal	$ 70,000.00
County Construction Management Services	$ -
WMATA Support - PE Design	$ 230,000.00
WMATA Support - Final Design	$ 520,000.00
WMATA Support - Construction	$ 1,980,000.00
JBGS Oversight	$ -
Sub-Total	**$ 3,600,000.00**

Construction Estimate	
Item Description	**Late 2020 Estimate**
Construction Hard Costs	$ 75,843,849.00
Fare Card & Exit Fare Machines Allowances - Included in Construction Hard Costs	*$ 2,156,000.00*
Fare Gates Allowance - Included in Construction Hard Costs	*$ 3,703,000.00*
Construction Escalation (from August 2021 Estimate to late-2022 Beyond)	$ 2,172,429.00
Sub-Total	**$ 78,016,278.00**

2020 Project Total	**$ 93,392,651.00**

12.5% Inflation Contingency	$ 11,674,081.38

2022 Project Estimate	**$ 105,066,732.38**

Appendix B

Benefit-Cost Analysis Summary

Technical Memorandum

SUBJECT: CONNECTING NATIONAL LANDING
Multimodal Projects Discretionary Grant Application Benefit-Cost Memorandum

Introduction

The Virginia Department of Transportation is seeking federal grant funding of $97 million to complete the $372 million financing plan for the Connecting National Landing project. These transportation improvements will help advance the integrated transportation and land use plan developed by Arlington County in 2010 – the Crystal City Sector Plan.

One of the key improvements identified to realize the community vision in the Sector Plan was the transformation of Route 1 into an urban boulevard linking Crystal City's east and west neighborhoods. Route 1 between 12th Street S and 20th Street S in the Crystal City area of Arlington County is currently an elevated freeway that forms a barrier between destinations to the east and west. While Crystal City and Pentagon City are evolving from auto-centric developments to higher-density, urban places that people can access by a variety of modes—walking, biking, taking transit, or driving—many stakeholders now desire to convert this half-mile long segment of urban freeway and embrace Route 1 as a city street with storefronts and building entrances. This urban boulevard will knit together the urban fabric of Crystal City as part of the larger National Landing area.

This memorandum summarizes the assumptions, methodologies, and results of the benefit-cost analysis (BCA) completed for the Connecting National Landing Project as a requirement of the Multimodal Projects Discretionary Grant (MPDG) competitive funding program. The BCA provides a means to measure a project's overall benefit by developing a uniform measurement of the impact the project has on society. This is accomplished by assigning a monetary value to benefits that can be compared to the construction costs and other related costs. In the BCA, the capital costs of constructing and maintaining the project are compared to the net benefit the project provides to the region. The costs and benefits are discounted to compare all costs and benefits with a common measure such as using 2020 dollars.

The purpose of the city of Connecting National Landing project is to create more vibrant street spaces, healthier environments, and increased economic opportunities. This project includes multiple components to improve multimodal connectivity and accommodations along Route 1 to meet the changing transportation needs of this growing urban activity center:

Route 1 Urban Boulevard Improvements

- Transforming the grade-separated Route 1 to an at-grade configuration.
- Walkable access along Route 1 between 15th Street S and 23rd Street S to buildings,

- parks, and public transportation facilities (bus, Metro, Commuter Rail, and Reagan National Airport).
- Wide, high-visibility pedestrian crosswalks and bicycle crossings of Route 1, with pedestrian refuges and shorter crossing distances than exist today.
- Accommodations for vehicles and buses while providing opportunities for wide sidewalks and other amenities along Route 1 that will embrace the future economic development by activating the Route 1 street frontage.
- Robust TDM program that increases the frequency of existing transit, potentially introduces new services, incentives for multimodal travel, partnerships with large employers, and other strategies to promote multimodal trips

I-395 Bridge Conversion to At-Grade Intersection

- The grade-separated bridge from I-395 southbound to Route 1 southbound will be converted to an at-grade intersection.
- Replaces a structurally deficient, fracture critical bridge

Crystal City Metro Station Second Entrance

- Construct a second at-grade entrance to the underground metro station.
- Increase ADA accessibility to transit systems
- Increase transit service area and ridership

The Connecting National Landing project meets all of DOT's MPDG project outcome criteria. The project will:

- ***Improve safety: Connecting National Landing improves multimodal safety for pedestrians, bicyclists, micro-mobility modes, transit, and vehicles along and across Route 1*** by lowering speeds by bringing the grade-separated highway to at-grade intersections, shifting travel to non-SOV modes with lower crashes rates, and by protecting vulnerable roadway users.
- ***Promote environmental sustainability:*** Connecting National Landing preserves, protects, and enhances the built, natural, visual, and social environments. Not only will an at-grade solution promote more walking and biking trips, but the new transit service will also provide for more environmentally friendly trips. This project will result in reduced greenhouse gas (GHG) emissions with a predicted CO2 reduction of nearly 150,000 metric tons and over 45 metric tons of NOx reduction. The project supports will reduce fuel consumption and decrease mobile source water runoff pollution;
- ***Multimodal accessibility and accommodation:*** Connecting National Landing increases multimodal accessibility and accommodation along and across Route 1. More travel choices will be made available through travel demand management strategies, which will create more walkable neighborhoods resulting in healthier communities. Rather than rebuilding a high-speed interstate ramp at I-395, the downtown area can become reconnected to create space for public transit, walking, and cycling.
- ***Spur economic competitiveness***: Connecting National Landing integrates Route 1 within the context of Crystal City and Pentagon City as a multimodal urban boulevard design consistent with the context of the surrounding existing and future built environment. This

project has the potential to spur development with a connected pedestrian grid and supports the movement of Amazon employees and associated mixed-use development in the area while reducing vehicle dependency. It increases the accessibility to job centers through the proposed access improvements. The Route 1 urban boulevard project will create approximately 6.5 acres of excess right-of-way which could result in more than $10M of developable land.

- ***Transit effectiveness:*** Connecting National Landing makes transit more accessible, reliable, and convenient. Accommodating multimodal travel choices is critical to the success of the Route 1 corridor and the efficient operation of National Landing. VDOT is committed to implementing a robust TDM strategy that is consistent with the results of the ongoing TDM study. Additionally, adding a second entrance to the Crystal City Metro Station will directly improve transit accessibility and reliability.
- ***Vehicular operations:*** Connecting National Landing maintains an appropriate level of vehicular operation and accommodation along Route 1 and on intersecting streets: 15th Street, 18th Street, 20th Street, and 23rd Street. Acceptable levels of service for vehicular operations will be maintained through the TDM program implementation. A mode shift of 30% is expected to reduce future peak period Design Year 2040 traffic volumes below the 2019 volumes.
- ***Align with DOT "State of Good Repair" goals:*** by prioritizing investment in transportation improvements that will extend the life of existing infrastructure;
- ***Equity, Multimodal Options, and Quality of Life:*** Connecting National Landing seeks to address automobile dependency as a barrier to success by reinventing the Route 1 corridor. The construction of bicycle and pedestrian infrastructure, as well as a renewed focus on multimodal travel options, will increase affordable and accessible transportation choices by creating new connections and opportunities for underserved communities. Redesigning Route 1 to include at-grade intersections removes the physical barrier to walking and biking and strengthens National Landing community connectivity. The reallocation of roadway space will create a place where the community will want to connect. Wide sidewalks, benches, tree canopies, and lighting will contribute to placemaking for the unique character of National Landing. This creates healthier and more walkable neighborhoods resulting in a higher quality of life.
- ***Demonstrate innovation*** through its innovative contracting methodology, application of near miss technology to track crash risk, and project financing incentives.

This project will contribute quantifiable benefits in several areas, the greatest of which are related to the encouragement of mode shift to transit, walking, and biking; improved pedestrian and bicyclist public health outcomes, creating of developable space and property value increases related to improved transit access and enhanced commercial activity, reduction in the cost of human life lost due to reduced emergency response times, and the residual value of infrastructure at the end of the analysis period. Among others, these areas of quantifiable benefit are the subject of this BCA. The substantial positive impacts of the project are in 2020 dollars and assume a 7-percent discount rate monetized at $535.6M in benefits, compared to a discounted project cost of $179.1M. As a result, the project has a benefit-cost ratio (BCR) of 2.99 (at a 7-percent discount), which represents a favorable investment of federal funds and a significant benefit to the community.

Table of Contents

This memorandum is organized to complement the BCA spreadsheet and to provide a tab-by-tab walkthrough of the methodology and results. The memorandum is organized as follows:

BCA Detailed Summary

Table 1: BCA Summary

Possible Societal Benefits for Consideration	Key Benefits Quantified	Total Benefits	Present Value (7% Discount Rate)
Safety			
Crash Savings	Reduction in crashes due to reduced volume and elimination of Route 1 SB Weave area and reduced traffic volume associated with mode shift	$90,166,711	$26,995,346
State of Good Repair			
Bridge Operations and Maintenance Savings	Reducing in annual and periodic bridge maintenance costs related to removing the above grade options	$8,694,560	$2,136,772
External Highway Costs Savings (Noise, Congestion, Pavement)	Reduction in milage-dependent highway costs (noise and congestion mitigation and pavement maintenance) related to volume reductions	$401,210,206	$110,899,513
Economic Impacts, Freight Movement, and Job Creation			
Travel Time (Delay) Impacts - Existing and Users	Additional delay due to the addition signalized intersections and reduction in speed limits	-$256,564,892	-$67,019,778
Travel Time (Delay) Impacts - Induced Transit	Additional delay due to the addition signalized intersections and reduction in speed limits	-$120,924,330	-$31,585,094
User Operating Cost Savings	Reduces users' costs associated with personal vehicle travel	$586,228,458	$162,107,083
Newly Developable Land	Value of land created (6.5 acres) by removing the above grade roadway	$108,635,500	$55,224,780
Property Value Increase	Property value increase as a proxy for increased commercial and retail activity related to the urban boulevard and properties adjacent to transit.	$384,089,565	$236,851,417
Climate Change, Resiliency, and the Environment			
Mobile Source Air Emission Reductions (Non-CO2)	Decrease in CO, VOC, NO_X, $PM_{2.5}$, SO_2 emissions due to reduced vehicle mileage	$2,262,306	$650,450
Mobile Source Air Emission Reductions (CO2)	Decrease in CO_2 emissions due to reduced vehicle mileage	$22,838,276	$12,495,025
Mobile Source Water Runoff Reductions	Reduction in milage-dependent water runoff costs because of reduced traffic volumes	$23,664,673	$6,549,548
Urban Tree Canopy Benefits	Net societal benefits of additional urban street trees	$203,688	$54,299
Equity, Multimodal Options, and Quality of Life			
Bicycle Benefits	Mortality reduction and revealed preference benefits associated with the addition of bicycle facilities	$30,051,452	$7,909,652
Pedestrian Benefits	Mortality reduction and revealed preference benefits associated with addition/improvement of pedestrian facilities	$79,066,387	$20,535,807
Other			
Residual Value	Residual value of assets at the end of the analysis period	$64,612,718	$7,413,736
Transportation Demand Management Costs		-$36,954,093	-$15,467,976
Total Benefits		**$1,387,281,186**	**$535,750,580**
Total Costs		**-$267,621,292**	**-$179,102,601**
Benefit / Cost Ratio		**5.18**	**2.99**
Net Present Value		**1,119,659,894**	**356,647,978**

Alternatives

Consistent with the direction provided by the US Department of Transportation (USDOT), the BCA compares a No-Build Alternative and a Build Alternative. These alternatives compare the benefits and costs of implementing the proposed construction at the project location and completing the improvements. The following is a description of the No-Build and Build scenarios used for comparison in the BCA.

No-Build Alternative

The No-Build alternative maintains the existing conditions in the Route 1 area. It assumes no street improvements and a significant delay in realizing the vision of the Crystal City Sector Plan. Traffic analysis conducted to evaluate the impact of Route 1 Urban Boulevard estimated that in the No-Build alternative, the existing annual average daily traffic (AADT) on 4th Street SW would grow from 47,000 vehicles per day (vpd) in 2021 to 64,000 vpd in 2040.

Build Alternative

The purpose of the Connecting National Landing project is to is to improve the safety and efficiency of all modes using the corridor, to address deficiencies in infrastructure conditions, and to provide for increased mobility and accessibility for both sides of US Route 1.

The proposed improvements involve

- converting the urban freeway to two at-grade intersections, pedestrian and bicycle accommodations, and landscaped medians through the corridor (assumed completion by 2030);
- improving the I-395 ramp connection to Route 1 (assumed completion by 2028), and;
- creating a second entrance to the Crystal City metrorail station (assumed completion by 2026)

As a direct result of conversion to an urban boulevard the anticipated AADT in 2040 would reduce from 64,000 vpd in the no-build scenario to 45,000 vpd.

BCA Methodology

The BCA was developed using the updated 2022 guidance provided by the USDOT. Analysis was completed as necessary to develop the benefits and costs of the No-Build and Build alternatives. Major components of the analysis include:

- Initial capital costs
- Safety benefits associated with reduced traffic volumes, increase transit and active transportation uses, all resulting in decreased vehicle-miles traveled (VMT) and reduced crash risk;

- State of good repair impacts as traffic is reduced overall and as the costs of mitigating structurally deficient bridges is reduced
- Cost savings for congestion, noise, and pavement maintenance mitigation expenses that are avoided due to decreased VMT
- Travel time impacts (disbenefits) associated with lowering posted speed limit and creating signalized intersections (affects personal vehicles, buses, and pedestrians crossing intersections).
- Reduced user vehicle operating costs due to decreased VMT
- Public value of additional developable land created reducing the ROW and footprint of the Route 1 corridor.
- Value of Bonus density leveraged by adjacent developers to densify and improve the commercial health of the corridor.
- Reduction in air and water pollution due to decreased VMT
- Value of open space, urban tress, and green spaces
- Mortality reduction and revealed preference benefits for pedestrians and cyclists; increase in community health outcomes related with more active and less car-dependent lifestyles
- Residual capital value of structures at the end of the BCA period
- TDM costs (or disbenefits) associated with implementing a rigorous TMD programs to create lasting travel behavior changes (resulting in a 30 percent mode shift in the peak periods)

In addition to these main benefits, unquantified benefits were also identified. These benefits were not developed into monetized results but describe the value of constructing the project beyond the quantified results of the BCA. These broader benefits are generally discussed in the project narrative and the Factors Not Quantified section.

The BCA spreadsheet included in this application begins with an Inputs tab (Tab A) containing key information about the project. This tab also includes many of the inputs and assumptions discussed below and provides source information as appropriate. The next tab (Tab B) is the Output Table which is shown above in **Table 1**. The Summary tab (Tab C) includes all the costs and benefits (annualized) and calculates the BCA results. The remaining tabs calculate the costs and benefits for each subject area. These tabs reference information from the Inputs tab and include additional inputs and sources as necessary.

Analysis Period

The BCA analysis was completed for a 30-year period starting in 2023 and covering the engineering and construction period of each project as well as a 27-year operating period for the Crystal City second entrance, a 25-year operating period for the I-395 interchange improvements, and a 23-year operating period for the Route 1 Urban Boulevard improvements. It is during these operating periods that the benefits of the combined project are accrued. This analysis period was used to capture the benefits of the project while staying within USDOT guidance. The present value of all benefits and costs was calculated using 2020 dollars. Thirty

years is an appropriate analysis period because this project involves significant infrastructure improvements beyond just capacity improvements.

The analysis uses the most publicly available project schedule and construction duration assumptions. Any temporary net benefits or indirect costs caused by the construction of the project, including jobs created by the construction or travel time delays due to construction, are assumed to be minimal and were excluded from the analysis. Based on this schedule, the project costs will be $267.6M undiscounted and $179.1M using a 7-percent discount rate.

Construction Costs and Residual Capital Value – Tabs D and Tab P

The project costs were developed based on individual construction line items, with contingencies, incidental costs, and indirect costs assumed as a percentage of the total raw construction cost. Project costs were developed using year of expenditure dollars) and then discounted back to 2020 dollars and further discounted by 7% per USDOT BCA guidelines.

Many of the components of the project have service lives beyond the analysis period, so the residual capital value is calculated for the Build Alternative. It was assumed that the majority project components of the Route 1 Urban Boulevard, the I-395 interchange project, and the Crystal City second entrance would have design service lives of 30, 50, and 75 years respectively.

To be conservative, soft costs associated with construction, such as engineering costs and mobilization, are given no residual values. The assumed design life of each construction line item was assigned and calculated as a benefit at the end of the analysis period in Tab Q.

The total benefit associated with the residual values was $64.6M undiscounted, or $7.4M at a 7-percent discount.

Crash Savings – Tab E

The Build alternative provides a net decrease in the monetary impact of crashes in the study area by reducing traffic speeds and volumes, thereby reducing crash likelihood and severity.

Three crash savings calculations were conducted.

- Consistent with the Route 1 Multimodal Phase 1 report, a detailed crash prediction analysis was improvements, and their estimated potential crash predictions analysis was conducted for future conditions with and without the conversion to an urban boulevard.
- A similar predictive analysis was conducted with and without the I-395 ramp improvements and the removal of the southbound Route 1 weave conditions
- A historic crash analysis based on VMT was conducted related to the reduction in daily traffic volumes specifically resulting from the mode shift related to the Crystal City second entrance.

Crashes were categorized as fatal crashes, injury crashes, or PDO crashes and monetized on a per-crash basis according to values recommended by USDOT. Based on the Build and No-Build

predicted crash values for each segment, the annual monetized value of crashes was calculated for each year of project use. The change in the monetized value of crashes was then calculated during the analysis period.

The total benefit associated with the reduction in crashes over the analysis period was $90.2M undiscounted, or $27.0M at a 7-percent discount.

Maintenance and State of Good Repair – Tab F

The new at grade urban boulevard and I-395 ramp improvements will replace structurally deficient bridge infrastructure. With the project, three bridges will be removed, and the ongoing inspection, maintenance, rehabilitation, and repair costs associated with those bridges will be eliminated. In the BCA spreadsheet, the bridges were assigned specific maintenance and inspection cost estimates, supported by historical maintenance and structure health data from the Federal Highway Administration's (FHWA) National Bridge Inventory (NBI).

Using the inspection frequency of 2 years indicated in the NBI, in combination with the date of last inspection, routine bi-yearly inspection and maintenance costs were assigned to the three existing bridges in the No-Build alternative. Assuming a 75-year design life and using the date of construction for each existing bridge found in the NBI, it was also determined that at least one bridge would be due for reconstruction within the analysis period. Thus, the costs associated with inspection, maintenance, and repair were assigned to each bridge and the cost for reconstruction was applied to one bridge.

The total state of good repair benefit associated with avoiding bridge inspection, maintenance, repair, and reconstruction cots was $8.7M undiscounted, or $2.1M at 7-percent discount.

External Highway Use – Tab G

External Highway Use benefits represent the congestion, noise, and pavement maintenance mitigation cost savings realized by jurisdictions due to reduced VMT. Similar to operating cost savings, USDOT-provided values for congestion and noise savings for passenger vehicles were applied to the annual VMT converted to non-vehicle modes in the Build alternative. The monetization vales was applied to the peak period VMT reductions resulting from the Route 1 urban boulevard and associated TDM measures and the all day VMT reductions associated with the Crystal City second entrance.

The total external highway use benefit of the project was $401.2M undiscounted or $110.9M at a 7-percent discount.

Travel Time – Tab H

The primary objective of this project is to provide additional community cohesion and connectivity across US Route 1. Provision of at grade signalized intersections result in greater active transportation use and increase commercial and retail activation of properties along the US

Route 1 corridor. For these reasons, travel time is not anticipated to reduce; rather, travel time is estimated to increase slightly due to the new signalized intersections and the reduction in posted speed limits.

The travel time impacts of the project (quantified as vehicle hours traveled [VHT]) were calculated using forecasted peak period volumes and travel times from Route 1 Multimodal Phase 1 study. This analysis incorporated forecasted demand growth based on anticipated development in the area using the Metropolitan Washington Council of Governments (MWCOG) travel demand model and Arlington County Commuter statistics from the 2019 State of the Commute survey.

Travel time impacts were monetized using standard BCA values of $17.90 per hour for all vehicle travel, $302.00 per hour for commercial operators, and $33.60 per hour for bus drivers. Commercial truck traffic was assumed to account for 2 percent of all traffic and bus traffic was assumed to account 1 percent of all traffic based on the data collected for the IMR. Travel time disbenefits we specifically calculated for the existing corridor users and the additionally delays for users that would be induced to use transit as a result of the TDM programs.

The BCA resulted in a net travel time disbenefit of -$377.4M in 2020 dollars, or -$98.6M at a 7-percent discount rate.

Operating Costs – Tab I

As previously discussed, a reduction is assumed for the peak period trips diverted from the Route 1 corridor due to the TDM strategies and for the all-day trips diverted from the Route 1 corridor due to the Crystal City second entrance. It is anticipated that these diverted trips will occur as users opt for walking, biking, or public transit due to the infrastructure improvements proposed under the Build alternative.

The vehicle savings associated with the reduction in traffic volumes was calculated based on Crystal City trip length statistics provided in the 2019 State of the Commute report.

The total operating cost savings benefit of the project was $586.2M undiscounted, or $162.1M at a 7-percent discount.

Developable Land and Bonus Density – Tab J

The project will result in 6.5 more acres of developable land. This land was conservatively valued at $75.00 per square foot (consistent with a 2019 Route 1 Value capture study).

Accordingly, the value of developable land, taken in the opening year of the project was $21.2M undiscounted, or $10.8M at a 7-percent discount.

The innovative partnerships aspects of the project allow developers to densify beyond zone maximums if the contribute to public infrastructure. This bonus density was conservatively valued at $50.00 per square foot (consistent with a 2019 Route 1 Value capture study).

Accordingly, the value of increased density (and more housing or commercial development), taken in the opening year of the project was $87.4M undiscounted, or $44.4M at a 7-percent discount.

Property Value – Tab K

Based on the 2019 Route 1 Value capture study, property values were anticipated to increase by 5% as a direct result of the infrastructure improvements. This premium was applied to properties adjacent to the Route 1 corridor.

Similarly, based on previous research, including a 2008 study prepared for the FTA and USDOT by the Center for Transit-oriented Development1, it is assumed that the relocated facility will result in a modest increase in property values in the area immediately surrounding the facility, based on the benefits of providing new access to transit. This study shows wide variety of property value increases due to multimodal transit centers. Properties within $1,000 of the proposed second entrance (the typical acceptable walking distance) were assumed to experience a one-time 10 percent increase in property value at project opening. Accordingly, the value of increase transit access, realized as property value increases, (and more housing or commercial development), taken in the opening year of the project was $384.1M undiscounted, or $236.9M at a 7-percent discount.

Environmental Impacts – Tab L

An overall reduction in vehicle miles traveled in the Build alternative will result in mobile-source emissions reductions. The projected emissions were based on the vehicle miles traveled that would have been travelled, assuming trip length statistics provided on the 2019 State of the Commute report. The difference in the emissions between the Build and No-Build alternatives and the associated cost to society represents the environmental benefit of the project.

In order to calculate the projected emissions of each alternative, average in-use emission rates for both passenger cars and heavy-duty trucks from the California Life-Cycle Benefit/Cost Analysis (Cal-B/C) Model (updated 2022) were used for carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), sulfur oxides (SOx), and volatile organic compounds (VOCs). Damage costs for these pollutant emissions from the Cal-B/C model were used to calculate the relative environmental costs of the Build and No-Build alternatives. Note that CO2 emissions were discounted at a 3-percent discount rate per USDOT guidance, while the remainder of pollutants were discounted at a 7-percent rate.

VMT dependent water runoff mitigation costs were also counted as a savings of this project based on monetization from the Victoria Transport Policy Institute (VPTI).

The total environmental air emissions benefit of the project was $25.1M or $13.1M at a 7-percent discount.

The total water runoff benefit of the project was $23.6M or $6.5M at a 7-percent discount.

Urban Tree Canopy – Tab M

Due to the landscaping and trees planned for the study area, "urban tree canopy" benefits were assumed to account for the benefits of beautification, privacy, wildlife habitat, shade, and sense of place-making provided by ornamental trees in an urban setting. An assumed value of $36.00 per tree was assigned per guidance in the USDA Northeast Community Tree Guide as the minimum benefit value suggested for medium-sized trees. This value was updated to 2020 dollars from the publication date of 2014, multiplied by a conservative estimate of 200 trees.

The total urban tree canopy benefit of the project was $203.7K undiscounted, or $54.3K at a 7-percent discount rate.

Bicycle Benefits – Tab N

The project also proposes enhanced bicycle facilities and TDM strategies that encourage bicycle use. The investment in shared use paths bike lanes is anticipated to draw commuter and recreational cyclists alike, thereby producing benefits associated with reduced mortality and the "revealed preference" for cycling over other modes of transportation. These reduced mortality and revealed preference benefits have been described in the 2022 USDOT BCA Guidance and assigned values of $6.31 per induced trip and $1.69 per cycling mile, respectively.

In order to estimate the number of new cyclists added to the network in the Build alternative, cyclists were broken into commuter and recreational populations and assumptions were made for each group respectively. The existing population of Crystal City was calculated, and the 2019 state of commute was used to determine the number of cyclists in the study area. According to a survey conducted by Breakaway Research Group for People for Bikes, 46 percent of respondents report they would bike more often if they had safe facilities separated from vehicle traffic. The survey also reported that 14 percent of respondents biked at least twice a week, and this value was assumed to represent commuter cyclists in the survey population. To be conservative, the increase in future commuter cyclists in was scaled down in accordance with the ratio of existing commuter cyclists in the survey and project area working populations. Research conducted by Forbes suggests that recreational cyclists account for 17 percent of the cyclist population, so the number of recreational cyclists was extrapolated accordingly.

The combination of commuter and recreational cyclists represents the total number of cyclists anticipated in the Build alternative in each respective year of analysis. The cyclist population was assumed to grow proportionally with the general population, whose growth was estimated

using historical census data. In each year, the number of cyclists was multiplied by the monetary values associated with mortality reduction and revealed preference benefits.

Cyclist travel time impacts were also calculated as a disbenefit of the project. The Build alternative was shown to result in 2 minutes of additional travel time delay due to crossing signalized intersections. This time disbenefit was monetized at a rate of $32.40 per hour according to USDOT and applied to all cyclists in the Build alternative. Note that while mortality reduction benefits were only applied to new cyclists induced to the network in the Build alternative, revealed preference benefits and time disbenefits apply to both new induced cyclists and cyclists who were already existing in the project area.

The total combined benefits for bicyclists were $30.1M undiscounted or $7.9M at a 7% discount rate.

Pedestrian Benefits – Tab O

The project proposes the addition of 10-foot sidewalks on both sides of the road

The No-Build and Build populations of commuter and recreational pedestrians were estimated in a manner similar to that of the equivalent bicyclist populations. An FHWA case study provided estimates for increases in pedestrian populations based on improvements to the network, and those increases were scaled according to the project area-specific data. Note that the population assumed to benefit from the pedestrian facilities was only those with the average walking trip per USDOT is only 0.86 miles in length.

The combination of commuter and recreational pedestrians represents the total number of pedestrians anticipated in the Build alternative in each respective year of analysis. The pedestrian population was assumed to grow proportionally with the general population, whose growth was estimated using historical census data. In each year, the number of pedestrians was multiplied by the monetary values associated with mortality reduction and revealed preference benefits, which combined represent the Pedestrian benefit of the project.

Pedestrian travel time impacts were also calculated as a disbenefit of the project. The Build alternative was shown to result in 2 minutes of additional travel time delay due to crossing signalized intersections. This time disbenefit was monetized at a rate of $32.40 per hour according to USDOT and applied to all pedestrians in the Build alternative. Note that while mortality reduction benefits were only applied to new pedestrians induced to the network in the Build alternative, revealed preference benefits and time disbenefits apply to both new induced pedestrians and pedestrians who were already existing in the project area.

The total combined benefits for pedestrians were $79.1M undiscounted or $20.5M at a 7% discount rate.

Economic Output

Construction of the project and an injection of new federal money in the region is anticipated to create short-term spending, earning, and employment gains. **Although these benefits are not**

included in the overall BCR, this quantification is still represented in the Economic Output tab to demonstrate the short-term economic benefits of this project.

The project is expected to generate a total of 2,724 job-years over the construction years, including 1,650 direct job-years, 439 indirect, and 635 induced. Labor income for these positions is estimated at a total of $178.15 million, including $114.4 million direct, $31.6 million indirect, and $32.2 million induced. Total value added is estimated at $262.2 million.

HDR prepared a technical memorandum that documents the methodology. The methodology relies on an input-output approach using the IMPLAN modeling tool. IMPLAN is widely used in economic impact modeling to forecast the effect of a given change in the economy's activity (such as an infrastructure construction project).[1] The change is specified in terms of incremental expenditures on construction, equipment, supplies, maintenance, etc. The results are typically presented as estimates of incremental employment, business output, labor income, and value added attributable to the project analyzed, in terms of direct, indirect, and induced impacts.

Direct impacts are the immediate effects of project expenditures such as employment of construction workers and business output of the construction company. Indirect impacts are employment of workers and business output of firms supplying input materials and services to the construction company and throughout the supply chain. Induced impacts capture the effects of re-spending of workers' income on consumption goods and services.

The methodology of the estimation of economic impacts with IMPLAN involves the following key steps:

Step (1): Identify the streams of expenditures directly resulting from project activities and classify them into industrial sectors;

Step (2): Identify IMPLAN industries that most closely correspond to the industrial sectors of expenditures listed in Step (1) (based on North American Industrial Classification System [NAICS] codes concordance); and

Step (3): Enter the expenditure information in IMPLAN and run the impact simulations.

The streams of expenditures identified as directly resulting from the project and taken into account in this assessment are expenditures related to project construction, including civil works (civil construction), engineering and design, and construction management and oversight.

[1] IMPLAN was originally developed in the 1970s for the U.S. National Forest Service for economic impact projections of alternative uses of public forest resources. In later years, IMPLAN was improved and updated to make it more functional and relevant for a wider range of projects and users. IMPLAN is now widely used and recognized by government organizations, academia, advisory services, and business organizations. More information is available at Economic Impact Analysis for Planning | IMPLAN.

The impact of these expenditures was estimated as the total cumulative impact over the construction period. Construction impacts estimated in this way can be converted to average annual impacts during the construction period by dividing all impact estimates by the number of years that development and construction are expected to take place.

This analysis was conducted at the state level to illustrate expected impacts across Virginia using 2019 IMPLAN state totals data.

Factors Not Quantified

Several factors were not quantified as part of the analysis but provide additional benefits beyond those quantified above. Some unquantified factors are:

- Fuel consumption: Mode shift from single-occupancy vehicles (SOVs) to active transportation modes will result in less fuel consumption travelers. Each 1% shift from automobile to active travel typically reduces fuel consumption 2-4% and can lessen the risks of climate change based on case study research.
- Reduced household transportation user costs: Households in auto-dependent communities devote 20% of household income more to transportation than communities with complete streets. The project will enhance transportation choice, emphasizing low-cost alternatives for short trips.
- Improved equity: The combined benefits of the project will allow different populations (children, elderly, and economically, socially, or physically disadvantaged people) to fairly use and share in public resources by increasing accessibility, connectivity, and affordability. More than 50% of older Americans who do not drive stay home on a given day because they lack transportation options.
- Non-peak period mode shift: Additional VMT-dependent benefits that occur outside of the peak period.

BCA Results

The results of the BCA conducted for the Connecting National Landing project are presented in terms of a BCR and a net present value (NPV). A BCR greater than 1.0 and NPV greater than 0 mean that the project benefits outweigh the project costs. The larger the BCR and NPV, the greater the expected benefits of the project. The BCR provides the amount of benefit per unit cost, which can be useful for determining the highest dollar-for-dollar benefit when comparing projects.

The results of the BCA for the project, calculated using the methodology described above, are presented in Table 2. The results are shown both without any discount applied and with a 7-percent discount. As can be seen in the table, there are substantial benefits associated with the Connecting National Landing project.

Table 2: BCR Summary

	Undiscounted	7% discount
Benefits	$1,387,281,186	$535,750,580
Costs	-$267,621,292	-$179,102,601
BCR	5.18	2.99
NPV	1,119,659,894	356,647,978

Project Information

Project	Connecting National Landing
Grant	MPDG "INFRA" 2022

Project Schedule

		Source
Base Year	2020	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Project Start	2023	
Construction Start	2026	
Construction Years	4	
Project Use Start	2030	
Total Analysis Period	30	years
Years of Operations	23	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Days / year	365	
Weekdays / year	261	
Discount Rate	7%	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022

Legend

Inputs
Calculated Cells
References to Other Sheets

Guidance Source

1	Primary Guidance Source	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
2	NOFO	Notice of Funding Opportunity for the Department of Transportation's MultimodalProject Discretionary Grant Opportunity
3		2019 State of the Commute Survey: Summary Results for Arlington County, VA
4		Route 1 Multimodal Improvements Phase 1 Report

Costs and Other Inputs

	Value	Note	Source
In-Vehicle Travel Time: All	$17.80	per hour	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Commercial Vehicle Operators Travel Time: Truck Drivers	$32.00	per hour	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Commercial Vehicle Operators Travel Time: Bus Drivers	$33.60	per hour	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Non-commercial vehicle occupants	1.67	Passenger vehicles (all travel)	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Commercial vehicle occupants	1	Assume 1 driver per truck	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Walk/Bike Travel Time	$32.40	per hour for personal travel	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Assumed Truck Vehicle %	2.0%		VDOT AADT REPORT
Assumed bus Vehicle %	1.0%		
Assumed K factor	0.08		VDOT AADT REPORT
Assumed D Factor	0.59		VDOT AADT REPORT
AM Peak Hour Traffic Growth Rate	1%		Route 1 Multimodal Improvements Phase 1 Report
PM Peak Hour Traffic Growth Rate	2%		Route 1 Multimodal Improvements Phase 1 Report
Build Condition TMD Vehicle Reduction	30%		Route 1 Multimodal Improvements Phase 1 Report
Arlington Residents Motorized Trips Per Day	2.14		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Arlington Residents Nonmotorized Trips Per Day	1.52	(walk + bike + other)	2019 State of the Commute Survey: Summary Results for Arlington County, VA
Arlington Residents Transit Trips Per Day	0.40		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Commuter Distance into Arlington	7.90		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Commuter Distance out of Arlington	16.20		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Non Commuter Average Distance (driving)	6.10		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Peak Period Trip Percentage	46%		MWCOG Travel Demand Model
Bike share of non motorized	5%		2019 State of the Commute Survey: Summary Results for Arlington County, VA
Walk share of non motorized	58%		2019 State of the Commute Survey: Summary Results for Arlington County, VA

Route 1 Annual Average Daily Traffic (Source: VDOT)

			Route 1 Northbound AADT			Route 1 Southbound			Route 1 Total		
Calendar Year	Project Year	Project Use Year	No Build	Build	Difference	No Build	Build	Difference	No Build	Build	Difference
2019	0	0	27,900	27,900		19,100	19,100		47,000	47,000	0
2020	0	0	28,300	28,300		19,400	19,400		47,700	47,700	0
2021	0	0	28,700	28,700		19,700	19,700		48,400	48,400	0
2022	0	0	29,200	29,200		19,900	19,900		49,100	49,100	0
2023	1	0	29,600	29,600		20,300	20,300		49,900	49,900	0
2024	2	0	30,100	30,100		20,500	20,500		50,600	50,600	0
2025	3	0	30,500	30,500		20,900	20,900		51,400	51,400	0
2026	4	0	31,000	31,000		21,200	21,200		52,200	52,200	0
2027	5	0	31,400	31,400		21,500	21,500		52,900	52,900	0
2028	6	0	31,900	31,900		21,800	21,800		53,700	53,700	0
2029	7	0	32,400	32,400		22,100	22,100		54,500	54,500	0
2030	8	1	32,900	23,030	9,870	22,500	15,750	6,750	55,400	38,780	16,620
2031	9	2	33,400	23,380	10,020	22,800	15,960	6,840	56,200	39,340	16,860
2032	10	3	33,900	23,730	10,170	23,100	16,170	6,930	57,000	39,900	17,100
2033	11	4	34,400	24,080	10,320	23,500	16,450	7,050	57,900	40,530	17,370
2034	12	5	34,900	24,430	10,470	23,900	16,730	7,170	58,800	41,160	17,640
2035	13	6	35,400	24,780	10,620	24,200	16,940	7,260	59,600	41,720	17,880
2036	14	7	35,900	25,130	10,770	24,600	17,220	7,380	60,500	42,350	18,150
2037	15	8	36,500	25,550	10,950	24,900	17,430	7,470	61,400	42,980	18,420
2038	16	9	37,000	25,900	11,100	25,400	17,780	7,620	62,400	43,680	18,720
2039	17	10	37,600	26,320	11,280	25,700	17,990	7,710	63,300	44,310	18,990
2040	18	11	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2041	19	12	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2042	20	13	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2043	21	14	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2044	22	15	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2045	23	16	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2046	24	17	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2047	25	18	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2048	26	19	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2049	27	20	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2050	28	21	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2051	29	22	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290
2052	30	23	38,100	26,670	11,430	26,200	18,340	7,860	64,300	45,010	19,290

847,200	593,040	254,160	581,200	406,840	174,360	1,428,400	999,880	428,520

Annual Traffic Volumes

Annual Vehicles

			Route 1 Northbound			Route 1 Southbound					Induced Multimodal Travelers - (Mode Shift)		
Calendar Year	Project Year	Rt 1 Project Use Year	No Build	Build	Difference	No Build	Build	Difference	Total Vehicles Shifted to other modes	People Shifted from Vehicles	People shifted to walking modes	People shifted to biking modes	people shifted to transit
2019	0	0	10,183,500	10,183,500	0	6,971,500	6,971,500	0	0	0	0	0	0
2020	0	0	10,329,500	10,329,500	0	7,081,000	7,081,000	0	0	0	0	0	0
2021	0	0	10,475,500	10,475,500	0	7,190,500	7,190,500	0	0	0	0	0	0
2022	0	0	10,658,000	10,658,000	0	7,263,500	7,263,500	0	0	0	0	0	0
2023	1	0	10,804,000	10,804,000	0	7,409,500	7,409,500	0	0	0	0	0	0
2024	2	0	10,986,500	10,986,500	0	7,482,500	7,482,500	0	0	0	0	0	0
2025	3	0	11,132,500	11,132,500	0	7,628,500	7,628,500	0	0	0	0	0	0
2026	4	0	11,315,000	11,315,000	0	7,738,000	7,738,000	0	0	0	0	0	0
2027	5	0	11,461,000	11,461,000	0	7,847,500	7,847,500	0	0	0	0	0	0
2028	6	0	11,643,500	11,643,500	0	7,957,000	7,957,000	0	0	0	0	0	0
2029	7	0	11,826,000	11,826,000	0	8,066,500	8,066,500	0	0	0	0	0	0
2030	8	1	12,008,500	8,405,950	3,602,550	8,212,500	5,748,750	2,463,750	6,066,300	10,130,721	5,865,154	533,196	3,732,371
2031	9	2	12,191,000	8,533,700	3,657,300	8,322,000	5,825,400	2,496,600	6,153,900	10,277,013	5,949,850	540,895	3,786,268
2032	10	3	12,373,500	8,661,450	3,712,050	8,431,500	5,902,050	2,529,450	6,241,500	10,423,305	6,034,545	548,595	3,840,165
2033	11	4	12,556,000	8,789,200	3,766,800	8,577,500	6,004,250	2,573,250	6,340,050	10,587,884	6,129,827	557,257	3,900,799
2034	12	5	12,738,500	8,916,950	3,821,550	8,723,500	6,106,450	2,617,050	6,438,600	10,752,462	6,225,110	565,919	3,961,433
2035	13	6	12,921,000	9,044,700	3,876,300	8,833,000	6,183,100	2,649,900	6,526,200	10,898,754	6,309,805	573,619	4,015,330
2036	14	7	13,103,500	9,172,450	3,931,050	8,979,000	6,285,300	2,693,700	6,624,750	11,063,333	6,405,087	582,281	4,075,965
2037	15	8	13,322,500	9,325,750	3,996,750	9,088,500	6,361,950	2,726,550	6,723,300	11,227,911	6,500,370	590,943	4,136,599
2038	16	9	13,505,000	9,453,500	4,051,500	9,271,000	6,489,700	2,781,300	6,832,800	11,410,776	6,606,239	600,567	4,203,970
2039	17	10	13,724,000	9,606,800	4,117,200	9,380,500	6,566,350	2,814,150	6,931,350	11,575,355	6,701,521	609,229	4,264,604
2040	18	11	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2041	19	12	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2042	20	13	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2043	21	14	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2044	22	15	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2045	23	16	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2046	24	17	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2047	25	18	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2048	26	19	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2049	27	20	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2050	28	21	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2051	29	22	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
2052	30	23	13,906,500	9,734,550	4,171,950	9,563,000	6,694,100	2,868,900	7,040,850	11,758,220	6,807,390	618,854	4,331,976
			309,228,000	216,459,600	92,768,400	212,138,000	148,496,600	63,641,400	156,409,800	261,204,366	151,223,580	13,747,598	96,233,187

Peak Period Annual Vehicles

			Route 1 Northbound			Route 1 Southbound		
Calendar Year	Project Year	Rt 1 Project Use Year	No Build	Build	Difference	No Build	Build	Difference
2019	0	0	4,684,410	4,684,410	0	3,206,890	3,206,890	0
2020	0	0	4,751,570	4,751,570	0	3,257,260	3,257,260	0
2021	0	0	4,818,730	4,818,730	0	3,307,630	3,307,630	0
2022	0	0	4,902,680	4,902,680	0	3,341,210	3,341,210	0
2023	1	0	4,969,840	4,969,840	0	3,408,370	3,408,370	0
2024	2	0	5,053,790	5,053,790	0	3,441,950	3,441,950	0
2025	3	0	5,120,950	5,120,950	0	3,509,110	3,509,110	0
2026	4	0	5,204,900	5,204,900	0	3,559,480	3,559,480	0
2027	5	0	5,272,060	5,272,060	0	3,609,850	3,609,850	0
2028	6	0	5,356,010	5,356,010	0	3,660,220	3,660,220	0
2029	7	0	5,439,960	5,439,960	0	3,710,590	3,710,590	0
2030	8	1	5,523,910	3,866,737	1,657,173	3,777,750	2,644,425	1,133,325
2031	9	2	5,607,860	3,925,502	1,682,358	3,828,120	2,679,684	1,148,436
2032	10	3	5,691,810	3,984,267	1,707,543	3,878,490	2,714,943	1,163,547
2033	11	4	5,775,760	4,043,032	1,732,728	3,945,650	2,761,955	1,183,695
2034	12	5	5,859,710	4,101,797	1,757,913	4,012,810	2,808,967	1,203,843
2035	13	6	5,943,660	4,160,562	1,783,098	4,063,180	2,844,226	1,218,954
2036	14	7	6,027,610	4,219,327	1,808,283	4,130,340	2,891,238	1,239,102
2037	15	8	6,128,350	4,289,845	1,838,505	4,180,710	2,926,497	1,254,213
2038	16	9	6,212,300	4,348,610	1,863,690	4,264,660	2,985,262	1,279,398
2039	17	10	6,313,040	4,419,128	1,893,912	4,315,030	3,020,521	1,294,509
2040	18	11	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2041	19	12	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2042	20	13	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2043	21	14	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2044	22	15	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2045	23	16	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2046	24	17	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2047	25	18	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2048	26	19	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2049	27	20	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2050	28	21	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2051	29	22	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
2052	30	23	6,396,990	4,477,893	1,919,097	4,398,980	3,079,286	1,319,694
					42,673,464			29,275,044

Off Peak Period Annual Vehicles

			Route 1 Northbound			Route 1 Southbound		
Calendar Year	Project Year	Rt 1 Project Use Year	No Build	Build	Difference	No Build	Build	Difference
2019	0	0	5,499,090	5,499,090	0	3,764,610	3,764,610	0
2020	0	0	5,577,930	5,577,930	0	3,823,740	3,823,740	0
2021	0	0	5,656,770	5,656,770	0	3,882,870	3,882,870	0
2022	0	0	5,755,320	5,755,320	0	3,922,290	3,922,290	0
2023	1	0	5,834,160	5,834,160	0	4,001,130	4,001,130	0
2024	2	0	5,932,710	5,932,710	0	4,040,550	4,040,550	0
2025	3	0	6,011,550	6,011,550	0	4,119,390	4,119,390	0
2026	4	0	6,110,100	6,110,100	0	4,178,520	4,178,520	0
2027	5	0	6,188,940	6,188,940	0	4,237,650	4,237,650	0
2028	6	0	6,287,490	6,287,490	0	4,296,780	4,296,780	0
2029	7	0	6,386,040	6,386,040	0	4,355,910	4,355,910	0
2030	8	1	6,484,590	4,539,213	1,945,377	4,434,750	3,104,325	1,330,425
2031	9	2	6,583,140	4,608,198	1,974,942	4,493,880	3,145,716	1,348,164
2032	10	3	6,681,690	4,677,183	2,004,507	4,553,010	3,187,107	1,365,903
2033	11	4	6,780,240	4,746,168	2,034,072	4,631,850	3,242,295	1,389,555
2034	12	5	6,878,790	4,815,153	2,063,637	4,710,690	3,297,483	1,413,207
2035	13	6	6,977,340	4,884,138	2,093,202	4,769,820	3,338,874	1,430,946
2036	14	7	7,075,890	4,953,123	2,122,767	4,848,660	3,394,062	1,454,598
2037	15	8	7,194,150	5,035,905	2,158,245	4,907,790	3,435,453	1,472,337
2038	16	9	7,292,700	5,104,890	2,187,810	5,006,340	3,504,438	1,501,902
2039	17	10	7,410,960	5,187,672	2,223,288	5,065,470	3,545,829	1,519,641
2040	18	11	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2041	19	12	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2042	20	13	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2043	21	14	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2044	22	15	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2045	23	16	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2046	24	17	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2047	25	18	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2048	26	19	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2049	27	20	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2050	28	21	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2051	29	22	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206
2052	30	23	7,509,510	5,256,657	2,252,853	5,164,020	3,614,814	1,549,206

50,094,936	34,366,356

Annual Vehicles Miles Traveled

			NO Build			Build						
Calendar Year	Project Year	Rt 1 Project Use Year	Peak Period VM	Off-Peak VMT	Daily VMT	Peak Period VM	Off-Peak VMT	Daily VMT	VMT Savings	Peak Period VMT Savings	Off Peak Period VMT Savings	Total VMT Savings
			0	0	0	0	0	0	0	0	0	0
2019	0	0										
2020	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0	0	0
2023	1	0	0	0	0	0	0	0	0	0	0	0
2024	2	0	0	0	0	0	0	0	0	0	0	0
2025	3	0	0	0	0	0	0	0	0	0	0	0
2026	4	0	0	0	0	0	0	0	0	0	0	0
2027	5	0	0	0	0	0	0	0	0	0	0	0
2028	6	0	0	0	0	0	0	0	0	0	0	0
2029	7	0	0	0	0	0	0	0	0	0	0	0
2030	8	1	119,331,567	66,607,974	185,939,541	83,532,097	46,625,582	130,157,679	55,781,862	35,799,470	19,982,392	55,781,862
2031	9	2	121,089,480	67,569,822	188,659,302	84,762,636	47,298,875	132,061,511	56,597,791	36,326,844	20,270,947	56,597,791
2032	10	3	122,847,393	68,531,670	191,379,063	85,993,175	47,972,169	133,965,344	57,413,719	36,854,218	20,559,501	57,413,719
2033	11	4	124,737,947	69,613,749	194,351,696	87,316,563	48,729,624	136,046,187	58,305,509	37,421,384	20,884,125	58,305,509
2034	12	5	126,628,501	70,695,828	197,324,329	88,639,951	49,487,080	138,127,030	59,197,299	37,988,550	21,208,748	59,197,299
2035	13	6	128,386,414	71,657,676	200,044,090	89,870,490	50,160,373	140,030,863	60,013,227	38,515,924	21,497,303	60,013,227
2036	14	7	130,276,968	72,739,755	203,016,723	91,193,878	50,917,829	142,111,706	60,905,017	39,083,090	21,821,927	60,905,017
2037	15	8	132,306,879	73,821,834	206,128,713	92,614,815	51,675,284	144,290,099	61,838,614	39,692,064	22,146,550	61,838,614
2038	16	9	134,330,074	75,024,144	209,354,218	94,031,052	52,516,901	146,547,953	62,806,265	40,299,022	22,507,243	62,806,265
2039	17	10	136,359,985	76,106,223	212,466,208	95,451,990	53,274,356	148,726,346	63,739,862	40,907,996	22,831,867	63,739,862
2040	18	11	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2041	19	12	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2042	20	13	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2043	21	14	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2044	22	15	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2045	23	16	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2046	24	17	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2047	25	18	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2048	26	19	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2049	27	20	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2050	28	21	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2051	29	22	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514
2052	30	23	138,383,180	77,308,533	215,691,713	96,868,226	54,115,973	150,984,199	64,707,514	41,514,954	23,192,560	64,707,514

Projected Route 1 Travel Speed - Average Arterial Travel Speed (mph)

Calendar Year	Project Year	Project Use Year	No Build	Build
2021	0	0	35	25
2022	0	0	35	25
2023	1	0	35	25
2024	2	0	35	25
2025	3	0	35	25
2026	4	0	35	25
2027	5	0	35	25
2028	6	0	35	25
2029	7	0	35	25
2030	8	1	35	25
2031	9	2	35	25
2032	10	3	35	25
2033	11	4	35	25
2034	12	5	35	25
2035	13	6	35	25
2036	14	7	35	25
2037	15	8	35	25
2038	16	9	35	25
2039	17	10	35	25
2040	18	11	35	25
2041	19	12	35	25
2042	20	13	35	25
2043	21	14	35	25
2044	22	15	35	25
2045	23	16	35	25
2046	24	17	35	25
2047	25	18	35	25
2048	26	19	35	25
2049	27	20	35	25
2050	28	21	35	25
2051	29	22	35	25
2052	30	23	35	25

BCA Output Table

Possible Societal Benefits for Consideration	Key Benefits Quantified	Total Benefits	Present Value (7% Discount Rate)	Tab
Safety				
Crash Savings	Reduction in Predicted Crashes due to reduced volume and elimination of Route 1 SB Weave area	$90,166,711	$26,995,346	E
State of Good Repair				
Bridge Operations and Maintenance Savings	Reducing in annual and periodic bridge maintenance costs related to removing the above grade options	$8,694,560	$2,136,772	F
External Highway Costs Savings (Noise, Congestion, Pavement)	Reduction in milage-dependent highway costs (noise and congestion mitigation and pavement maintenance) related to volume reductions	$401,210,206	$110,899,513	G
Economic Impacts, Freight Movement, and Job Creation				
Travel Time (Delay) Impacts - Existing Users	Decrease in CO, CO_2, VOC, NO_X, $PM_{2.5}$, SO_2 emissions due to reduced vehicle mileage	-$256,564,892	-$67,019,778	H
Travel Time (Delay) Impacts - Induced Transit	Decrease oil and other pollutant runoff to river	-$120,924,330	-$31,585,094	I
User Operating Cost Savings	Reduces users costs associated with personal vehicle travel	$586,228,458	$162,107,083	J
Newly Developable Land and Bonus Density	Value of land created (6.5 acres) by removing the above grade roadway and additional density for	$108,635,500	$55,224,780	K
Property Value Increase	Property value increase as a proxy for increased commercial and retail activity related to the urban boulevard and properties adjacent to transit.	$384,089,565	$236,851,417	L
Climate Change, Resiliency, and the Environment				
Mobile Source Air Emission Reductions (Non-CO2)	Decrease in CO, VOC, NO_X, $PM_{2.5}$, SO_2 emissions due to reduced vehicle mileage	$2,262,306	$650,450	M
Mobile Source Air Emission Reductions (CO2)	Decrease in CO_2 emissions due to reduced vehicle mileage	$22,838,276	$12,495,025	M
Mobile Source Water Runoff Reductions	Reduction in milage-dependent water runoff costs as a result of reduced traffic volumes	$23,664,673	$6,549,548	M
Urban Tree Canopy Benefits	Net societal benefits of additional urban street trees	$203,688	$54,299	N
Equity, Multimodal Options, and Quality of Life				
Bicycle Benefits	Mortality reduction and revealed preference benefits associated with the addition of bicycle facilities	$30,051,452	$7,909,652	N
Pedestrian Benefits	Mortality reduction and revealed preference benefits associated with addition/improvement of pedestrian facilities	$79,066,387	$20,535,807	O
Other				
Residual Value	Residual value of assets at the end of the analysis period	$64,612,718	$7,413,736	P
Transportation Demand Management Costs		-$36,954,093	-$15,467,976	R
Total Benefits		$1,387,281,186	$535,750,580	
Total Costs		-$267,621,292	-$179,102,601	D
Benefit / Cost Ratio		5.18	2.99	
Net Present Value		1,119,659,894	356,647,978	
	Consistency Check (Outputs vs. Summary)	*TRUE*	*TRUE*	
	Consistency Check (Outputs vs. Summary)	*TRUE*	*TRUE*	

Summary of Costs and Benefits

Mode Shift 30%

	Undiscounted	7% discount
Benefits	$1,387,281,186	$535,750,580
Costs	$267,621,292	$179,102,601
BCR	5.18	2.99
NPV	$1,119,659,894	$356,647,978

Costs

Calendar Year	Project Year	Construction	Total Costs	Present Value (7% Discount Rate)
2023	1	$18,607,062	$18,607,062	$15,188,905
2024	2	$44,776,309	$44,776,309	$34,159,632
2025	3	$44,776,309	$44,776,309	$31,924,889
2026	4	$40,487,057	$40,487,057	$26,978,236
2027	5	$52,498,871	$52,498,871	$32,693,659
2028	6	$52,498,871	$52,498,871	$30,554,821
2029	7	$13,976,812	$13,976,812	$7,602,460
2030	8	$0	$0	$0
2031	9	$0	$0	$0
2032	10	$0	$0	$0
2033	11	$0	$0	$0
2034	12	$0	$0	$0
2035	13	$0	$0	$0
2036	14	$0	$0	$0
2037	15	$0	$0	$0
2038	16	$0	$0	$0
2039	17	$0	$0	$0
2040	18	$0	$0	$0
2041	19	$0	$0	$0
2042	20	$0	$0	$0
2043	21	$0	$0	$0
2044	22	$0	$0	$0
2045	23	$0	$0	$0
2046	24	$0	$0	$0
2047	25	$0	$0	$0
2048	26	$0	$0	$0
2049	27	$0	$0	$0
2050	28	$0	$0	$0
2051	29	$0	$0	$0
2052	30	$0	$0	$0
Total		$267,621,292	$267,621,292	$179,102,601

Benefits

Calendar Year	Project Year	Residual Value	TDM Costs	Bridge Maintenance Savings	Crash Savings	Travel Time Disbenefits (Baseline Veh)	Travel Time Disbenefits (Induced Bus)	Operating Cost Savings	External Highway Use Benefits	Environmental Benefits	Runoff	Pedestrian Benefits	Bicycle Benefits	Urban Tree Canopy Benefits	Developable Land	Property Value Premium	Total Benefits (Non-CO2)	Total Benefits (CO2)
2023	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2024	2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2025	3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2026	4	$0	$0	$0	$1,861,739	$0	$0	$6,000,919	$4,076,624	$292,079	$246,038	$0	$0	$0	$0	$263,301,390	$275,526,440	$252,348
2027	5	$0	$0	$0	$2,153,401	$0	$0	$6,000,919	$4,076,624	$297,166	$246,038	$0	$0	$0	$0	$0	$12,517,373	$256,775
2028	6	$0	$0	$221,370	$2,706,152	$0	$0	$6,000,919	$4,076,624	$306,717	$246,038	$0	$0	$0	$0	$0	$13,292,190	$265,630
2029	7	$0	-$10,410,093	$0	$3,001,703	$0	$0	$6,000,919	$4,076,624	$311,821	$246,038	$0	$0	$0	$0	$0	$2,956,956	$270,057
2030	8	$0	-$2,274,000	$467,500	$3,289,475	-$9,953,050	-$4,690,008	$22,461,515	$15,373,935	$822,124	$906,538	$2,965,305	$1,218,120	$8,856	$108,635,500	$120,788,175	$259,283,008	$736,977
2031	9	$0	-$2,342,000	$0	$3,314,305	-$10,098,134	-$4,757,734	$22,704,002	$15,540,359	$841,638	$916,268	$3,021,670	$1,228,676	$8,856	$0	$0	$29,622,119	$755,786
2032	10	$0	-$2,446,000	$495,970	$3,339,134	-$10,243,218	-$4,825,460	$22,946,488	$15,706,784	$861,374	$925,998	$3,078,035	$1,239,232	$8,856	$0	$0	$30,312,377	$774,816
2033	11	$0	-$2,450,000	$0	$3,367,065	-$10,403,031	-$4,901,651	$23,207,271	$15,885,765	$881,917	$936,462	$3,141,446	$1,251,108	$8,856	$0	$0	$30,130,605	$794,604
2034	12	$0	-$2,524,000	$526,170	$3,394,998	-$10,562,844	-$4,977,843	$23,468,054	$16,064,747	$902,698	$946,926	$3,204,857	$1,262,983	$8,856	$0	$0	$30,900,974	$814,629
2035	13	$0	-$2,416,000	$0	$3,419,828	-$10,707,928	-$5,045,569	$23,710,541	$16,231,171	$923,114	$956,656	$3,261,222	$1,273,540	$8,856	$0	$0	$30,781,098	$834,334
2036	14	$0	-$2,278,000	$558,210	$3,447,761	-$10,867,741	-$5,121,760	$23,971,324	$16,410,153	$957,015	$967,121	$3,324,632	$1,285,415	$8,856	$0	$0	$31,795,592	$867,394
2037	15	$0	-$2,346,000	$0	$3,475,693	-$11,033,004	-$5,197,951	$24,251,330	$16,602,328	$979,280	$978,356	$3,388,043	$1,297,291	$8,856	$0	$0	$31,515,374	$888,848
2038	16	$0	-$2,416,000	$592,210	$3,506,729	-$11,207,547	-$5,282,609	$24,530,409	$16,793,867	$1,001,769	$989,555	$3,458,500	$1,310,486	$8,856	$0	$0	$32,375,700	$910,525
2039	17	$0	-$2,489,000	$0	$3,534,662	-$11,372,810	-$5,358,800	$24,810,415	$16,986,042	$1,024,545	$1,000,790	$3,521,910	$1,322,362	$8,856	$0	$0	$32,056,486	$932,486
2040	18	$0	-$2,563,000	$628,270	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,047,543	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$32,948,876	$954,669
2041	19	$0	$0	$0	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,060,705	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$34,883,690	$967,747
2042	20	$0	$0	$666,540	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,073,867	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,550,314	$980,825
2043	21	$0	$0	$0	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,100,190	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$34,883,942	$1,006,980
2044	22	$0	$0	$707,130	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,113,352	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,591,156	$1,020,058
2045	23	$0	$0	$0	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,126,514	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$34,884,110	$1,033,135
2046	24	$0	$0	$750,190	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,139,675	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,634,384	$1,046,213
2047	25	$0	$0	$0	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,152,837	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$34,884,278	$1,059,290
2048	26	$0	$0	$795,880	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,165,999	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,680,242	$1,072,368
2049	27	$0	$0	$0	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,179,161	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$34,884,447	$1,085,446
2050	28	$0	$0	$844,350	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,179,161	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,728,797	$1,085,446
2051	29	$0	$0	$545,000	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,179,161	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$35,429,447	$1,085,446
2052	30	$64,612,718	$0	$895,770	$3,565,697	-$11,547,353	-$5,443,457	$25,089,495	$17,177,581	$1,179,161	$1,011,989	$3,592,367	$1,335,557	$8,856	$0	$0	$100,392,935	$1,085,446
Total		$64,612,718	-$36,954,093	$8,694,560	$90,166,711	-$256,564,892	-$120,924,330	$586,228,458	$401,210,206	$25,100,582	$23,664,673	$79,066,387	$30,051,452	$203,688	$108,635,500	$384,089,565	$1,364,442,909	$22,838,276

Total Benefit	Present Value (7% Discount Rate*)
$0	$0
$0	$0
$0	$0
$275,778,788	$183,806,238
$12,774,148	$8,003,972
$13,557,820	$7,945,866
$3,227,013	$1,815,364
$260,019,984	$132,354,713
$30,377,906	$14,619,252
$31,087,193	$14,002,498
$30,925,209	$13,044,217
$31,715,603	$12,522,496
$31,615,432	$11,692,014
$32,662,986	$11,310,798
$32,404,222	$10,514,728
$33,286,225	$10,113,639
$32,988,972	$9,395,669
$33,903,545	$9,043,193
$35,851,437	$8,945,079
$36,531,138	$8,536,059
$35,890,922	$7,868,887
$36,611,214	$7,518,477
$35,917,245	$6,920,800
$36,680,597	$6,621,204
$35,943,569	$6,090,821
$36,752,611	$5,835,095
$35,969,892	$5,364,061
$36,814,242	$5,140,778
$36,514,892	$4,783,944
$101,478,380	$11,940,717
$1,387,281,186	$535,750,580

*includes CO2 @ 3% discount

D - Cost Estimate

Cost Estimate Inputs

Base Year	2020
Inflation Rate	3.0%

Detailed Cost Estimate

Project Phase	Total Amount (Nominal) (Cost Estimate Year $)	Total Amount (Real) ($2020)	Lifespan	Cost Year
Route 1 Urban Boulevard				
Route 1 Urban Boulevard Subtotal	$177,270,216	$131,780,411		
I-395 Bridge Conversion				
Preliminary Engineering (PE)	-	$5,894,995	No residual	Pre-Construction
Right-of-Way Acquisition (ROW)	-	-	No residual	Pre-construction
Construction (CN)	-	$21,433,688	50 Year Life Span	All
Contingency (75% of PE and CN)	-	$20,496,748	No residual	All
I-395 Bridge Conversion Subtotal	$64,200,000	$47,825,431		
Crystal City Metro Second At-Grade Entrance				
Preliminary Engineering (PE)	$15,764,258	$13,202,317	No residual	Pre-Construction
Right-of-Way Acquisition (ROW)	-	-	No residual	Pre-construction
Construction (CN)	$89,330,793	$74,813,132	75 Year Life Span	All
Crystal City Metro Second At-Grade Entrance Subtotal	$105,095,050	$88,015,450		
Total Price	$346,565,266	$267,621,292		

Cost Breakdown by Asset Lifespan & Residual Value

	Route 1 Urban Boulevard
No residual	$16,214,233
30 Year Life Span	$115,566,177
50 Year Life Span	$0
75 Year Life Span	$0
Total	$131,780,411

Cost Breakdown by Year of Expenditure: Route 1 Urban Boulevard

	Annual Construction Costs	Total cost ($2020)
1	2023	$5,404,744
2	2024	$5,404,744
3	2025	$5,404,744
4	2026	$38,522,059
5	2027	$38,522,059
6	2028	$38,522,059
	Subtotal	$131,780,411

Cost Breakdown by Year of Expenditure: I-395 Bridge Conversion

	Annual Construction Costs	Total cost ($2020)
1	2024	$1,964,998
2	2025	$1,964,998
3	2026	$1,964,998
4	2027	$13,976,812
5	2028	$13,976,812
6	2029	$13,976,812
	Subtotal	$47,825,431

Cost Breakdown by Year of Expenditure: Crystal City Metro Second At-Grade Entrance

	Annual Construction Costs	Total cost ($2020)
1	2023	$13,202,317
2	2024	$37,406,566
3	2025	$37,406,566
	Subtotal	$88,015,450
	Project Total	$267,621,292

E - Crash Savings

Crash Cost Factors

Fatal Crash Value	$	12,000,000	Sources:
Injury Crash Value	$	308,600	Sources:

Route 1 Urban Boulevard - Predictive Crashes (Annual)

Segment #	Segment	Fat/Injury	PDO	Fatal Prop	Injury Prop	Sources:
1	No Build	6.8	13	0.01	0.99	
2	Build	3.4	11.8	0.01	0.99	

		No-Build		Build		No-Build	Build	Total Benefit (-Cost)		
Calendar Year	Project Year	Fat/Injury	PDO	Fatal Prop	Injury Prop	Crash Cost	Crash Cost	% of Benefits Realized	Crash Savings (Unadjusted)	Present Value (7% Discount Rate)
2023	1							0%	$0	$0
2024	2							0%	$0	$0
2025	3							0%	$0	$0
2026	4							20%	$291,662	$194,347
2027	5							40%	$583,324	$363,265
2028	6							60%	$874,985	$509,249
2029	7							80%	$1,166,647	$634,579
2030	8	6.8	13	3.4	11.8	$3,018,750	$1,560,441	100%	$1,458,309	$741,330
2031	9	6.9	13.2	3.4	12.0	$3,062,342	$1,582,974	100%	$1,479,368	$702,837
2032	10	7.0	13.4	3.5	12.1	$3,105,934	$1,605,507	100%	$1,500,427	$666,208
2033	11	7.1	13.6	3.6	12.3	$3,154,975	$1,630,858	100%	$1,524,117	$632,454
2034	12	7.2	13.8	3.6	12.5	$3,204,016	$1,656,208	100%	$1,547,808	$600,267
2035	13	7.3	14.0	3.7	12.7	$3,247,609	$1,678,741	100%	$1,568,868	$568,630
2036	14	7.4	14.2	3.7	12.9	$3,296,650	$1,704,091	100%	$1,592,559	$539,455
2037	15	7.5	14.4	3.8	13.1	$3,345,691	$1,729,441	100%	$1,616,250	$511,663
2038	16	7.7	14.6	3.8	13.3	$3,400,181	$1,757,608	100%	$1,642,573	$485,978
2039	17	7.8	14.9	3.9	13.5	$3,449,222	$1,782,958	100%	$1,666,264	$460,736
2040	18	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$437,397
2041	19	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$408,782
2042	20	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$382,039
2043	21	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$357,046
2044	22	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$333,688
2045	23	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$311,858
2046	24	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$291,456
2047	25	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$272,389
2048	26	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$254,569
2049	27	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$237,915
2050	28	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$222,350
2051	29	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$207,804
2052	30	7.9	15.1	3.9	13.7	$3,503,712	$1,811,125	100%	$1,692,587	$194,209
Total		175.3	335.2	87.7	304.2	$77,833,626	$40,233,452		$40,516,792	$11,522,498

Crystal City Second Entrance (Crashes per VMT)

Segment #	Segment	Fat/Injury	PDO	Fatal Prop	Injury Prop	Sources:
1	No Build	43	82	0.00	1.00	
2	6-year average	7.17	13.67			
	Crashes per VMT	0.000000406	0.000000774			

		No-Build		Build	No-Build	Build		
Calendar Year	Project Year	VMT Savings	Injury Crashes Avoided	PDO Crashes Avoided	Crash Cost	Crash Cost	Crash Savings	Present Value (7% Discount Rate)
2023	1						$0	$0
2024	2						$0	$0
2025	3						$0	$0
2026	4	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$1,046,209
2027	5	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$977,765
2028	6	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$913,799
2029	7	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$854,018
2030	8	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$798,148
2031	9	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$745,932
2032	10	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$697,133
2033	11	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$651,526
2034	12	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$608,903
2035	13	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$569,068
2036	14	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$531,839
2037	15	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$497,046
2038	16	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$464,529
2039	17	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$434,139
2040	18	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$405,738
2041	19	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$379,194
2042	20	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$354,387
2043	21	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$331,203
2044	22	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$309,535
2045	23	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$289,285
2046	24	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$270,360
2047	25	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$252,673
2048	26	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$236,143
2049	27	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$220,694
2050	28	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$206,256
2051	29	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$192,763
2052	30	13,335,375	5.41	10.32	$1,669,476	$99,399	$1,570,077	$180,152
Total		360055135	146	279	$45,075,848	$2,683,769	$42,392,080	$13,418,440

I-395 Interchange - Predictive Crashes (Annual)

Segment #	Segment	Fat/Injury	PDO	Fatal Prop	Injury Prop	Sources:
1	No Build	2	2.4	0.01	0.99	
2	Build	1.4	1.8			

1.00

		No-Build		Build		No-Build	Build		
Calendar Year	Project Year	Fat/Injury	PDO	Fatal Prop	Injury Prop	Crash Cost	Crash Cost	Crash Savings	Present Value (7% Discount Rate)
2023	1							$0	$0
2024	2							$0	$0
2025	3							$0	$0
2026	4							$0	$0
2027	5							$0	$0
2028	6	2	2.4	1.4	1.8	874,152	613,063	$261,089	$151,956
2029	7	2.0	2.4	1.4	1.8	887,175	622,196	$264,979	$144,131
2030	8	2.0	2.4	1.4	1.8	874,152	613,063	$261,089	$132,725
2031	9	2.0	2.4	1.4	1.8	886,775	621,915	$264,860	$125,833
2032	10	2.1	2.5	1.4	1.9	899,398	630,768	$268,630	$119,275
2033	11	2.1	2.5	1.5	1.9	913,599	640,728	$272,871	$113,232
2034	12	2.1	2.5	1.5	1.9	927,800	650,687	$277,113	$107,469
2035	13	2.2	2.6	1.5	1.9	940,423	659,540	$280,883	$101,805
2036	14	2.2	2.6	1.5	2.0	954,624	669,500	$285,125	$96,582
2037	15	2.2	2.7	1.6	2.0	968,826	679,459	$289,366	$91,606
2038	16	2.3	2.7	1.6	2.0	984,604	690,525	$294,079	$87,007
2039	17	2.3	2.7	1.6	2.1	998,805	700,485	$298,321	$82,488
2040	18	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$78,310
2041	19	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$73,187
2042	20	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$68,399
2043	21	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$63,924
2044	22	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$59,742
2045	23	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$55,834
2046	24	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$52,181
2047	25	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$48,767
2048	26	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$45,577
2049	27	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$42,595
2050	28	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$39,809
2051	29	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$37,204
2052	30	2.3	2.8	1.6	2.1	1,014,584	711,551	$303,033	$34,770
Total		51.6	61.9	36.1	46.4	$22,538,605	$15,806,834	$7,257,839	$2,054,407

F - Maintenance & SOGR

Interchange Ramps and Bridges Maintenance and Inspection Data

Future Inflation Rate	3%
Average costs per square meter of deck area	
Maintenance and Repair	$30.68
Inspection	$22.07

				No-Build										
Structure Number	Structure Description	Year Constructed	Deck Area (sq. m.)	Inspection Cost	Inspection Frequency (Years)	Last Inspected	Maintenance and Repair Cost	Structure Lifespan (Years)	Due for Reconstruction	Cost of Reconstruction (Cost Estimate Year $)	Year of Cost Estimate	Inflation Adjustment Value	Cost of Reconstruction (2020 $)	Sources
110	SB I-395 Exit 8C Ramp	1976	3,620	$79,893	2	2020	$111,062	75	2051	$500,000	2015	1.09	$545,000	Bridge-specific Info: National Bridge Inventory
114	Rte 1 bridge over 15th St	1988	1,794	$39,594	2	2020	$55,040	75	2063	$110,000	2014	1.10	$121,000	
117	Rte 1 bridge over 18th St	1988	1,792	$39,549	2	2020	$54,979	75	2063	$630,000	2014	1.10	$693,000	

Maintenance and SOGR Benefits

		Costs Savings Per Structure			Total Benefit (-Cost)	
Calendar Year	Project Year	110	114	117	Total Benefit	Present Value (7% Discount Rate)
2023	1	$0	$0	$0	$0	$0
2024	2	$0	$0	$0	$0	$0
2025	3	$0	$0	$0	$0	$0
2026	4	$0	$0	$0	$0	$0
2027	5	$0	$0	$0	$0	$0
2028	6	$221,369	$0	$0	$221,370.0	$128,839
2029	7	$0	$0	$0	$0.0	$0
2030	8	$234,851	$116,387	$116,258	$467,500.0	$237,653
2031	9	$0	$0	$0	$0.0	$0
2032	10	$249,153	$123,475	$123,338	$495,970.0	$220,217
2033	11	$0	$0	$0	$0.0	$0
2034	12	$264,326	$130,995	$130,849	$526,170.0	$204,058
2035	13	$0	$0	$0	$0.0	$0
2036	14	$280,424	$138,972	$138,818	$558,210.0	$189,085
2037	15	$0	$0	$0	$0.0	$0
2038	16	$297,502	$147,436	$147,272	$592,210.0	$175,214
2039	17	$0	$0	$0	$0.0	$0
2040	18	$315,620	$156,415	$156,240	$628,270.0	$162,357
2041	19	$0	$0	$0	$0.0	$0
2042	20	$334,841	$165,940	$165,755	$666,540.0	$150,447
2043	21	$0	$0	$0	$0.0	$0
2044	22	$355,233	$176,046	$175,850	$707,130.0	$139,408
2045	23	$0	$0	$0	$0.0	$0
2046	24	$376,866	$186,767	$186,559	$750,190.0	$129,179
2047	25	$0	$0	$0	$0.0	$0
2048	26	$399,817	$198,142	$197,921	$795,880.0	$119,702
2049	27	$0	$0	$0	$0.0	$0
2050	28	$424,166	$210,208	$209,974	$844,350.0	$110,920
2051	29	$545,000	$0	$0	$545,000.0	$66,911
2052	30	$449,998	$223,010	$222,761	$895,770.0	$102,782
Total		$4,749,165	$1,973,794	$1,971,594	$8,694,560	$2,136,772

G - External Highway Use

External Highway Cost Calculation Inputs - Vehicles

Congestion Cost of light-duty vehicles (Urban)	$0.124	per VMT	Source:	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Noise Cost of light-duty vehicles (Urban)	$0.0017	per VMT	Source:	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Pavement costs of light duty vehicles	$0.1800	per VMT		

Calendar Year	Project Year	Annual VMT Converted to Active Modes in the Build Alternative		Total VMT Converted to Active Modes	Benefit				
		Light-Duty Vehicles	Trucks		Congestion Benefit	Noise Benefit	Pavement Benefit	Total	Present Value (7% Discount Rate)
2023	1	0		0	$0	$0	$0	$0	$0
2024	2	0		0	$0	$0	$0	$0	$0
2025	3	0		0	$0	$0	$0	$0	$0
2026	4	0		0	$0	$0	$0	$0	$0
2027	5	0		0	$0	$0	$0	$0	$0
2028	6	0		0	$0	$0	$0	$0	$0
2029	7	0		0	$0	$0	$0	$0	$0
2030	8	35,083,481	715,989	35,799,470	$4,572,308	$87,780	$6,637,222	$11,297,310	$5,742,980
2031	9	35,600,307	726,537	36,326,844	$4,639,665	$89,073	$6,734,997	$11,463,735	$5,446,338
2032	10	36,117,134	737,084	36,854,218	$4,707,021	$90,367	$6,832,772	$11,630,159	$5,163,930
2033	11	36,672,956	748,428	37,421,384	$4,779,459	$91,757	$6,937,925	$11,809,141	$4,900,374
2034	12	37,228,779	759,771	37,988,550	$4,851,898	$93,148	$7,043,077	$11,988,123	$4,649,201
2035	13	37,745,606	770,318	38,515,924	$4,919,254	$94,441	$7,140,852	$12,154,547	$4,405,367
2036	14	38,301,429	781,662	39,083,090	$4,991,692	$95,832	$7,246,005	$12,333,529	$4,177,793
2037	15	38,898,222	793,841	39,692,064	$5,069,470	$97,325	$7,358,909	$12,525,704	$3,965,317
2038	16	39,493,042	805,980	40,299,022	$5,146,991	$98,813	$7,471,439	$12,717,243	$3,762,573
2039	17	40,089,836	818,160	40,907,996	$5,224,769	$100,306	$7,584,342	$12,909,418	$3,569,562
2040	18	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$3,385,536
2041	19	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$3,164,053
2042	20	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,957,058
2043	21	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,763,606
2044	22	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,582,809
2045	23	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,413,841
2046	24	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,255,926
2047	25	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$2,108,342
2048	26	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$1,970,413
2049	27	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$1,841,507
2050	28	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$1,721,035
2051	29	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$1,608,444
2052	30	40,684,655	830,299	41,514,954	$5,302,290	$101,795	$7,696,872	$13,100,957	$1,503,219
Total		904,131,305	18,451,659	922,582,964	117,832,296	2,262,173	$171,046,882	$291,141,351	$76,059,223

H - Travel Time

Travel Time Calculation Inputs - Vehicles

			Sources:
In-Vehicle Travel Time: All	$17.80	per hour	
Commercial Vehicle Operators Travel Time: Truck Drivers	$32.00	per hour	
Commercial Vehicle Operators Travel Time: Bus Drivers	$33.60	Passenger vehicles (all travel)	
Non-commercial vehicle occupants	1.67		
Commercial vehicle occupants	1.00		
Average bus ridership	20.29		https://www.fhwa.dot.gov/policyinformation/tables/occupancyfactors/fhwa_pl_19_048.pdf
Assumed Truck Vehicle %	2.00%		
Assumed bus Vehicle %	1.00%		
Assumed Percent of Peak Period Delay occurring off Peak	35%		

Anticipated Travel Times (Existing Travelers)

AM Peak Period	Travel Time (Seconds)		
	No Build	Build	Additional Travel Delay
Northbound	190	559	369
Southbound	136	294	158
PM Peak Period	Travel Time (Seconds)		
	No Build	Build	Additional Travel Delay
Northbound	193	360	167
Southbound	332	646	314

Anticipated Travel Times (Induced Travelers)

AM Peak Period	Travel Time (Seconds)		
	No Build	Build	Additional Travel Delay
Northbound	190	559	369
Southbound	136	294	158
	163	426.5	263.5
PM Peak Period	No Build	Build	Additional Travel Delay
Northbound	193	360	167
Southbound	332	646	314
	262.5	503	240.5

Peak Period Travel Time Disbenefits (Existing Travelers)

		No Build Vehicles		Build Vehicles		Annual Peak Hour VHT		Annual Hour VHT					
								Passenger Vehicle		Trucks		Buses	
Calendar Year	Project Year	NB	SB	NB	SB	No Build	Build	No Build	Build	No Build	Build	No Build	Build
2023	1							0	0	0	0	0	0
2024	2							0	0	0	0	0	0
2025	3							0	0	0	0	0	0
2026	4							0	0	0	0	0	0
2027	5							0	0	0	0	0	0
2028	6							0	0	0	0	0	0
2029	7							0	0	0	0	0	0
2030	8	5,523,910	3,777,750	3,866,737	2,644,425	539,395	838,790	523,213	813,627	10,788	16,776	5,394	8,388
2031	9	5,607,860	3,828,120	3,925,502	2,679,684	547,135	850,894	530,721	825,368	10,943	17,018	5,471	8,509
2032	10	5,691,810	3,878,490	3,984,267	2,714,943	554,875	862,998	538,228	837,108	11,097	17,260	5,549	8,630
2033	11	5,775,760	3,945,650	4,043,032	2,761,955	563,706	876,637	546,794	850,338	11,274	17,533	5,637	8,766
2034	12	5,859,710	4,012,810	4,101,797	2,808,967	572,537	890,275	555,361	863,567	11,451	17,806	5,725	8,903
2035	13	5,943,660	4,063,180	4,160,562	2,844,226	580,276	902,379	562,868	875,308	11,606	18,048	5,803	9,024
2036	14	6,027,610	4,130,340	4,219,327	2,891,238	589,107	916,017	571,434	888,537	11,782	18,320	5,891	9,160

2037	15	6,128,350	4,180,710	4,289,845	2,926,497	597,740	929,621	579,808	901,733	11,955	18,592	5,977	9,296
2038	16	6,212,300	4,264,660	4,348,610	2,985,262	607,663	944,794	589,433	916,450	12,153	18,896	6,077	9,448
2039	17	6,313,040	4,315,030	4,419,128	3,020,521	616,296	958,398	597,807	929,646	12,326	19,168	6,163	9,584
2040	18	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2041	19	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2042	20	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2043	21	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2044	22	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2045	23	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2046	24	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2047	25	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2048	26	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2049	27	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2050	28	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736
2051	29	6,396,990	4,398,980	4,477,893	3,079,286	626,218	973,571	607,431	944,364	12,524	19,471	6,262	9,736

Travel Time

Travel Time Calculation Inputs - Vehicles

In-Vehicle Travel Time: All	$17.80
Commercial Vehicle Operators Travel Time: Truck Drivers	$32.00
Commercial Vehicle Operators Travel Time: Bus Drivers	$33.60
Non-commercial vehicle occupants	1.67
Commercial vehicle occupants	1.00
Average bus ridership	20.29
Assumed Truck Vehicle %	2.00%
Assumed bus Vehicle %	1.00%
Assumed Percent of Peak Period Delay occurring off Peak	35%

Anticipated Travel Times (Existing Travelers)

AM Peak Period	Travel Time (Secor
	No Build
Northbound	190
Southbound	136
PM Peak Period	Travel Time (Secor
	No Build
Northbound	193
Southbound	332

Anticipated Travel Times (Induced Travelers)

AM Peak Period	Travel Time (Secor
	No Build
Northbound	190
Southbound	136
PM Peak Period	163
	No Build
Northbound	193
Southbound	332
	262.5

Peak Period Travel

	VHT Savings (Vehicles)			Travel Time Savings (Persons hours)			Total Travel Time Savings (2020 $)			Bene
Calendar Year	Passenger Vehicle	Trucks	Buses	Passenger Vehicle	Trucks	Buses (Riders)	Passenger Vehicle	Trucks	Buses	Total
2023	0	0	0	0	0	0	$0		$0	$0
2024	0	0	0	0	0	0	$0		$0	$0
2025	0	0	0	0	0	0	$0		$0	$0
2026	0	0	0	0	0	0	$0		$0	$0
2027	0	0	0	0	0	0	$0		$0	$0
2028	0	0	0	0	0	0	$0		$0	$0
2029	0	0	0	0	0	0	$0		$0	$0
2030	-290,413	-5,988	-2,994	-484,990	-5,988	-57,753	-$8,632,830	-$191,613	-$1,128,607	-$9,953,050
2031	-294,647	-6,075	-3,038	-492,060	-6,075	-58,595	-$8,758,670	-$194,406	-$1,145,058	-$10,098,134
2032	-298,880	-6,162	-3,081	-499,130	-6,162	-59,437	-$8,884,509	-$197,199	-$1,161,510	-$10,243,218
2033	-303,543	-6,259	-3,129	-506,917	-6,259	-60,364	-$9,023,124	-$200,276	-$1,179,631	-$10,403,031
2034	-308,206	-6,355	-3,177	-514,704	-6,355	-61,292	-$9,161,739	-$203,353	-$1,197,753	-$10,562,844
2035	-312,440	-6,442	-3,221	-521,774	-6,442	-62,134	-$9,287,578	-$206,146	-$1,214,204	-$10,707,928
2036	-317,103	-6,538	-3,269	-529,561	-6,538	-63,061	-$9,426,193	-$209,222	-$1,232,326	-$10,867,741

2037	-321,925	-6,638	-3,319	-537,614	-6,638	-64,020	-$9,569,535	-$212,404	-$1,251,066	-$11,033,004
2038	-327,018	-6,743	-3,371	-546,119	-6,743	-65,033	-$9,720,925	-$215,764	-$1,270,858	-$11,207,547
2039	-331,840	-6,842	-3,421	-554,172	-6,842	-65,992	-$9,864,267	-$218,946	-$1,289,597	-$11,372,810
2040	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2041	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2042	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2043	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2044	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2045	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2046	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2047	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2048	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2049	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2050	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353
2051	-336,933	-6,947	-3,474	-562,677	-6,947	-67,004	-$10,015,657	-$222,306	-$1,309,389	-$11,547,353

I-Operating Cost Savings

Route 1 - External Highway Use Calculation Inputs - Vehicles

Operating Cost of light-duty vehicles	$0.45	per VMT	Source: USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Operating Cost of Commercial vehicles	$0.94	per VMT	

		Annual VMT Converted to Active Modes in the Build Alternative			Benefit	
Calendar Year	Project Year	Total VMT (Peak Period)	Light-Duty Vehicles	Trucks	Total	Present Value (7% Discount Rate)
2023	1		0		$0	$0
2024	2		0		$0	$0
2025	3		0		$0	$0
2026	4		0		$0	$0
2027	5		0		$0	$0
2028	6		0		$0	$0
2029	7		0		$0	$0
2030	8	35,799,470	35,083,481	715,989	$16,460,596	$8,367,733
2031	9	36,326,844	35,600,307	726,537	$16,703,083	$7,935,514
2032	10	36,854,218	36,117,134	737,084	$16,945,569	$7,524,035
2033	11	37,421,384	36,672,956	748,428	$17,206,352	$7,140,025
2034	12	37,988,550	37,228,779	759,771	$17,467,135	$6,774,056
2035	13	38,515,924	37,745,606	770,318	$17,709,622	$6,418,782
2036	14	39,083,090	38,301,429	781,662	$17,970,405	$6,087,198
2037	15	39,692,064	38,898,222	793,841	$18,250,411	$5,777,613
2038	16	40,299,022	39,493,042	805,980	$18,529,490	$5,482,208
2039	17	40,907,996	40,089,836	818,160	$18,809,496	$5,200,982
2040	18	41,514,954	40,684,655	830,299	$19,088,576	$4,932,851
2041	19	41,514,954	40,684,655	830,299	$19,088,576	$4,610,141
2042	20	41,514,954	40,684,655	830,299	$19,088,576	$4,308,543
2043	21	41,514,954	40,684,655	830,299	$19,088,576	$4,026,676
2044	22	41,514,954	40,684,655	830,299	$19,088,576	$3,763,248
2045	23	41,514,954	40,684,655	830,299	$19,088,576	$3,517,054
2046	24	41,514,954	40,684,655	830,299	$19,088,576	$3,286,967
2047	25	41,514,954	40,684,655	830,299	$19,088,576	$3,071,932
2048	26	41,514,954	40,684,655	830,299	$19,088,576	$2,870,964
2049	27	41,514,954	40,684,655	830,299	$19,088,576	$2,683,144
2050	28	41,514,954	40,684,655	830,299	$19,088,576	$2,507,611
2051	29	41,514,954	40,684,655	830,299	$19,088,576	$2,343,562
2052	30	41,514,954	40,684,655	830,299	$19,088,576	$2,190,245
Total			904,131,305	18,451,659	$424,203,647	$110,821,082

Crystal City Second Entrance - External Highway Use Calculation Inputs - Vehicles

Average Daily Ridership	11700		
Peak Period Ridership	7500		
Off-Peak Ridership	4200		
Induced Trips	30%		
Operating Cost of light-duty vehicles	$0.45	per VMT	Source: https://www.wmata.com/initiatives/ridership-portal/Rail-Data-Portal.cfm

							Benefit	
Calendar Year	Project Year	Induced Transit Trips (Peak/commute)	Induced Transit Trips (Nonpeak/noncommuter)	Commute VMT Savings	Noncommuter VMT Savings	Total VMT Converted to	Total	Present Value (7% Discount Rate)
2023	1	0	0			0	$0	$0
2024	2	0	0			0	$0	$0
2025	3	0	0			0	$0	$0
2026	4	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$3,998,666
2027	5	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$3,737,071
2028	6	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$3,492,589

2029	7	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$3,264,102
2030	8	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$3,050,563
2031	9	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,850,993
2032	10	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,664,480
2033	11	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,490,168
2034	12	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,327,260
2035	13	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,175,009
2036	14	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$2,032,719
2037	15	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,899,737
2038	16	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,775,455
2039	17	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,659,304
2040	18	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,550,751
2041	19	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,449,300
2042	20	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,354,486
2043	21	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,265,875
2044	22	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,183,061
2045	23	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,105,664
2046	24	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$1,033,331
2047	25	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$965,730
2048	26	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$902,551
2049	27	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$843,506
2050	28	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$788,323
2051	29	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$736,751
2052	30	821,250	459,900	10529985.38	2805390	13,335,375	$6,000,919	$688,552
Total		22,173,750	12,417,300	284,309,605	75,745,530	360,055,135	$162,024,811	$51,286,001

J- Developable Land

Route 1 Urban Boulevard - Developable Calculation Inputs

Input		**Unit**
Developable Acres	6.5	
Developable Square feet	283140	
Market Value per sq ft (in 2021)	75	ROUTE 1 VALUE CAPTURE ANALYSIS (November 2019) HR&A

Developable Land

Calendar Year	Project Year	Developable Land	Present Value (7% Discount Rate)
2023	1	0	$0
2024	2	0	$0
2025	3	0	$0
2026	4	0	$0
2027	5	0	$0
2028	6	0	$0
2029	7	0	$0
2030	8	$ 21,235,500.00	$10,795,051
2031	9	0	$0
2032	10	0	$0
2033	11	0	$0
2034	12	0	$0
2035	13	0	$0
2036	14	0	$0
2037	15	0	$0
2038	16	0	$0
2039	17	0	$0
2040	18	0	$0
2041	19	0	$0
2042	20	0	$0
2043	21	0	$0
2044	22	0	$0
2045	23	0	$0
2046	24	0	$0
2047	25	0	$0
2048	26	0	$0
2049	27	0	$0
2050	28	0	$0
2051	29	0	$0
2052	30	0	$0
Total		$21,235,500	$10,795,051

Bonus Density		
Unlocked Density		1748000
Market Value per sq ft (in 2021)	$	50

Calendar Year	Project Year	Developable Land	Present Value (7% Discount Rate)
2023	1	0	$0
2024	2	0	$0
2025	3	0	$0
2026	4	0	$0
2027	5	0	$0
2028	6	0	$0
2029	7	0	$0
2030	8	$ 87,400,000.00	$44,429,728
2031	9	0	$0
2032	10	0	$0
2033	11	0	$0
2034	12	0	$0
2035	13	0	$0
2036	14	0	$0
2037	15	0	$0
2038	16	0	$0
2039	17	0	$0
2040	18	0	$0
2041	19	0	$0
2042	20	0	$0
2043	21	0	$0
2044	22	0	$0
2045	23	0	$0
2046	24	0	$0
2047	25	0	$0
2048	26	0	$0
2049	27	0	$0
2050	28	0	$0
2051	29	0	$0
2052	30	0	$0
Total		$87,400,000	$44,429,728

K - PropertyValue

Route 1 Urban Boulevard - Property Values

Input			**Unit**
Adjacent Property Values	$	2,415,763,500.00	
Complete Streets Premium		5%	
Anticipated Property Value Incre	$	120,788,175.00	

Calendar Year	Project Year	Developable Land	Present Value (7% Discount Rate)
2023	1	0	$0
2024	2	0	$0
2025	3	0	$0
2026	4	0	$0
2027	5	0	$0
2028	6	0	$0
2029	7	0	$0
2030	8	$ 120,788,175.00	$61,402,583
2031	9	0	$0
2032	10	0	$0
2033	11	0	$0
2034	12	0	$0
2035	13	0	$0
2036	14	0	$0
2037	15	0	$0
2038	16	0	$0
2039	17	0	$0
2040	18	0	$0
2041	19	0	$0
2042	20	0	$0
2043	21	0	$0
2044	22	0	$0
2045	23	0	$0
2046	24	0	$0
2047	25	0	$0
2048	26	0	$0
2049	27	0	$0
2050	28	0	$0
2051	29	0	$0
2052	30	0	$0
Total		$120,788,175	$61,402,583

Crystal City Second Entrance - Property Values

Input			**Unit**
Nearby Property Values	$	2,633,013,900.00	
Transit Station Access Premium		10%	
Anticipated Property Value Incre	$	263,301,390.00	

Calendar Year	Project Year	Developable Land	Present Value (7% Discount Rate)
2023	1	0	$0
2024	2	0	$0
2025	3	0	$0
2026	4	$263,301,390	$175,448,834
2027	5	0	$0
2028	6	0	$0
2029	7	0	$0
2030	8	0	$0
2031	9	0	$0
2032	10	0	$0
2033	11	0	$0
2034	12	0	$0
2035	13	0	$0
2036	14	0	$0
2037	15	0	$0
2038	16	0	$0
2039	17	0	$0
2040	18	0	$0
2041	19	0	$0
2042	20	0	$0
2043	21	0	$0
2044	22	0	$0
2045	23	0	$0
2046	24	0	$0
2047	25	0	$0
2048	26	0	$0
2049	27	0	$0
2050	28	0	$0
2051	29	0	$0

2052	30	0	$0
Total		$263,301,390	$175,448,834

Route 1 Urban Boulevard

		Annual Peak Period VMT		No Build Emissions						Build Emissions																	
				Metric Tons Emitted - Car						Metric Emitted - Truck						Metric Tons Saved - Car						Metric Tons Saved - Truck					
				2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
Calendar Year	Project Year	No-Build	Build	CO	CO2	NOX	PM2.5	SOX	VOC	CO	CO2	NOX	PM2.5	SOX	VOC	CO	CO2	NOX	PM2.5	SOX	VOC	CO	CO2	NOX	PM2.5	SOX	VOC
2023	1	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	2	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	3	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	4	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	5	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	6	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	7			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2030	8	119,331,567	83,532,097	118.14	33,381.89	7.67	0.14	0.34	1.93	2.03	3,444.21	4.22	0.04	0.03	0.18	92.45	26,899.55	5.82	0.15	0.27	1.96	2.16	2,466.99	3.45	0.05	0.02	0.25
2031	9	121,089,480	84,762,636	119.88	33,873.65	7.79	0.14	0.34	1.96	2.06	3,494.95	4.29	0.04	0.03	0.19	93.81	27,295.82	5.90	0.15	0.27	1.99	2.19	2,503.33	3.50	0.05	0.02	0.25
2032	10	122,847,393	85,993,175	121.62	34,365.41	7.90	0.14	0.35	1.99	2.09	3,545.69	4.35	0.04	0.03	0.19	95.17	27,692.08	5.99	0.15	0.28	2.02	2.23	2,539.67	3.55	0.05	0.02	0.26
2033	11	124,737,947	87,316,563	123.49	34,894.27	8.02	0.15	0.35	2.02	2.12	3,600.26	4.41	0.04	0.03	0.19	96.64	28,118.25	6.08	0.15	0.28	2.05	2.26	2,578.76	3.61	0.05	0.02	0.26
2034	12	126,628,501	88,639,951	125.36	35,423.14	8.14	0.15	0.36	2.05	2.15	3,654.82	4.48	0.04	0.03	0.20	98.10	28,544.41	6.17	0.15	0.28	2.08	2.29	2,617.84	3.66	0.05	0.02	0.26
2035	13	128,386,414	89,870,490	127.10	35,914.90	8.26	0.15	0.36	2.08	2.18	3,705.56	4.54	0.04	0.03	0.20	99.47	28,940.68	6.26	0.16	0.29	2.11	2.33	2,654.18	3.71	0.05	0.03	0.27
2036	14	130,276,968	91,193,878	128.97	36,443.76	8.38	0.15	0.37	2.11	2.21	3,760.13	4.61	0.04	0.04	0.20	100.93	29,366.85	6.35	0.16	0.29	2.14	2.36	2,693.27	3.77	0.05	0.03	0.27
2037	15	132,306,879	92,614,815	130.98	37,011.61	8.51	0.15	0.37	2.14	2.25	3,818.71	4.68	0.05	0.04	0.20	102.50	29,824.43	6.45	0.16	0.30	2.17	2.40	2,735.23	3.83	0.05	0.03	0.28
2038	16	134,330,074	94,031,052	132.98	37,577.58	8.64	0.16	0.38	2.18	2.28	3,877.11	4.75	0.05	0.04	0.21	104.07	30,280.49	6.55	0.16	0.30	2.21	2.43	2,777.06	3.88	0.05	0.03	0.28
2039	17	136,359,985	95,451,990	134.99	38,145.43	8.77	0.16	0.38	2.21	2.32	3,935.70	4.83	0.05	0.04	0.21	105.64	30,738.07	6.65	0.17	0.31	2.24	2.47	2,819.02	3.94	0.05	0.03	0.28
2040	18	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2041	19	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2042	20	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2043	21	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2044	22	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2045	23	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2046	24	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2047	25	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2048	26	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2049	27	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2050	28	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2051	29	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
2052	30	138,383,180	96,868,226	137.00	38,711.40	8.90	0.16	0.39	2.24	2.35	3,994.09	4.90	0.05	0.04	0.21	107.21	31,194.14	6.75	0.17	0.31	2.27	2.51	2,860.85	4.00	0.06	0.03	0.29
Total		**3075276548**	**2152693584**	**3044.468428**	**860279.793**	**197.77411**	**3.5796219**	**8.65075293**	**49.8164048**	**52.2735508**	**88760.3231**	**108.846338**	**1.06097041**	**0.83032467**	**4.7605281**	**2382.53668**	**693224.417**	**149.926497**	**3.758603**	**6.89077216**	**50.5323292**	**55.7267788**	**63576.4145**	**88.93423**	**1.22703534**	**0.60060151**	**6.42579035**

Emission Savings												Damage Costs for Emissions per metric ton						Build Savings -					
Car						Truck						7	6	2	4	3	5						
CO	CO2	NOX	PM2.5	SOX	VOC	CO	CO2	NOX	PM2.5	SOX	VOC	CO	CO2	NOX	PM2.5	SOX	VOC	Total Non CO2 Savings	Total cO2 Savings	Total	Present Value (3% Discount Rate)*	Present Value (7% Discount Rate)*	Total (Discount Savings)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$101	$54	$16,000	$774,700	$43,100	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$103	$55	$16,200	$788,100	$44,000	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$105	$56	$16,500	$801,700	$44,900	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$107	$57	$16,800	$814,500	$45,700	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$109	$58	$17,100	$827,400	$46,500	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$113	$60	$17,400	$840,600	$47,300	$1,415	$0	$0	$0	$0	$0	$0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$114	$61	$17,700	$854,000	$48,200	$1,415	$0	$0	$0	$0	$0	$0
25.7	6482.3	1.9	0.0	0.1	0.0	-0.1	977.2	0.8	0.0	0.0	-0.1	$116	$62	$18,100	$867,600	$49,100	$1,415	$42,605	$462,493	$505,098	$344,138	$21,658	$365,796
26.1	6577.8	1.9	0.0	0.1	0.0	-0.1	991.6	0.8	0.0	0.0	-0.1	$118	$63	$18,100	$867,600	$49,100	$1,415	$43,281	$476,875	$520,156	$344,505	$20,563	$365,067
26.4	6673.3	1.9	0.0	0.1	0.0	-0.1	1006.0	0.8	0.0	0.0	-0.1	$120	$64	$18,100	$867,600	$49,100	$1,415	$43,959	$491,478	$535,436	$344,713	$19,518	$364,231
26.8	6776.0	1.9	0.0	0.1	0.0	-0.1	1021.5	0.8	0.0	0.0	-0.1	$122	$65	$18,100	$867,600	$49,100	$1,415	$44,685	$506,839	$551,524	$345,133	$18,543	$363,675
27.3	6878.7	2.0	0.0	0.1	0.0	-0.1	1037.0	0.8	0.0	0.0	-0.1	$124	$66	$18,100	$867,600	$49,100	$1,415	$45,413	$522,436	$567,850	$345,392	$17,612	$363,004
27.6	6974.2	2.0	0.0	0.1	0.0	-0.1	1051.4	0.8	0.0	0.0	-0.1	$126	$67	$18,100	$867,600	$49,100	$1,415	$46,095	$537,715	$583,810	$345,139	$16,707	$361,846
28.0	7076.9	2.0	0.0	0.1	0.0	-0.1	1066.9	0.8	0.0	0.0	-0.1	$129	$69	$18,100	$867,600	$49,100	$1,415	$46,879	$561,920	$608,799	$350,170	$15,879	$366,050
28.5	7187.2	2.1	0.0	0.1	0.0	-0.1	1083.5	0.9	0.0	0.0	-0.1	$131	$70	$18,100	$867,600	$49,100	$1,415	$47,662	$578,946	$626,609	$350,272	$15,089	$365,361
28.9	7297.1	2.1	0.0	0.1	0.0	-0.2	1100.0	0.9	0.0	0.0	-0.1	$133	$71	$18,100	$867,600	$49,100	$1,415	$48,445	$596,197	$644,642	$350,203	$14,333	$364,536
29.4	7407.4	2.1	0.0	0.1	0.0	-0.2	1116.7	0.9	0.0	0.0	-0.1	$135	$72	$18,100	$867,600	$49,100	$1,415	$49,232	$613,730	$662,962	$350,002	$13,613	$363,615
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$137	$73	$18,100	$867,600	$49,100	$1,415	$50,018	$631,487	$681,504	$349,639	$12,926	$362,564
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$139	$74	$18,100	$867,600	$49,100	$1,415	$50,073	$640,137	$690,211	$344,105	$12,093	$356,199
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$141	$75	$18,100	$867,600	$49,100	$1,415	$50,129	$648,788	$698,917	$338,597	$11,315	$349,912
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$144	$77	$18,100	$867,600	$49,100	$1,415	$50,240	$666,089	$716,329	$337,502	$10,598	$348,100
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$146	$78	$18,100	$867,600	$49,100	$1,415	$50,296	$674,739	$725,035	$331,927	$9,916	$341,843
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$148	$79	$18,100	$867,600	$49,100	$1,415	$50,351	$683,390	$733,741	$326,391	$9,277	$335,668
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$150	$80	$18,100	$867,600	$49,100	$1,415	$50,407	$692,040	$742,447	$320,895	$8,680	$329,575
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$152	$81	$18,100	$867,600	$49,100	$1,415	$50,462	$700,691	$751,153	$315,443	$8,121	$323,564
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$154	$82	$18,100	$867,600	$49,100	$1,415	$50,518	$709,341	$759,859	$310,037	$7,598	$317,635
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$156	$83	$18,100	$867,600	$49,100	$1,415	$50,573	$717,992	$768,565	$304,677	$7,109	$311,786
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$156	$83	$18,100	$867,600	$49,100	$1,415	$50,573	$717,992	$768,565	$295,803	$6,644	$302,447
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$156	$83	$18,100	$867,600	$49,100	$1,415	$50,573	$717,992	$768,565	$287,187	$6,209	$293,396
29.8	7517.3	2.2	0.0	0.1	0.0	-0.2	1133.2	0.9	0.0	0.0	-0.1	$156	$83	$18,100	$867,600	$49,100	$1,415	$50,573	$717,992	$768,565	$278,823	$5,803	$284,626
661.93175	**167055.376**	**47.8476128**	**-0.1789811**	**1.75998077**	**-0.7159244**	**-3.453228**	**25183.9086**	**19.9121081**	**-0.1660649**	**0.22972316**	**-1.6652623**	**3939.375**	**2101**	**534000**	**25655800**	**1449000**	**42450**	$1,113,045	$14,267,296	$15,380,341	$7,610,691	$289,803	$7,900,494

Crystal City Second Entrance - Air Emissions

No Build Emissions
Build Emissions

Calendar Year	Project Year	Annual Daily No-Build	Annual Daily Build	Metric Tons Saved - Car 2	3	4	5	6	7	Emission Savings Car CO	CO2	NOX	PM2.5	SOX	VOC	Damage Costs for Emissions per metric ton 7 CO	7 CO2	6 NOX	2 PM2.5	4 SOX	3 VOC	5	Build Savings - Total Non CO2 Savings	Total cO2 Savings	Total	Present Value (3% Discount Rate)*	Present Value (7% Discount Rate)*	Total (Discount Savings)
2023	1	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	$101	$54	$16,000	$774,700	$43,100	$1,415		$0	$0	$0	$0	$0	$0
2024	2	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	$103	$55	$16,200	$788,100	$44,000	$1,415		$0	$0	$0	$0	$0	$0
2025	3	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	$105	$56	$16,500	$801,700	$44,900	$1,415		$0	$0	$0	$0	$0	$0
2026	4	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$107	$57	$16,800	$814,500	$45,700	$1,415		$39,731	$252,348	$292,079	$211,338	$26,474	$237,812
2027	5	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$109	$58	$17,100	$827,400	$46,500	$1,415		$40,391	$256,775	$297,166	$208,782	$25,154	$233,935
2028	6	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$113	$60	$17,400	$840,600	$47,300	$1,415		$41,088	$265,630	$306,717	$209,690	$23,913	$233,604
2029	7		13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$114	$61	$17,700	$854,000	$48,200	$1,415		$41,765	$270,057	$311,821	$206,976	$22,717	$229,693
2030	8	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$116	$62	$18,100	$867,600	$49,100	$1,415		$42,542	$274,484	$317,026	$204,242	$21,626	$225,868
2031	9	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$118	$63	$18,100	$867,600	$49,100	$1,415		$42,571	$278,911	$321,482	$201,491	$20,225	$221,716
2032	10	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$120	$64	$18,100	$867,600	$49,100	$1,415		$42,599	$283,338	$325,937	$198,728	$18,915	$217,642
2033	11	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$122	$65	$18,100	$867,600	$49,100	$1,415		$42,628	$287,765	$330,393	$195,954	$17,689	$213,643
2034	12	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$124	$66	$18,100	$867,600	$49,100	$1,415		$42,656	$292,193	$334,849	$193,174	$16,543	$209,717
2035	13	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$126	$67	$18,100	$867,600	$49,100	$1,415		$42,685	$296,620	$339,304	$190,389	$15,471	$205,860
2036	14	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$129	$69	$18,100	$867,600	$49,100	$1,415		$42,742	$305,474	$348,216	$190,361	$14,478	$204,839
2037	15	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$131	$70	$18,100	$867,600	$49,100	$1,415		$42,770	$309,901	$352,672	$187,495	$13,540	$201,035
2038	16	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$133	$71	$18,100	$867,600	$49,100	$1,415		$42,799	$314,328	$357,127	$184,635	$12,663	$197,297
2039	17	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$135	$72	$18,100	$867,600	$49,100	$1,415		$42,827	$318,755	$361,583	$181,782	$11,842	$193,624
2040	18	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$137	$73	$18,100	$867,600	$49,100	$1,415		$42,856	$323,183	$366,039	$178,938	$11,075	$190,013
2041	19	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$139	$74	$18,100	$867,600	$49,100	$1,415		$42,885	$327,610	$370,494	$176,106	$10,357	$186,464
2042	20	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$141	$75	$18,100	$867,600	$49,100	$1,415		$42,913	$332,037	$374,950	$173,288	$9,686	$182,974
2043	21	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$144	$77	$18,100	$867,600	$49,100	$1,415		$42,970	$340,891	$383,861	$172,727	$9,064	$181,791
2044	22	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$146	$78	$18,100	$867,600	$49,100	$1,415		$42,999	$345,318	$388,317	$169,874	$8,477	$178,351
2045	23	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$148	$79	$18,100	$867,600	$49,100	$1,415		$43,027	$349,746	$392,773	$167,040	$7,928	$174,968
2046	24	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$150	$80	$18,100	$867,600	$49,100	$1,415		$43,056	$354,173	$397,228	$164,228	$7,414	$171,642
2047	25	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$152	$81	$18,100	$867,600	$49,100	$1,415		$43,084	$358,600	$401,684	$161,438	$6,934	$168,371
2048	26	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$154	$82	$18,100	$867,600	$49,100	$1,415		$43,113	$363,027	$406,140	$158,671	$6,484	$165,155
2049	27	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$156	$83	$18,100	$867,600	$49,100	$1,415		$43,141	$367,454	$410,596	$155,928	$6,064	$161,992
2050	28	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$156	$83	$18,100	$867,600	$49,100	$1,415		$43,141	$367,454	$410,596	$151,386	$5,667	$157,054
2051	29	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$156	$83	$18,100	$867,600	$49,100	$1,415		$43,141	$367,454	$410,596	$146,977	$5,297	$152,274
2052	30	0	13,335,375	15.22	4,427.16	0.96	0.02	0.04	0.32	15.2	4427.2	1.0	0.0	0.0	0.3	$156	$83	$18,100	$867,600	$49,100	$1,415		$43,141	$367,454	$410,596	$142,696	$4,950	$147,646
Total			**360055135.1**	**410.8229092**	**119533.3**	**25.8519587**	**0.64809924**	**1.188181946**	**8.71333427**	**410.822909**	**119533.3**	**25.8519587**	**0.64809924**	**1.18818195**	**8.71333427**	**3939.375**	**2101**	**534000**	**25655800**	**1449000**	**42450**	$1,149,261	$8,570,980	$9,720,241	$4,884,333	$360,647	$5,244,980

Damage Costs for Emissions per metric ton*

	2	3	4	5	6	7
Year	**NOX**	**SO2**	**PM2.5**	**VOCs**	**CO2**	**CO**
2021	$15,600	$41,500	$748,600	$1,415	$52	$98
2022	$15,800	$42,300	$761,600	$1,415	$53	$99
2023	$16,000	$43,100	$774,700	$1,415	$54	$101
2024	$16,200	$44,000	$788,100	$1,415	$55	$103
2025	$16,500	$44,900	$801,700	$1,415	$56	$105
2026	$16,800	$45,700	$814,500	$1,415	$57	$107
2027	$17,100	$46,500	$827,400	$1,415	$58	$109
2028	$17,400	$47,300	$840,600	$1,415	$60	$113
2029	$17,700	$48,200	$854,000	$1,415	$61	$114
2030	$18,100	$49,100	$867,600	$1,415	$62	$116
2031	$18,100	$49,100	$867,600	$1,415	$63	$118
2032	$18,100	$49,100	$867,600	$1,415	$64	$120
2033	$18,100	$49,100	$867,600	$1,415	$65	$122
2034	$18,100	$49,100	$867,600	$1,415	$66	$124
2035	$18,100	$49,100	$867,600	$1,415	$67	$126
2036	$18,100	$49,100	$867,600	$1,415	$69	$129
2037	$18,100	$49,100	$867,600	$1,415	$70	$131
2038	$18,100	$49,100	$867,600	$1,415	$71	$133
2039	$18,100	$49,100	$867,600	$1,415	$72	$135
2040	$18,100	$49,100	$867,600	$1,415	$73	$137
2041	$18,100	$49,100	$867,600	$1,415	$74	$139
2042	$18,100	$49,100	$867,600	$1,415	$75	$141
2043	$18,100	$49,100	$867,600	$1,415	$77	$144
2044	$18,100	$49,100	$867,600	$1,415	$78	$146
2045	$18,100	$49,100	$867,600	$1,415	$79	$148
2046	$18,100	$49,100	$867,600	$1,415	$80	$150
2047	$18,100	$49,100	$867,600	$1,415	$81	$152
2048	$18,100	$49,100	$867,600	$1,415	$82	$154
2049	$18,100	$49,100	$867,600	$1,415	$83	$156

Sources
NOX, SO2, PM2 USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
VOC *Sources: McCubbin and Delucchi, 1996 for emissions other than CO2e*
CO *Interagency Working Group on Social Cost of Carbon, United States Government, 2021 for CO2*

Damage Costs for Emissions per metric ton*

Route 1 Urban Boulevard - Water Runoff

No Build Emissions

	Water Ruoff savings		0.01845	Source: https://www.vtpi.org/tca/tca0515.pdf	
		VMT Savings			
2023	1	0	0	$0	
2024	2	0	0	$0	
2025	3	0	0	$0	0
2026	4	0	0	$0	
2027	5	0	0	$0	
2028	6	0	0	$0	
2029	7	0	0	$0	
2030	8	35,799,470	660,500	$335,765	
2031	9	36,326,844	670,230	$318,422	
2032	10	36,854,218	679,960	$301,911	
2033	11	37,421,384	690,425	$286,502	
2034	12	37,988,550	700,889	$271,817	
2035	13	38,515,924	710,619	$257,561	
2036	14	39,083,090	721,083	$244,256	
2037	15	39,692,064	732,319	$231,833	
2038	16	40,299,022	743,517	$219,980	
2039	17	40,907,996	754,753	$208,695	
2040	18	41,514,954	765,951	$197,936	
2041	19	41,514,954	765,951	$184,987	
2042	20	41,514,954	765,951	$172,885	
2043	21	41,514,954	765,951	$161,575	
2044	22	41,514,954	765,951	$151,005	
2045	23	41,514,954	765,951	$141,126	
2046	24	41,514,954	765,951	$131,893	
2047	25	41,514,954	765,951	$123,265	
2048	26	41,514,954	765,951	$115,201	
2049	27	41,514,954	765,951	$107,664	
2050	28	41,514,954	765,951	$100,621	
2051	29	41,514,954	765,951	$94,038	
2052	30	41,514,954	765,951	$87,886	
Total		922,582,964	$17,021,656	$4,446,822	

Crystal City Second Entrance - Water Runoff

No Build Emissions

Water Ruoff savings $(2007)	0.015	Source: https://www.vtpi.org/tca/tca0515.pdf	
Water Ruoff savings $(2020)	0.01845		

		VMT Savings			
2023	1	0	0	0	
2024	2	0	0	0	
2025	3	0	0	0	0
2026	4	13,335,375	246,038	$163,945	
2027	5	13,335,375	246,038	$153,220	
2028	6	13,335,375	246,038	$143,196	
2029	7	13,335,375	246,038	$133,828	
2030	8	13,335,375	246,038	$125,073	
2031	9	13,335,375	246,038	$116,891	
2032	10	13,335,375	246,038	$109,244	
2033	11	13,335,375	246,038	$102,097	
2034	12	13,335,375	246,038	$95,418	
2035	13	13,335,375	246,038	$89,175	
2036	14	13,335,375	246,038	$83,341	
2037	15	13,335,375	246,038	$77,889	
2038	16	13,335,375	246,038	$72,794	
2039	17	13,335,375	246,038	$68,031	
2040	18	13,335,375	246,038	$63,581	
2041	19	13,335,375	246,038	$59,421	
2042	20	13,335,375	246,038	$55,534	
2043	21	13,335,375	246,038	$51,901	
2044	22	13,335,375	246,038	$48,505	
2045	23	13,335,375	246,038	$45,332	
2046	24	13,335,375	246,038	$42,367	
2047	25	13,335,375	246,038	$39,595	
2048	26	13,335,375	246,038	$37,005	
2049	27	13,335,375	246,038	$34,584	
2050	28	13,335,375	246,038	$32,321	
2051	29	13,335,375	246,038	$30,207	
2052	30	13,335,375	246,038	$28,231	
Total		360,055,135	$6,643,017	$2,102,726	

M - Urban Tree Canopy

Urban Tree Canopy Calculation Inputs

Input			Unit	Source
Number of trees		200	trees	
Average Annual Net Benefit ($2007)	$	36.00	per tree	USDA Northeast Community Tree Guide
Average Annual Net Benefit ($2020)	$	44.28	per tree	

Urban Tree Canopy Benefits

Calendar Year	Project Year	Number of Trees	Total Urban Canopy Benefits	Present Value (7% Discount Rate)
2023	1	0	$0	$0
2024	2	0	$0	$0
2025	3	0	$0	$0
2026	4	0	$0	$0
2027	5	0	$0	$0
2028	6	0	$0	$0
2029	7	0	$0	$0
2030	8	200	$8,856	$4,502
2031	9	200	$8,856	$4,207
2032	10	200	$8,856	$3,932
2033	11	200	$8,856	$3,675
2034	12	200	$8,856	$3,435
2035	13	200	$8,856	$3,210
2036	14	200	$8,856	$3,000
2037	15	200	$8,856	$2,804
2038	16	200	$8,856	$2,620
2039	17	200	$8,856	$2,449
2040	18	200	$8,856	$2,289
2041	19	200	$8,856	$2,139
2042	20	200	$8,856	$1,999
2043	21	200	$8,856	$1,868
2044	22	200	$8,856	$1,746
2045	23	200	$8,856	$1,632
2046	24	200	$8,856	$1,525
2047	25	200	$8,856	$1,425
2048	26	200	$8,856	$1,332
2049	27	200	$8,856	$1,245
2050	28	200	$8,856	$1,163
2051	29	200	$8,856	$1,087
2052	30	200	$8,856	$1,016
Total			$203,688	$54,299

N - Bicycle

Bicycle Calculation Inputs

Crystal City Population	25000		https://datacommons.org/place/wikidataId/Q3820323?utm_medium=explore&mprop=count&popt=Person&hl=en
Proportion of Commuter Cyclists	0.83		https://www.forbes.com/sites/michelinemaynard/2013/08/27/whos-out-there-on-the-roads-the-4-types-of-cyclists/?sh=1bc6d6807c55
Proportion of Recreational Cyclists	0.17		https://www.forbes.com/sites/michelinemaynard/2013/08/27/whos-out-there-on-the-roads-the-4-types-of-cyclists/?sh=1bc6d6807c55
Portion of traffic Crossing Rt 1	25%		
		Unit	
Mortality Reduction Benefit (Ages 20-64)	$6.31	per induced trip (2020 $)	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
% of population aged 20-64	82%		USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Revealed Preference Benefit	$1.42	per cycling mile	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Length of project with new bike lanes	2.38	miles	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Cycling travel time savings benefit	32.40	per hour for personal travel	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Average cycling speed	9.80	mph	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Average cyclist time savings (Build vs. No-Build)	2.00	minutes	
Annualization	365.00		
Benefit scaling percentage based on trip origins and destinations	100%		

Bicycle Network Improvement Benefits

			Baseline		Build Conditions		Crossing Rt 1		**Benefits**				
Calendar Year	Project Year		Annual Number of Commuter Cyclists (Trips)	Annual Number of Recreational Cyclists (Trips)	(Trips)	Number of Recreational Cyclists (Trips)	**Total Commuter Cyclists Trips**	Total Recreational Cyclists Trips	Mortality Reduction Benefit	Revealed Preference Benefit	Travel Time Disbenefit	Total Bicycle Benefits	Present Value (7% Discount Rate)
2023	1		0	0			0	0	$0	$0	$0	$0	$0
2024	2		0	0			0	0	$0	$0	$0	$0	$0
2025	3		0	0			0	0	$0	$0	$0	$0	$0
2026	4		0	0			0	0	$0	$0	$0	$0	$0
2027	5		0	0			0	0	$0	$0	$0	$0	$0
2028	6		0	0			0	0	$0	$0	$0	$0	$0
2029	7		0	0			0	0	$0	$0	$0	$0	$0
2030	8		605,900	124,100	309,433	63,378	228,833	46869	$482,249	$931,765	-$195,894	$1,218,120	$619,230
2031	9		605,900	124,100	313,901	64,293	229,950	47098	$489,213	$936,313	-$196,850	$1,228,676	$583,735
2032	10		605,900	124,100	318,369	65,208	231,067	47327	$496,177	$940,862	-$197,807	$1,239,232	$550,234
2033	11		605,900	124,100	323,396	66,238	232,324	47584	$504,011	$945,979	-$198,882	$1,251,108	$519,165
2034	12		605,900	124,100	328,423	67,267	233,581	47842	$511,846	$951,096	-$199,958	$1,262,983	$489,807
2035	13		605,900	124,100	332,892	68,183	234,698	48071	$518,809	$955,645	-$200,914	$1,273,540	$461,589
2036	14		605,900	124,100	337,918	69,212	235,955	48328	$526,644	$960,762	-$201,990	$1,285,415	$435,415
2037	15		605,900	124,100	342,945	70,242	237,211	48585	$534,478	$965,879	-$203,066	$1,297,291	$410,689
2038	16		605,900	124,100	348,531	71,386	238,608	48871	$543,183	$971,564	-$204,261	$1,310,486	$387,726
2039	17		605,900	124,100	353,558	72,415	239,864	49129	$551,017	$976,682	-$205,337	$1,322,362	$365,644
2040	18		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$345,133
2041	19		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$322,554
2042	20		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$301,453
2043	21		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$281,732
2044	22		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$263,301
2045	23		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$246,075
2046	24		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$229,977
2047	25		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$214,932
2048	26		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$200,871
2049	27		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$187,730
2050	28		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$175,448
2051	29		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$163,970
2052	30		605,900	124,100	359,143	73,559	241,261	49415	$559,722	$982,367	-$206,533	$1,335,557	$153,243
Total							4,272,178	875,024	$12,434,017	$22,307,321	-$4,689,886	$30,051,452	$7,909,652

O - Pedestrian

Pedestrian Calculation Inputs

Input	Unit			Source
Crystal City Population		25000		
Proportion of Commuter Pedestrians		0.22		https://safety.fhwa.dot.gov/ped_bike/docs/case1.pdf
Proportion of Recreational Pedestrians		0.78		https://safety.fhwa.dot.gov/ped_bike/docs/case1.pdf
Portion of traffic Crossing Rt 1		25%		
Mortality Reduction Benefit (Ages 20-74)		$7.08	per induced trip (2020 $)	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
% of population aged 20-74		85%		USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Revealed preference benefit for expanded sidewalk		$0.10	per foot of added width per person-mile walked	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Average walking trip length		0.86	miles	USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2022
Width of new sidewalk		20	feet	6th Street Bridge Concept Design Open House #3
Revealed preference benefit		$1.72	per pedestrian	
Walking travel time savings benefit	$	32.40	per hour for personal travel	
Average pedestrian time savings (Build vs. No-Build)		2	minutes	
Annualization		365.00	Commuter trips	
Benefit scaling percentage based on trip origins and desi		100%		

Pedestrian Network Improvement Benefits

			No-Build		Build		Crossing Rt 1		Benefits				
Calendar Year	Project Year		Annual Number of Commuter Pedestrians	Number of Recreational Pedestrians	Number of Commuter Pedestrians	Number of Recreational Pedestrians	**Total Commuter Cyclists**	Total Recreational Cyclists	Mortality Reduction Benefit	Revealed Preference Benefit	Travel Time Disbenefit	Total Pedestrian Benefits	Present Value (7% Discount Rate)
2023	1		0	0			0	0	$0	$0	$0	$0	$0
2024	2		0	0			0	0	$0	$0	$0	$0	$0
2025	3		0	0			0	0	$0	$0	$0	$0	$0
2026	4		0	0			0	0	$0	$0	$0	$0	$0
2027	5		0	0			0	0	$0	$0	$0	$0	$0
2028	6		0	0			0	0	$0	$0	$0	$0	$0
2029	7		0	0			0	0	$0	$0	$0	$0	$0
2030	8		1,766,600	6,263,400	902,201	3,198,714	667,200	2365529	$4,382,308	$737,831	-$2,154,834	$2,965,305	$1,507,411
2031	9		1,766,600	6,263,400	915,230	3,244,905	670,457	2377076	$4,445,590	$741,433	-$2,165,353	$3,021,670	$1,435,574
2032	10		1,766,600	6,263,400	928,258	3,291,096	673,714	2388624	$4,508,873	$745,035	-$2,175,872	$3,078,035	$1,366,684
2033	11		1,766,600	6,263,400	942,915	3,343,061	677,379	2401615	$4,580,065	$749,087	-$2,187,706	$3,141,446	$1,303,588
2034	12		1,766,600	6,263,400	957,571	3,395,025	681,043	2414606	$4,651,258	$753,139	-$2,199,540	$3,204,857	$1,242,899
2035	13		1,766,600	6,263,400	970,599	3,441,216	684,300	2426154	$4,714,540	$756,741	-$2,210,059	$3,261,222	$1,182,017
2036	14		1,766,600	6,263,400	985,256	3,493,181	687,964	2439145	$4,785,733	$760,793	-$2,221,893	$3,324,632	$1,126,168
2037	15		1,766,600	6,263,400	999,913	3,545,146	691,628	2452136	$4,856,926	$764,845	-$2,233,727	$3,388,043	$1,072,568
2038	16		1,766,600	6,263,400	1,016,198	3,602,884	695,700	2466571	$4,936,029	$769,347	-$2,246,876	$3,458,500	$1,023,245
2039	17		1,766,600	6,263,400	1,030,855	3,654,849	699,364	2479562	$5,007,222	$773,399	-$2,258,710	$3,521,910	$973,838
2040	18		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$928,336
2041	19		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$867,604
2042	20		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$810,844
2043	21		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$757,799
2044	22		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$708,223
2045	23		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$661,891
2046	24		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$618,589
2047	25		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$578,121
2048	26		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$540,300
2049	27		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$504,953
2050	28		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$471,919
2051	29		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$441,046
2052	30		1,766,600	6,263,400	1,047,140	3,712,587	703,435	2493997	$5,086,325	$777,902	-$2,271,859	$3,592,367	$412,192
Total							12,456,229	44,162,994	$112,990,763	$17,664,368	-$51,588,745	$79,066,387	$20,535,807

P - Construction & Residual

Residual Calculation	Route 1 Urban Boulevard	I-395 Bridge Conversion	Crystal City Metro Second At-Grade Entrance
Cost of Assets with Residual Value	$115,566,177	$21,433,688	$74,813,132
Assumed percentage of construction with Residual Value	50%	75%	90%
Design Service Life (years)	30	50	75
Project Use Start	2030	2028	2026
Age at end of analysis period	23	25	27
Residual ratio at end of analysis (linear depreciation)	0.233	0.500	0.640
Residual Value at end of analysis	$13,482,721	$8,037,633	$43,092,364

Construction Costs (Cost)				Residual Value					Total Benefit (-Cost)	
Calendar Year	Project Year	Project Cost	Present Value (7% Discount Rate)	Calendar Year	Project Year	Route 1 Urban Boulevard	I-395 Bridge Conversion	Crystal City Metro Second At-Grade Entrance	Total Benefit	Present Value (7% Discount Rate)
2023	1	$18,607,062	$15,188,905	2023	1	$0	$0	$0	$0	$0
2024	2	$44,776,309	$34,159,632	2024	2	$0	$0	$0	$0	$0
2025	3	$44,776,309	$31,924,889	2025	3	$0	$0	$0	$0	$0
2026	4	$40,487,057	$26,978,236	2026	4	$0	$0	$0	$0	$0
2027	5	$52,498,871	$32,693,659	2027	5	$0	$0	$0	$0	$0
2028	6	$52,498,871	$30,554,821	2028	6	$0	$0	$0	$0	$0
2029	7	$13,976,812	$7,602,460	2029	7	$0	$0	$0	$0	$0
2030	8	$0	$0	2030	8	$0	$0	$0	$0	$0
2031	9	$0	$0	2031	9	$0	$0	$0	$0	$0
2032	10	$0	$0	2032	10	$0	$0	$0	$0	$0
2033	11	$0	$0	2033	11	$0	$0	$0	$0	$0
2034	12	$0	$0	2034	12	$0	$0	$0	$0	$0
2035	13	$0	$0	2035	13	$0	$0	$0	$0	$0
2036	14	$0	$0	2036	14	$0	$0	$0	$0	$0
2037	15	$0	$0	2037	15	$0	$0	$0	$0	$0
2038	16	$0	$0	2038	16	$0	$0	$0	$0	$0
2039	17	$0	$0	2039	17	$0	$0	$0	$0	$0
2040	18	$0	$0	2040	18	$0	$0	$0	$0	$0
2041	19	$0	$0	2041	19	$0	$0	$0	$0	$0
2042	20	$0	$0	2042	20	$0	$0	$0	$0	$0
2043	21	$0	$0	2043	21	$0	$0	$0	$0	$0
2044	22	$0	$0	2044	22	$0	$0	$0	$0	$0
2045	23	$0	$0	2045	23	$0	$0	$0	$0	$0
2046	24	$0	$0	2046	24	$0	$0	$0	$0	$0
2047	25	$0	$0	2047	25	$0	$0	$0	$0	$0
2048	26	$0	$0	2048	26	$0	$0	$0	$0	$0
2049	27	$0	$0	2049	27	$0	$0	$0	$0	$0
2050	28	$0	$0	2050	28	$0	$0	$0	$0	$0
2051	29	$0	$0	2051	29	$0	$0	$0	$0	$0
2052	30	$0	$0	2052	30	$13,482,721	$8,037,633	$43,092,364	$64,612,718	$7,413,736
Total		$267,621,292	$179,102,601	Total		$13,482,721	$8,037,633	$43,092,364	$64,612,718	$7,413,736

Q - TDM Costs

TDM Cost Assumptions

Annual Varies by year Sources:
One-Time Costs $7,187,000
Contingency $ 2,801,000

		Transportation Demand Management Costs			Total Disbenefit	
Calendar Year	Project Year	Annual Costs	One-Time Costs	Contingency	TDM Total Cost	Present Value (7% Discount Rate)
2023	1	$0	$0	$0	$0	$0
2024	2	$0	$0	$0	$0	$0
2025	3	$0	$0	$0	$0	$0
2026	4	$0	$0	$0	$0	$0
2027	5	$0	$0	$0	$0	$0
2028	6	$0	$0	$0	$0	$0
2029	7	-$422,093	-$7,187,000	-$2,801,000	-$10,410,093	-$5,662,401
2030	8	-$2,274,000	$0	$0	-$2,274,000	-$1,155,986
2031	9	-$2,342,000	$0	$0	-$2,342,000	-$1,112,667
2032	10	-$2,446,000	$0	$0	-$2,446,000	-$1,086,053
2033	11	-$2,450,000	$0	$0	-$2,450,000	-$1,016,663
2034	12	-$2,524,000	$0	$0	-$2,524,000	-$978,851
2035	13	-$2,416,000	$0	$0	-$2,416,000	-$875,670
2036	14	-$2,278,000	$0	$0	-$2,278,000	-$771,637
2037	15	-$2,346,000	$0	$0	-$2,346,000	-$742,684
2038	16	-$2,416,000	$0	$0	-$2,416,000	-$714,807
2039	17	-$2,489,000	$0	$0	-$2,489,000	-$688,229
2040	18	-$2,563,000	$0	$0	-$2,563,000	-$662,328
2041	19	$0	$0	$0	$0	$0
2042	20	$0	$0	$0	$0	$0
2043	21	$0	$0	$0	$0	$0
2044	22	$0	$0	$0	$0	$0
2045	23	$0	$0	$0	$0	$0
2046	24	$0	$0	$0	$0	$0
2047	25	$0	$0	$0	$0	$0
2048	26	$0	$0	$0	$0	$0
2049	27	$0	$0	$0	$0	$0
2050	28	$0	$0	$0	$0	$0
2051	29	$0	$0	$0	$0	$0
2052	30	$0	$0	$0	$0	$0
Total		-$26,966,093	-$7,187,000	-$2,801,000	-$36,954,093	-$15,467,976

Appendix C

Letters of Support

Congress of the United States
Washington, DC 20510

May 18, 2022

The Honorable Pete Buttigieg
Secretary
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

We are pleased to provide this letter of support for the Virginia Department of Transportation (VDOT) application for the Fiscal Year 2023 Multimodal Project Discretionary Grant Program (MPDG) to assist with the National Landing project.

In 2018, following the announcement of an agreement to bring Amazon's new corporate headquarters (HQ2) to Crystal City, the Commonwealth of Virginia identified improvements to Route 1 as one of five transportation projects to be fully or partially funded by the Commonwealth. The Commonwealth's commitment to Amazon is to improve safety, accessibility, and the pedestrian experience crossing Route 1. This grant request will allow Virginia to convert the Route 1 corridor in Arlington into a multimodal urban boulevard that prioritizes pedestrian safety in a walkable environment. VDOT is developing multimodal solutions for Route 1 to meet National Landing's transportation needs with the coming of Amazon and other related developments.

The National Landing will benefit Virginia's state of good repair. The transformation of Route 1 to an urban boulevard includes the removal of three bridge structures from the VDOT inventory, which will reduce long term maintenance costs. Modifications to the I-395 interchange will remove a structurally deficient bridge and avoid future replacement or rehabilitation costs, while also extending the urban boulevard to the north which will contribute to lower speeds.

The project includes a connected pedestrian grid and associated mixed-use development in the area. It increases the accessibility to job centers through the proposed access improvements, which will benefit residents of all income levels. The project will create approximately 6.5 acres of excess right-of-way resulting in high value developable land. It will reduce the need for single-occupancy vehicle trips in favor of environmentally friendly options such as enhanced transit service, walkability, biking routes. The project also includes multiple innovative solutions, such as a progressive design-build strategy and a pilot safety project to implement near-miss crash technology in National Landing.

This project satisfies all the merit criteria outlined in the federal grant opportunity, especially the priorities of providing economic, state of good repair, environmental, and equity benefits. This MPDG grant application has been developed to make a strategic request within the maximum allowed federal funding limit with the state funding the remaining cost. VDOT has also worked

with the Governor and Virginia General Assembly to allocate funding sources for the required funding match.

Investment in National Landing will produce significant, measurable benefits to the economy, health, and safety of local citizens. VDOT is fully committed to this project and will readily apply expertise and plans in place to implement the important initiative that is detailed in VDOT's grant application.

We ask that you give this proposal every appropriate consideration.

Sincerely,

Tim Kaine
United States Senator

Mark R. Warner
United States Senator

Robert J. Wittman
Member of Congress

Abigail Davis Spanberger
Member of Congress

Robert C. "Bobby" Scott
Member of Congress

Donald S. Beyer Jr.
Member of Congress

A. Donald McEachin
Member of Congress

Elaine G. Luria
Member of Congress

COMMONWEALTH of VIRGINIA

Office of the Governor

Glenn Youngkin
Governor

May 19, 2022

The Honorable Secretary Peter Buttigieg
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Dear Secretary Buttigieg,

I am pleased to provide this letter of support for the Virginia Department of Transportation (VDOT) application for the U.S. Department of Transportation FY 2023 Multimodal Project Discretionary Grant Program (MPDG). In late 2018, Amazon announced that its second corporate headquarters will be in Crystal City along Route 1, which has been rebranded "National Landing." The Commonwealth of Virginia committed to a number of projects to improve safety, accessibility, and the pedestrian experience crossing Route 1.

This grant will allow Virginia to convert the Route 1 corridor in Arlington from an elevated freeway that is currently a barrier between the East and West sides into a multimodal urban boulevard. VDOT is developing a number of multimodal solutions for Route 1 to meet National Landing's transportation needs with the coming of Amazon and other related developments.

The purpose of this project is to provide enhanced multimodal connectivity and accommodations along and across Route 1 in Crystal City to meet the changing transportation needs of this growing urban activity center. The need for this project is two-fold:

- multimodal transportation demand is increasing from the creation of an additional Amazon U.S. Headquarters (HQ2) and other ongoing development in National Landing; and
- these areas are already heavily developed with limited space for expanding the footprint of the transportation network

The U.S. Department of Transportation's support will have the greatest impact in the following areas:

- **Multimodal safety and reliability and congestion reduction:** Ultimately, a safe transportation network for people walking, biking, taking transit, and driving benefits daily quality of life for its users. The Route 1 corridor will serve all users, which is tied to the Vision Zero Plan. Lower speeds and traffic volumes will improve safety in the corridor.

- **State of good repair:** The transformation of Route 1 to an urban boulevard includes the removal of three bridge structures from the VDOT inventory, reducing long term maintenance costs. Modifications to the I-395 interchange will remove a structurally deficient bridge and avoid future replacement or rehabilitation costs.

- **Economic impacts, freight movement, and job creation:** This project has the potential to spur development with a connected pedestrian grid which will support the movement of Amazon employees and associated mixed-use development in the area. It increases the accessibility to job centers through the proposed access improvements. The project will create approximately 6.5 acres of excess right-of-way resulting in more than $10M of developable land.

- **Climate change, resiliency, and the environment:** This project will result in reduced greenhouse gas (GHG) emissions. New transit service, as well as enhanced opportunities for walking and biking are more environmentally friendly than single-occupant vehicle trips. VDOT is committed to implementing a robust travel demand management (TDM) strategy that is consistent with the results of the ongoing TDM study. Planned improvements to the Crystal City Metro Station and the Crystal City VRE Station also support the necessary mode shift.

- **Equity, multimodal options, and quality of life:** More travel choices will be made available creating more walkable neighborhoods that result in a higher quality of life. The downtown area will become reconnected to create space for public transit, walking, and cycling. Arlington County supports affordable housing options that will provide opportunities for existing and future residents of all income levels.

- **Innovation areas:** This project provides multiple innovative solutions, such as a progressive design-build strategy and a pilot safety project to implement near-miss crash technology in National Landing. There is also the potential for value capture through land sales to further support National Landing elements.

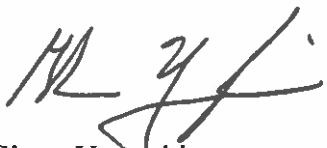
This project satisfies all the merit criteria outlined in the federal grant opportunity guidelines, especially the priorities of providing economic, state of good repair, environmental, and equity benefits.

This MPDG grant application has been developed to make a strategic request within the maximum allowed federal funding limit with the state funding the remaining cost. VDOT has also worked with the Governor and General Assembly to allocate funding sources for the required funding match.

I can assure the U.S. Department of Transportation that its investment in National Landing will have a significant, measurable impact on the economic health, well-being, and safety of citizens. VDOT is completely committed to this project and will readily apply expertise and plans already in place to efficiently implement this important initiative as detailed in the grant application.

On behalf of the Commonwealth, I ask that you give this proposal every appropriate consideration.

Sincerely,



Glenn Youngkin

COMMONWEALTH of VIRGINIA

Office of the Governor

W. Sheppard Miller III
Secretary of Transportation

May 19, 2022

The Honorable Secretary Peter Buttigieg
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Dear Secretary Buttigieg,

I am pleased to provide this letter of support for the Virginia Department of Transportation (VDOT) application for the U.S. Department of Transportation FY 2023 Multimodal Project Discretionary Grant Program (MPDG). In late 2018, Amazon announced that its second corporate headquarters will be in Crystal City along Route 1, which has been rebranded "National Landing." The Commonwealth of Virginia committed to a number of projects to improve safety, accessibility, and the pedestrian experience crossing Route 1.

This grant will allow Virginia to convert the Route 1 corridor in Arlington from an elevated freeway that is currently a barrier between the East and West sides into a multimodal urban boulevard. VDOT is developing a number of multimodal solutions for Route 1 to meet National Landing's transportation needs with the coming of Amazon and other related developments.

The purpose of this project is to provide enhanced multimodal connectivity and accommodations along and across Route 1 in Crystal City to meet the changing transportation needs of this growing urban activity center. The need for this project is two-fold: multimodal transportation demand is increasing from the creation of an additional Amazon U.S. Headquarters (HQ2) and other ongoing development in National Landing; and these areas are already heavily developed with limited space for expanding the footprint of the transportation network

USDOT's support will have the greatest impact in the following areas:

- **Multimodal safety and reliability and congestion reduction:** Ultimately, a safe transportation network for people walking, biking, taking transit, and driving benefits daily quality of life for its users. The Route 1 corridor will serve all users, which is tied to the Vision Zero Plan.

- **State of good repair:** The transformation of Route 1 to an urban boulevard includes the removal of three bridge structures from the VDOT inventory, reducing long term maintenance costs. Modifications to the I-395 interchange will remove a structurally deficient bridge and avoid future replacement or rehabilitation costs.

- **Economic impacts, freight movement, and job creation:** This project has the potential to spur development with a connected pedestrian grid which will support the movement of Amazon employees and associated mixed-use development in the area. It increases the accessibility to job centers through the proposed access improvements. The project will create approximately 6.5 acres of excess right-of-way resulting in more than $10M of developable land.

- **Climate change, resiliency, and the environment:** This project will result in reduced greenhouse gas (GHG) emissions. New transit service, as well as enhanced opportunities for walking and biking are more environmentally friendly than single-occupant vehicle trips. VDOT is committed to implementing a robust travel demand management (TDM) strategy that is consistent with the results of the ongoing TDM study. Planned improvements to the Crystal City Metro Station and the Crystal City VRE Station also support the necessary mode shift.

- **Equity, multimodal options, and quality of life:** More travel choices will be made available creating more walkable neighborhoods that result in a higher quality of life. The downtown area will become reconnected to create space for public transit, walking, and cycling. Arlington County supports affordable housing options that will provide opportunities for existing and future residents of all income levels.

- **Innovation areas:** This project provides multiple innovative solutions, such as a progressive design-build strategy and a pilot safety project to implement near-miss crash technology in National Landing. There is also the potential for value capture through land sales to further support National Landing elements.

This project satisfies all the merit criteria outlined in the federal grant opportunity guidelines, especially the priorities of providing economic, state of good repair, environmental, and equity benefits. VDOT has also worked with the Governor and General Assembly to allocate funding sources for the required funding match.

I can assure USDOT that its investment in National Landing will have a significant, measurable impact on the economic health, well-being, and safety of citizens. VDOT is completely committed to this project and will readily apply expertise and plans already in place to efficiently implement this important initiative as detailed in the grant application.

On behalf of the Commonwealth, I ask that you give this proposal every appropriate consideration.

Sincerely,

W. Sheppard Miller III

National Capital Region
Transportation Planning Board

May 19, 2022

The Honorable Peter Buttigieg
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590-0001

Re: Mega Program Grant Application by the Virginia Department of Transportation for the National Landing Connecting Communities Through Choice Project

Dear Secretary Buttigieg:

I am writing to express the support of the National Capital Region Transportation Planning Board (TPB), the Metropolitan Planning Organization (MPO) for the National Capital Region, for an application by the Virginia Department of Transportation (VDOT) for a Multimodal Program Discretionary Grant (MPDG) grant for the National Landing Connecting Communities Through Choice project.

The Connecting Communities Through Choice project seeks to transform a segment of elevated urban freeway in Crystal City, Arlington County to an at-grade, tree-lined urban boulevard with wide spaces for sidewalks, street trees, lighting, and other amenities desired by citizens and landowners—and with safe crossings for pedestrians, bicyclists, and other users. Part of the Route 1 highway through the National Landing district, this transformation will reconnect the business district to adjacent neighborhoods, creating space for public transit, walking, and cycling, improving safety and transit accessibility, and providing mobility for residents and employees of the Amazon headquarters and other mixed-use developments in this area.

The project is consistent with the regional transportation goals adopted by the TPB in our Regional Transportation Priorities Plan and as identified in the Washington region's long-range transportation plan, Visualize 2045. The TPB has long supported targeted transportation improvements that provide a broad range of public and private transportation choices for our region while maximizing safety and improving accessibility and affordability for everyone. This grant would advance the region's long-term transportation priorities in accordance with the TBP's Vision and Regional Transportation Priorities Plan.

The TPB requests your favorable consideration of this request by VDOT. I anticipate that upon a successful grant award, subject to the availability of the required matching funding, the region's transportation improvement program (TIP) will be amended to include the grant funding for this project.

Sincerely,

Pamela Sebesky

Pamela J. Sebesky
Chair, National Capital Region Transportation Planning Board

Cc: W. Sheppard Miller III, Secretary, Virginia Department of Transportation

GREATER WASHINGTON PARTNERSHIP
FROM BALTIMORE TO RICHMOND.
FOSTERING UNITY. ADVANCING GROWTH.

May 18, 2021

The Honorable Peter Buttigieg
U.S. Secretary of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: Multimodal Project Delivery Grant Application for the VDOT Route 1 Urban Boulevard Project

Dear Secretary Buttigieg:

On behalf of the Greater Washington Partnership (the Partnership), I am writing to express our support for the Virginia Department of Transportation's (VDOT) application for the FY 2023 Multimodal Project Discretionary Grant Program (MPDG) to convert the Route 1 corridor in Arlington into a multimodal urban boulevard that prioritizes pedestrian safety in a walkable environment.

The Partnership is a civic alliance of the leading employers in the Capital Region of Baltimore, Washington and Richmond who employ more than 300,000 residents and are committed to making the region one of the best places to live, work, and build a business. Improving roadway and trail performance, creating high-performing public transit, and expanding access to opportunity are key components of our Blueprint for Regional Mobility which will be advanced by this application.

VDOT's project will identify enhanced multimodal connectivity and accommodations along and across Route 1 in Crystal City, to meet the changing transportation needs of this growing urban activity center. Multimodal transportation demand along the corridor is already increasing along the heavily developed corridor from the creation of Amazon's HQ2 and other ongoing development in National Landing. The Route 1 Urban Boulevard will serve all users, which is tied to Arlington County's Vision Zero Plan, by removing an outdated auto oriented urban expressway, lowering speeds and traffic volumes, and improving the safety for all users along the corridor.

Additionally, the Route 1 urban boulevard project will remove three bridge structures from the VDOT inventory, reducing long term maintenance costs for the state. Modifications to the I-395 interchange will also remove a structurally deficient bridge and avoid future replacement or rehabilitation costs, while extending the urban boulevard to the north. Perhaps most importantly, the project will increase access to job centers and opportunity for residents and free up approximately 6.5 acres of excess right-of-way which could result in more than $10M of developable land to create more accessible, sustainable, and inclusive communities along the enhance corridor.

This project can be a national example for how to transform an urban freeway into a city street with storefronts and building entrances, knitting together the urban fabric of Arlington County and Alexandria's National Landing area. I thank you for your consideration and support of VDOT's Route 1 corridor MPDG application.

Sincerely,

Joe McAndrew
Vice President, Government Affairs & Infrastructure

NATIONAL LANDING
PENTAGON CITY
CRYSTAL CITY
POTOMAC YARD

May 19, 2022

The Honorable Pete Buttigieg
Secretary of Transportation, USDOT
1200 New Jersey Avenue, S.E.
Washington, DC 20590

Dear Secretary Buttigieg,

On behalf of the Crystal City, Pentagon City, and Potomac Yard business community, the National Landing Business Improvement District (BID) expresses its support for the Virginia Department of Transportation (VDOT) application with the U.S. Department of Transportation for the FY 2023 Multimodal Project Discretionary Grant Program (MPDG).

In late 2018, with the announcement of an agreement to bring Amazon's new corporate headquarters to Crystal City, the Commonwealth of Virginia identified improvements to Route 1 as one of five transportation projects to be fully or partially funded by the Commonwealth. The Commonwealth's commitment to Amazon is to improve safety, accessibility, and the pedestrian experience crossing Route 1.

This grant request will allow Virginia to convert the Route 1 corridor in Arlington into a multimodal urban boulevard that prioritizes pedestrian safety in a walkable environment. VDOT will develop appropriate multimodal solutions for Route 1 to meet National Landing's transportation needs with the coming of Amazon and other related developments.

The purpose of this project is to identify enhanced multimodal connectivity and accommodations along and across Route 1 in Crystal City, to meet the changing transportation needs of this growing urban activity center. The need for this project is two-fold:

- Multimodal transportation demand is increasing from the creation of an additional Amazon U.S. Headquarters (HQ2), Boeing global headquarters and other ongoing residential and office development in National Landing
- These areas are already heavily developed with limited space for expanding the footprint of the transportation network

Here is why the U.S. Department of Transportation's support will have the greatest impact:

- **Multimodal safety and reliability and congestion reduction:** Ultimately, a safe transportation network for people walking, biking, taking transit, and driving benefits daily quality of life for its users. The Route 1 corridor will serve all users, which is tied to the Vision Zero Plan. Lower speeds and traffic volumes will improve safety in the corridor.
- **State of good repair:** The Route 1 urban boulevard project will remove three bridge structures from the VDOT inventory, reducing long term maintenance costs. Modifications to the I-395 interchange will remove a structurally deficient bridge and avoid future replacement or rehabilitation costs, while also extending the urban boulevard to the north contributing to lower speeds.
- **Economic impacts, freight movement, and job creation:** This project has the potential to spur development with a connected pedestrian grid and supports movement of Amazon employees and associated mixed-use development in the area. It increases the accessibility to job centers through the proposed access improvements. The Route 1 urban boulevard project will create approximately 6.5 acres of excess right-of-way resulting in more than $10M of developable land.
- **Climate change, resiliency, and the environment:** This project will result in reduced greenhouse gas (GHG) emissions. New transit service, as well as enhanced opportunities for walking and biking are more environmentally friendly than single-

NATIONAL LANDING
BUSINESS
IMPROVEMENT
DISTRICT

2011 Crystal Drive
Suite 205
Arlington, VA 22202
nationallanding.org

occupant vehicle trips. VDOT is committed to implementing a robust TDM strategy that is consistent with the results of the ongoing TDM study. Planned improvements to the Crystal City Metro Station and the Crystal City VRE Station also support the necessary mode shift.

- **Equity, multimodal options, and quality of life:** More travel choices will be made available creating more walkable neighborhoods that result in a higher quality of life. The downtown area can become reconnected to create space for public transit, walking, and cycling. Arlington County supports affordable housing options that will provide opportunities for existing and future residents of all income levels.
- **Innovation areas:** This project provides multiple innovative solutions, such as a progressive design-build strategy, a pilot safety project to implement near-miss crash technology in National Landing, as well as value capture through land sales for either funds or in-kind support of National Landing elements.

This project satisfies all the merit criteria outlined in the federal grant opportunity, especially the priorities of providing multimodal enhancements, economic benefits, state of good repair, environmental, and equity benefits.

This MPDG grant application has been developed to make a strategic request within the maximum allowed federal funding limit with the state funding the remaining cost. VDOT has also worked with the Governor and General Assembly to allocate funding sources for the required funding match.

I can assure the U.S. Department of Transportation that its investment in National Landing will have a significant, measurable impact on the economic health, well-being, and safety of citizens. VDOT is completely committed to this project and will readily apply expertise and plans already in place to efficiently implement this important initiative that is detailed in the grant application.

Please accept this letter of recommendation as an indication of the National Landing BID's support for the VDOT's request for the USDOT MPDG funding opportunity.

I ask that you give this proposal every appropriate consideration. Should you or your staff have any questions, please feel free to contact me at Tracy@nationallanding.org.

Sincerely,

Tracy Sayegh Gabriel
President & Executive Director
National Landing Business Improvement District

Appendix D

Data Collection and Analysis Plan

Connecting National Landing – Data Collection and Analysis Plan - Discussion Draft

The Virginia Department of Transportation (VDOT) is committed to establishing and implementing an effective data collection and analysis program for identifying the impacts and benefits of Connecting National Landing and the accuracy of forecasts prepared during the development phase of the Project and included in the grant application.

VDOT's data collection plan will focus on safety, the primary goal for the proposed Project and the USDOT. It aligns with USDOT's National Roadway Safety Strategy and directly ties into the proposed near-miss technology implementation.

As part of its data collection plan for the Project Area, VDOT will:

1. Benchmark current numbers, rates, and consequences of crashes, fatalities and serious injuries among transportation users;
2. Identify with qualitative and quantitative measures the degree to which the Project addresses vulnerable roadway users and the degree to which it addresses inequities in crash victims over current measures; and
3. Assess the Project's proposed and future incorporation of roadway design and technology that is proven to improve safety.

The intent of the data collection initiative is to assess the overall safety impact of the Project. Its interim results additionally will be used to evaluate the need for short-, middle- and long-term design, technology or behavioral-change campaigns to sustain and strengthen safety results from the Project. As such, VDOT will closely consult with USDOT to ensure that data collection and analysis measures are consistent throughout and that the impacts of any later changes can be separated from the impacts of the Project as originally implemented.

In addition to ongoing consultation with USDOT, VDOT will regularly and periodically report on its data collection and analysis efforts to USDOT to ensure its requirements are being fully met. This reporting will include, but not be limited to, the following:

1. Baseline data collection and benchmarking results;
2. Interim reporting on a mutually agreeable schedule and in a format aligned with USDOT informational needs;
3. Required quarterly reports in fifth year after substantial completion; and
4. Required final report no later than six (6) years after the date of substantial completion.

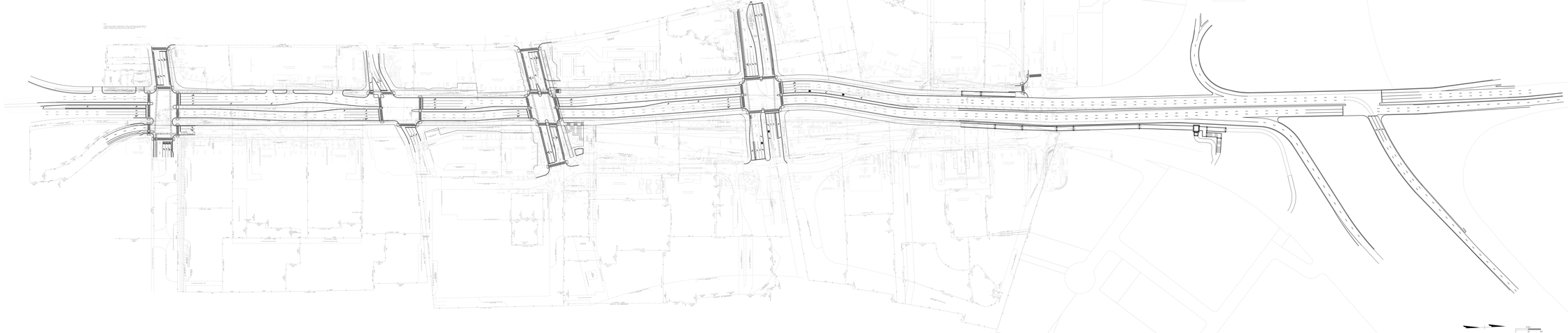
VDOT acknowledges and expects that its data collection and analysis plan may be refined as part of the grant award agreement and/or as a result of potential future USDOT guidance on a more detailed framework for performance measure data collection that may direct use of:

- Standardized measurement approaches;
- Data storage system requirements; and
- Other requirements the Secretary determines to be necessary.

Appendix E

Concept Sketches

CONCEPT PLAN
ROUTE 1 AT-GRADE CONCEPT WITH
I-395 INTERCHANGE MODIFICATIONS



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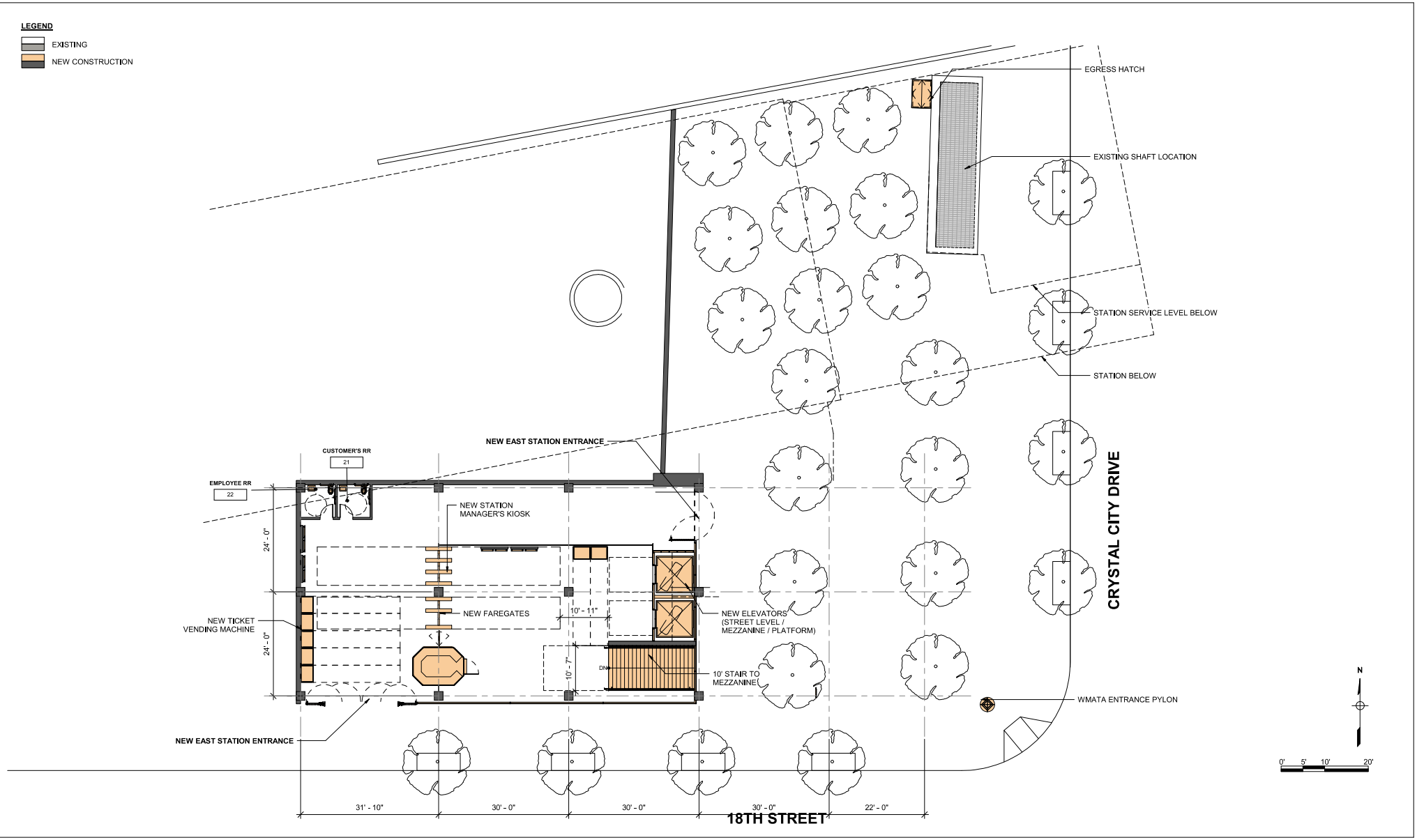
0001-000-894



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CRYSTAL CITY SECOND ENTRANCE STUDY

KGP design studio

SURFACE FAREGATES ALTERNATIVE D

STREET LEVEL

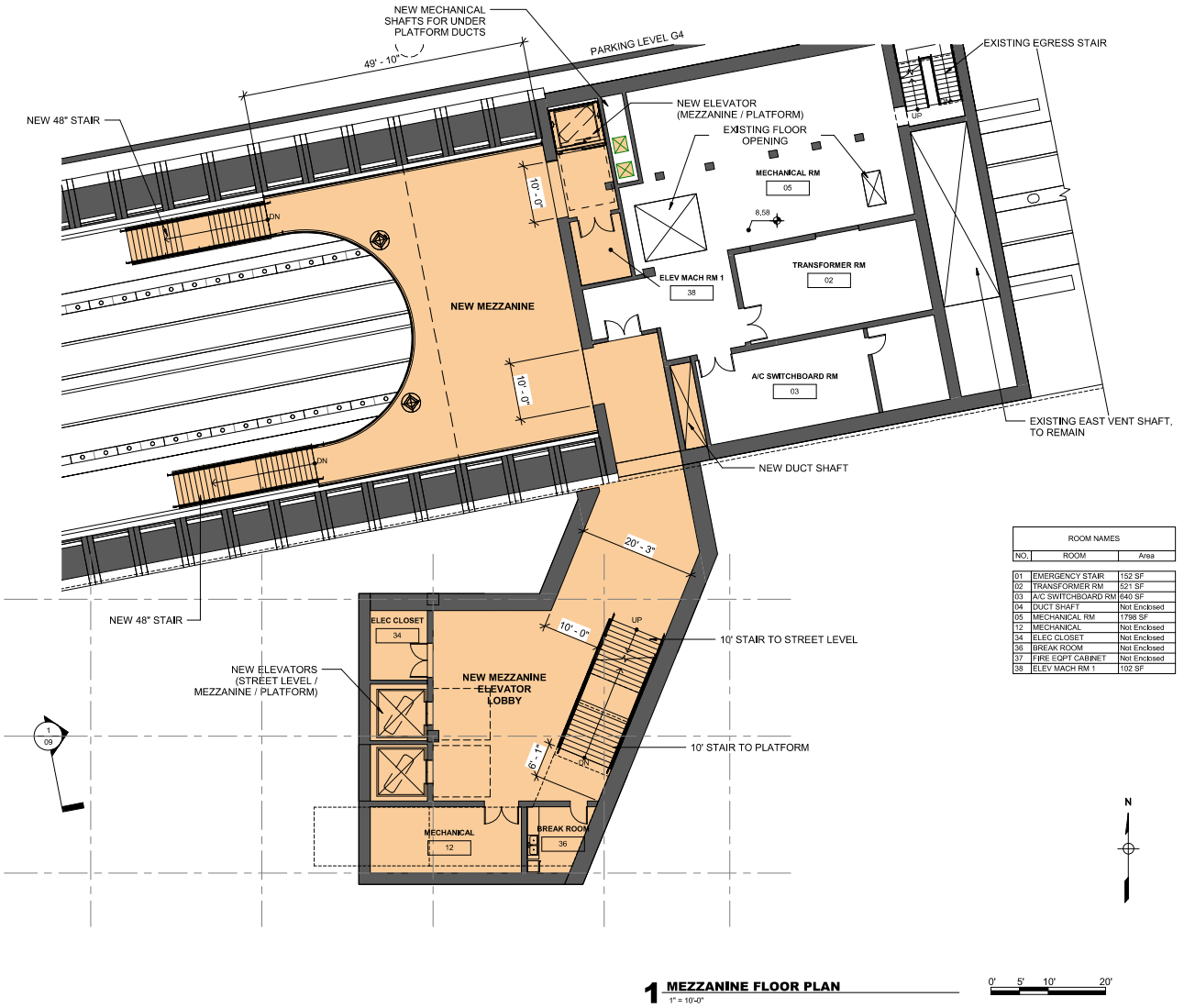
02/07/21

1

LEGEND

EXISTING

NEW CONSTRUCTION



ROOM NAMES		
NO.	ROOM	Area
01	EMERGENCY STAIR	152 SF
02	TRANSFORMER RM	521 SF
03	A/C SWITCHBOARD RM	640 SF
04	DUCT SHAFT	Not Enclosed
05	MECHANICAL RM	1798 SF
12	MECHANICAL	Not Enclosed
34	ELEC CLOSET	Not Enclosed
36	BREAK ROOM	Not Enclosed
37	FIRE EQPT CABINET	Not Enclosed
38	ELEV MACH RM 1	102 SF

1 MEZZANINE FLOOR PLAN
1" = 10'-0"

0' 5' 10' 20'

1C0081 M-0071

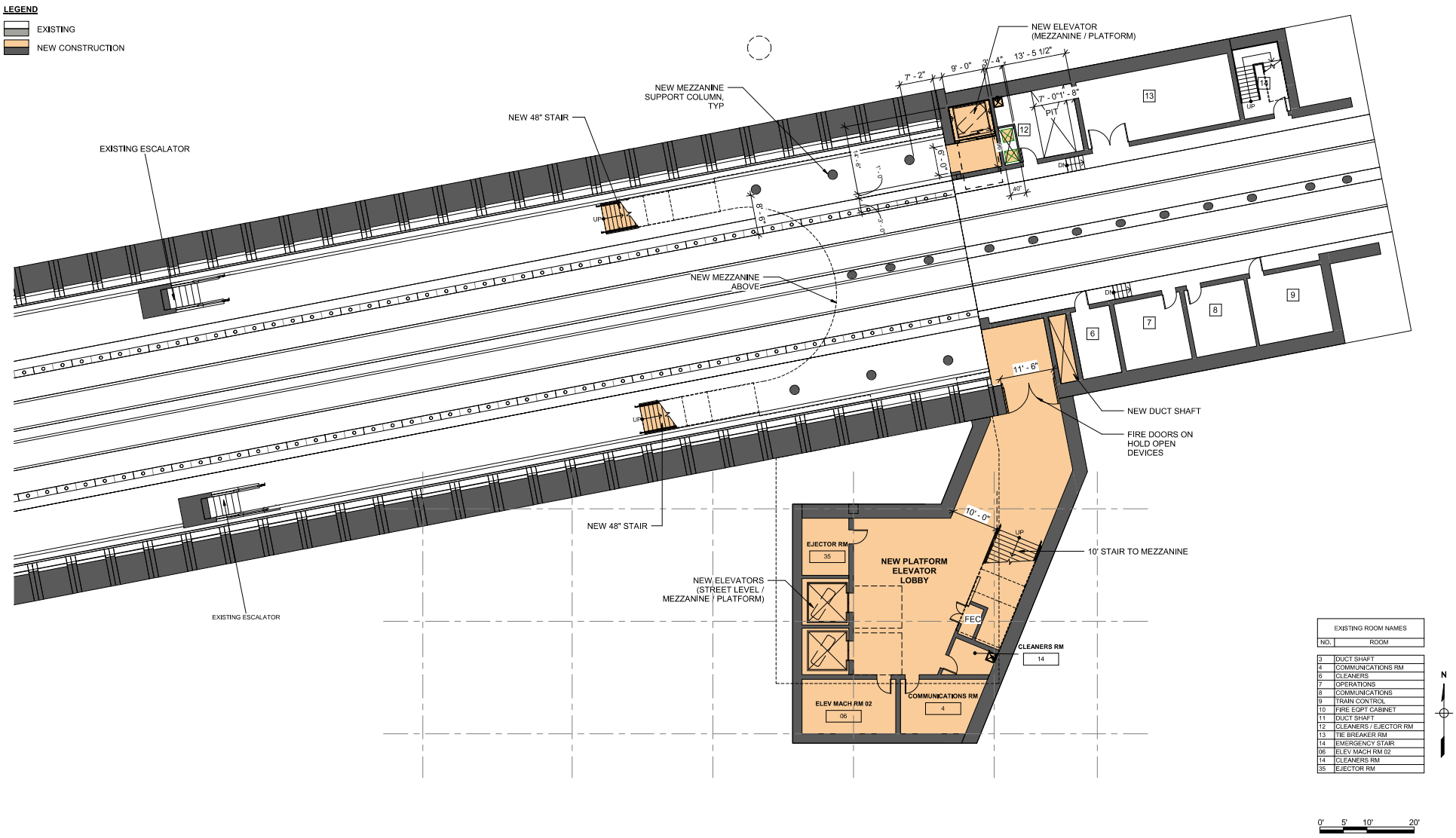
CRYSTAL CITY SECOND ENTRANCE STUDY

KGP design studio

SURFACE FAREGATES ALTERNATIVE D

NEW MEZZANINE FLOOR PLAN

02/07/21



1C0081 M-0071

CRYSTAL CITY SECOND ENTRANCE STUDY

KGP design studio

SURFACE FAREGATES ALTERNATIVE D

PLATFORM LEVEL FLOOR PLAN

02/07/21