



## Appendix K

Tiger II—Union Station Metrorail Station Access and Capacity Improvements







District Department of Transportation

# Union Station Metrorail Station Access and Capacity Improvements

TIGER II National Infrastructure Investments

Grant Application

August 23, 2010



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## Union Station Metrorail Station Access and Capacity Improvements Overview

### Quick Facts

- **Project Type:** Transit and Multi-modal
- **Location:** District of Columbia
- **Cost:** \$36 million
- **TIGER II Grant Request:** \$17.6 million
- **Rural/Urban:** Urban
- **Construction Timeframe:** 2011 through 2013, *i.e.* 36 months
- **Jobs:** 391.3

### Why Fund This TIGER II Project?

#### 1. A Catalyst Project for Urban Livability and Economic Development

Union Station, the mid-Atlantic region's major intermodal transportation hub last received major public and private rehabilitation funds in the mid-'80s. Since then Metrorail, commuter and intercity passenger rail ridership has grown rapidly—outstripping the capacity of many elements of the station complex. This project will greatly relieve existing congestion in the Metrorail station area and provide capacity for expected growth over the next 20 years. The project completes a partially-built north entrance to Union Station and provides pedestrian access to adjoining neighborhoods now separated by a steep grade change and twelve or more railroad tracks. The new north end access will connect to the DC streetcar line now under construction and one of the busiest bus routes in the region. The project will hasten the construction of an intercity bus terminal and planned air-rights development and improve access to jobs and transportation for middle and working class neighborhoods east of Union Station.

#### 2. Significant Long-Term Benefits

- Assure Metrorail station functionality for an additional 20+ years
- Reduce travel time and nearly eliminate Metrorail station mezzanine congestion
- Catalyze development of 3 million sq. ft. Burnham Place air-rights development
- Enhance the customer experience at Union Station generating additional Metrorail, commuter and intercity passenger rail, streetcar and intercity and local bus trips to and from Union Station
- Promote the economic viability of the commercial and retail elements of Union Station, already one of the District's largest retail developments
- Provide the customer accessibility necessary for the relocation of the Greyhound intercity bus terminal to the Union Station parking garage and the subsequent redevelopment of the existing Greyhound terminal location

#### 3. A Solid Economic Investment

- A benefit-cost ratio of 2.5 and a EER of 15.5%
- A net present value of \$44.2 million using a 7% discount rate

## 1. Project Description

Union Station is the largest intermodal transportation center in the mid-Atlantic region and the second busiest intercity passenger rail station in North America. Located just east of Washington's central business district and blocks from the U.S. Capitol, Union Station plays a major role in the travel and commutation needs of thousands of residents and visitors to the national capital region from DC, Virginia, Maryland and the entire East Coast.

Each weekday 22,276 commuters and intercity rail riders make 44,552 trips through the station on 229 Amtrak, MARC and VRE trains and 35,000 passengers enter and leave the adjoining Metrorail station. They are joined by 350 intercity bus passengers served by three different bus companies, 200 to 1,000 tour bus passengers, depending on the season, 2,500 individuals parking at the station's parking garage and over 150 bicycle commuters and renters at the bike station.

The most recent major upgrade and rehabilitation of Union Station's rail station occurred in the late 1980s. The Metrorail station at Union Station opened in 1976 and has undergone no major upgrade or renewal beyond routine maintenance projects and the addition of one mezzanine escalator and stair. As these adjoining stations experience new growth from expanded intercity travel, commuter rail's growing popularity and the renewal of adjoining DC neighborhoods, Union Station's many stakeholders have come together to begin projects that will create a 21<sup>st</sup> century multi-mode transportation center.

The Union Station Metrorail Station Access and Capacity Improvements project will design and build a series of stairs, escalators, passageways and elevators to greatly enhance the capacity of the Union Station Metrorail station and provide improved access to the many other modes of transportation available at Union Station. The work focuses on the north mezzanine area of the Metrorail station and consists of the following actions:

- Complete the final section (approximately 15 percent) of a partially constructed pedestrian passageway from the station mezzanine to H Street and out to 1<sup>st</sup> Street.
- Build two or more elevators connecting the passageway to the H Street bridge and the bus deck of the Union Station parking garage
- Replace existing ADA elevators and add two elevators for redundancy and capacity
- Add a station mezzanine-to-platform stair and mezzanine-to-train concourse stairs or escalators to relieve passenger congestion on the platform and mezzanine
- Expand the mezzanine fare control area and install additional fare control gates
- Relocate the 1<sup>st</sup> Street entrance to the Metrorail station to reduce circulation conflicts, add capacity and shorten walking paths

This set of station access and capacity improvements represent a stand-alone project requiring no additional projects to achieve the intended reduction in current and future pedestrian

congestion at and adjacent to the north mezzanine of the Metrorail station. The improvements result in immediate travel time savings and complement anticipated streetcar and high speed rail projects at Union Station in the near future.

## 2. Project Parties

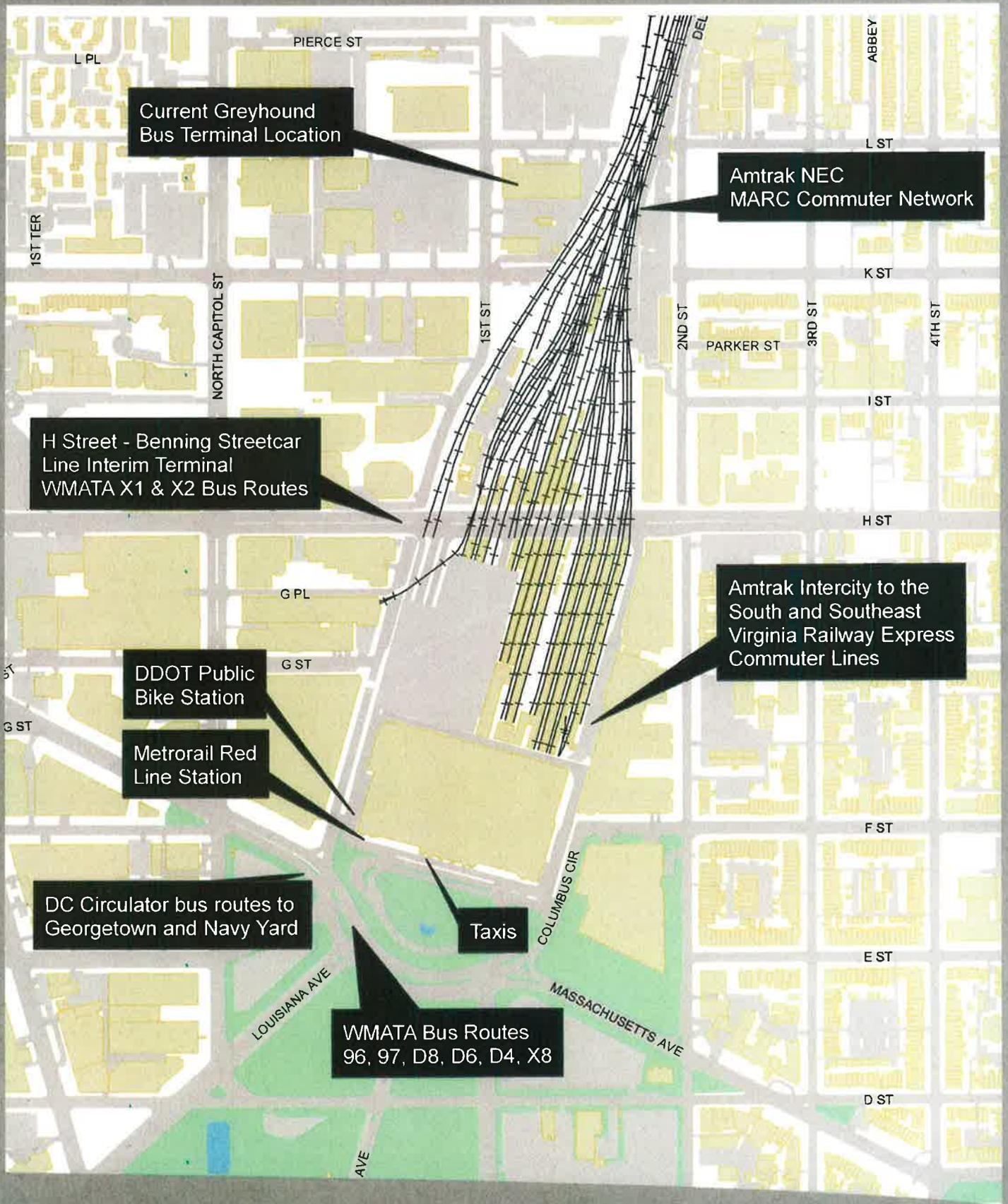
The grant applicant is the District Department of Transportation (DDOT) ([www.dc.dot.gov](http://www.dc.dot.gov)) on behalf of itself and the Washington Metropolitan Area Transit Authority (WMATA). DDOT serves as both the city and state Department of Transportation for the District of Columbia. The agency is responsible for construction, maintenance and operation of the City's streets and federal-aid roads and highways; construction, maintenance and operation of traffic and pedestrian signals, streetlights, sidewalks and bikeways; permitting of public space uses; evaluation of the transportation impacts of local development; the oversight of the District's contributions to WMATA; ownership and policy management for the DC Circulator bus system; and management and oversight of the DC bikeshare program. DDOT's service area encompasses the entirety of the District of Columbia with the exception of some federal property.

WMATA ([www.wmata.com](http://www.wmata.com)) is the regional subway and bus service provider for the District of Columbia, Prince George's and Montgomery counties in Maryland and Fairfax and Arlington counties in Virginia along with the cities of Alexandria and Falls Church. Established under a unique multi-jurisdictional compact, WMATA operates over 1,116 rail cars on 106 miles of track. The Metrorail system serves 86 stations and carries approximately 750,000 riders on an average weekday. WMATA's regional bus network carries over 450,000 riders on an average weekday using a fleet of approximately 1,500 buses. Over 3.4 million people live in the WMATA service area.

The Union Station Redevelopment Corporation ([www.usrcdc.com](http://www.usrcdc.com)) (USRC) is a 501(c)(3) established by Congress to operate and maintain Washington Union Station. Through various operating and maintenance contracts a small staff at USRC oversees the operation of the retail and public space at Union Station and leases passenger facilities and waiting room space to Amtrak, MARC and VRE. USRC maintains the station's infrastructure and works with the many public and private stakeholders involved with Union Station.

While not a direct Project Party, the National Railroad Passenger Corporation, (Amtrak) has been deeply involved in the preliminary planning for this project. Successful implementation of the Metrorail station improvement will enhance access for many of Amtrak's customers. The project's construction affects certain Amtrak facilities and the Project Parties are working cooperatively to fully mitigate both construction impacts and permanent alterations arising from the project. The Project Parties are designing the Metrorail project to allow for the construction of new intercity passenger tracks at Union Station at some point in the future.

Figure 1: Union Station Transportation Infrastructure



### 3. Grant Funds and Sources / Uses of Project Funds

Preliminary design consultants for WMATA have prepared an order of magnitude cost estimate for the scope of work of \$36 million. DDOT seeks \$17.6 million in U.S. DOT TIGER II funding to complete the financing package for this project. As shown in the table below, TIGER II funds will represent approximately 49 percent of the project funding. Local funding will provide approximately 45 percent of the project cost and the remaining 6 percent will be federal Bus and Bus Facility appropriations associated with the project’s benefit to the planned intercity bus terminal in the parking garage.

**Table 1: Financial Plan  
Union Station Metrorail Access & Circulation Improvements**

Funding Sources	Budget	Percent
USRC contribution	6,000,000	17%
WMATA Bonded Station Surcharge	10,000,000	28%
DC Preliminary Design funds*	250,000	1%
Akridge In-Kind (see letter of support)	TBD	0%
<b>Local Share Total</b>	<b>\$16,250,000</b>	<b>45%</b>
Federal TIGER2 grant application	17,557,000	49%
FTA Bus & Bus Facilities (FY08 & FY09)	965,000	3%
FTA Bus & Bus Facilities (at FHWA)	728,000	2%
FTA Bus & Bus Facilities (FY10)	500,000	1%
<b>Project Total</b>	<b>\$36,000,000</b>	<b>100%</b>

\* matching FY'08 FTA grant

The Union Station Redevelopment Corporation will provide a cash contribution of up to \$6.0 million as part of a full funding grant agreement with U.S. DOT. The WMATA Board of Directors has authorized the imposition of a nickel fare surcharge at up to six Metrorail stations for the purposes of funding station specific capital improvements. The project funding plan assumes that WMATA will issue approximately \$10 million in debt for this project and the nickel surcharge will fund the debt service costs. The nickel surcharge at Union Station will generate approximately \$960,000 annually. None of the local stakeholders, WMATA, DDOT and USRC have the resources to fully fund this project.

Akridge, a DC-based real estate development corporation ([www.akridge.com](http://www.akridge.com)), owns the air rights over the station tracks behind Union Station. They have been an extensive partner in the on-going development of the Union Station Master Plan, one component of which is the Metrorail access project. Akridge has contributed staff and consultant time valued at over

\$100,000 on site and design issues related to the H Street elevators and has committed to providing additional financial investments to the project as outlined in their letter of support included in Appendix A to this application.

Greyhound Lines, while not contributing directly to the project, has committed to making a financial contribution toward the construction of the intercity bus terminal in the parking garage. The USRC and Greyhound are in preliminary negotiations over the terms of that contribution. Completion of the H Street passageway and elevators is necessary for the successful relocation of the intercity bus terminal.

#### 4. Primary Selection Criteria Discussion

##### **State of Good Repair**

The Union Station Metrorail station opened in 1976 as part of the Red line's initial operating segment. While major components have been maintained and repaired over the 34 years of operation the north mezzanine layout is unchanged from 1976 even as average weekday boardings at the station have grown from around 6,000 in 1977 to nearly 35,000 in 2010. (WMATA added a stair and escalator from the platform to the south mezzanine a number of years ago.)

Most of the work funded in this project focuses on maintaining and increasing the functionality of the Metrorail station in response to current peak period congestion and future station use. The project creates a new north entrance to Union Station, relocates an existing entrance to reduce conflicting pedestrian movements and adds vertical circulation capacity.

Without these improvements the customer experience at Union Station will continue to degrade. Waiting times for passengers exiting the platform and the mezzanine levels will increase. Pedestrian conflicts in the free-zone area of the station will increase. If travel times continue to increase more travelers will chose alternate means of transportation and businesses will consider relocating to less congested locations. It is to combat these actions and maintain the desirability of Union Station that the region has made a large commitment to funding these improvements.

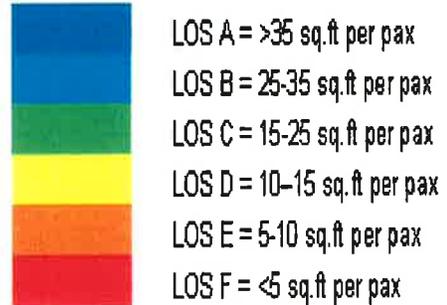
The scope of work for the access improvements includes replacement of the two station elevators with four new elevators. Two of these elevators will serve the platform-to-mezzanine and allow the construction of a new-platform-to-mezzanine stair in the location of the old elevator. The second set of new elevators will serve the mezzanine-to-train concourse. By adding ADA elevator capacity DDOT and WMATA will reduce the waiting time for elevators at a station where customers frequently have luggage and also provide ADA accessibility redundancy during outages for unplanned repairs or scheduled maintenance.

**Time Savings Benefit of the Project**

Reduced passenger congestion, both current and future year, expressed technically primarily as time savings, is a major project benefit. Accordingly DDOT and WMATA have devoted a considerable portion of the application to a discussion of the specific improvements that result from building the project.

Based on September, 2009 field counts, more than 5,000 people pass through the north mezzanine in the morning peak hour and 6,000 in the evening peak hour.

Under the current travel demand and operating condition, the north mezzanine experiences congested conditions on various circulation paths. The discussion here uses the level of service (LOS) measure for pedestrian walking space density and corresponding “heat” maps to illustrate the overall peak hour performance. The pedestrian level of service, named as Fruin’s LOS, is applied in the analysis of pedestrian facilities. LOS E and F depict severe congestion with tight space among pedestrians.

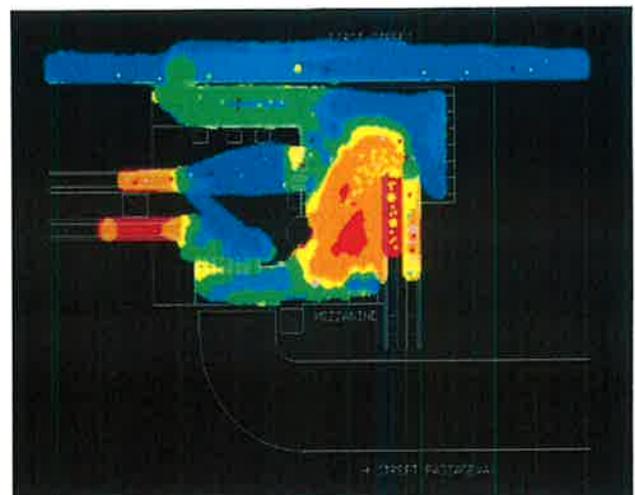


Other measures of effectiveness, including queue clearance time and travel time, are discussed here as well and DDOT and WMATA have provided additional information in an attached technical memorandum. The LOS maps shown on the following pages represent passenger flow modeling based on actual and projected 2030 station use.

**Zone 1 - Metrorail Mezzanine** The free-zone area, between the 1st Street entrance, Metrorail faregates and Amtrak concourse escalators, is where multiple pedestrian paths converge. In the evening, the free-zone area exists as a bottleneck where pedestrian paths converge. More than 50 percent of the pedestrians traveling through this area experienced LOS E or F, with spill-over of congestion back to the 1st Street entrance. The PM period color map identifies continuous congestion and delay in the evening peak period.

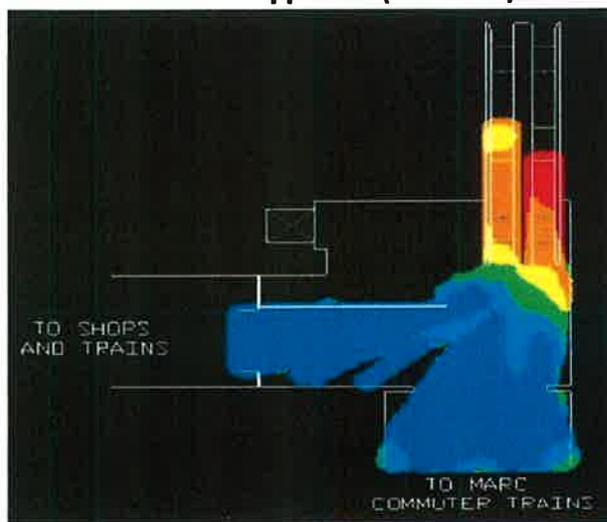
**Free-zone Area (AM Hour)**

**Free-zone Area (PM Hour)**

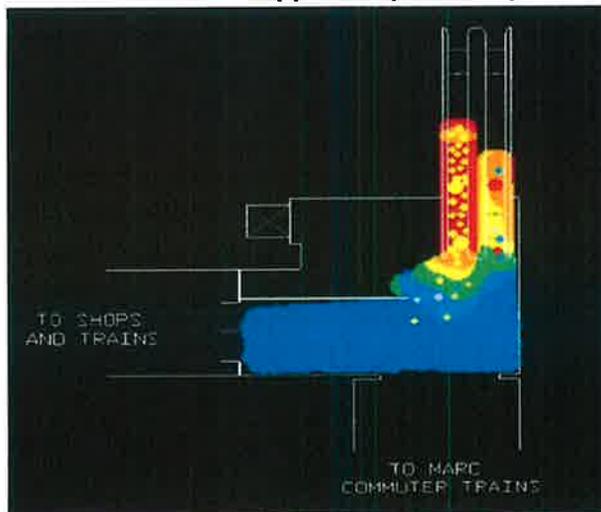


**Zone 2 – Amtrak Concourse Approach** This area focuses on the escalators between the Metrorail mezzanine and the Amtrak concourse approach to the escalators. In the morning, heavy queuing occurs at the top of the down escalator, which transports predominantly rail commuters to the mezzanine level. The heavy flow from the concourse to Metrorail and the 1st Street entrance causes congestion on the down escalator in the morning (red color in the AM Hour map) and up escalator in the afternoon (red color in the PM Hour map). Besides escalators, the concourse approach presents an extended queuing condition in the morning. In the afternoon, the queuing formed by those returning to the Amtrak concourse spreads inside the Metrorail mezzanine zone as shown in the preceding maps.

**Amtrak Concourse Approach (AM Hour)**

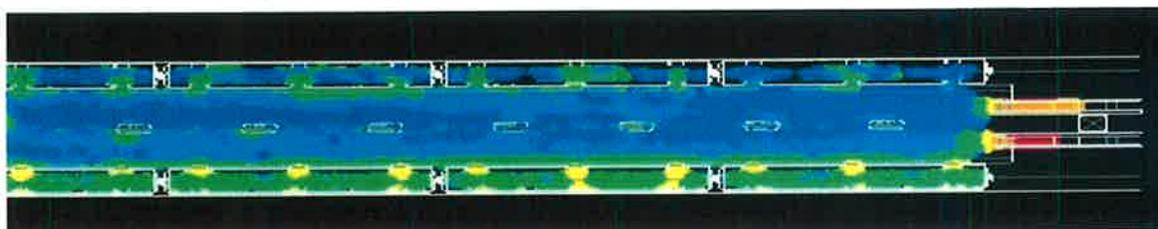


**Amtrak Concourse Approach (PM Hour)**

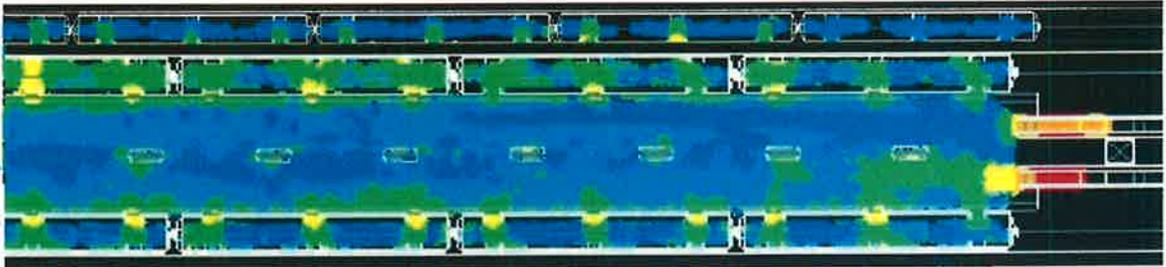


**Zone 3 – Metrorail Platform** Severe platform congestion occurs continuously throughout most of the peak period when the Metrorail Red Line is on a 2.5 minute headway and eastbound and westbound trains often arrive simultaneously. Under such operating conditions, the platform often must accommodate a surge of arriving passengers before residual queues from the previous train clear, which delays exiting passengers and imposes potential safety hazards. The maps below illustrate the LOS conditions on the platform and the bi-directional bottlenecks at the escalators in both the morning and evening rush hour.

**Metrorail Platform (AM Hour)**



### Metrorail Platform (PM Hour)



#### Summary of Existing Conditions

Within the three zones, Metrorail passengers leaving the Metrorail platform experienced noticeable trip time delay, averaging an additional 30 to 40 seconds in the evening peak hour, as compared to the morning. Due to the pulse nature of train arrivals and exit surges, these averages tend to understate the actual customer queuing experience. In 2009, passenger volume already exceeded the existing vertical capacity, with the worst clearance time condition experienced in the evening, averaging 5 minutes, at the bottom of the up escalator in the Mezzanine's free-zone area.

The base year performance pinpoints serious capacity constraints including congestion of vertical circulation from the Metrorail platform through the mezzanine to the Amtrak concourse, a crowded mezzanine and platform and delays to all pedestrians going through the mezzanine's free-zone area and in and out of the 1st Street entrance. Table 2, shown later in the report, summarizes both the 2009 and 2030 escalator clearance times.

#### Future Demand Situation 2030

The 2030 projection takes into account Metrorail ridership generated by neighborhood development underway and planned, transfers from new transportation facilities terminating at Union Station and anticipated ridership growth on Metrorail, Amtrak and commuter rail. (Please refer to the complete pedestrian modeling report attached to this application for a detailed explanation of how WMATA determined future station demand.)

- Planned area development in the North of Massachusetts Avenue (NoMa) mixed-use neighborhood and the Burnham Place air rights development north of Union Station would exceed 5 million square feet at full build-out.
- New transportation facilities identified in the 2009 DDOT Union Station Intermodal Transportation Center Feasibility Study consists of the H Street pedestrian passageway connecting the north mezzanine with H Street (part of this project application), a new streetcar terminal and a new intercity bus terminal located in the Union Station parking garage. The projection assumes all these facilities would be completed by 2030.

- Growth is assigned to the 2009 Metrorail and Amtrak/commuter passenger volumes in the study zone to derive a 2030 ridership projection, which is separated from the growth impact of the planned area development. The projection applies a compound annual growth rate of 1.5 percent for Amtrak and commuter rail trips through the study zone. Similarly, Metrorail's ridership is assigned a 1 percent annual growth factor for the peak hours based on the results of the 2007 Metrorail Rider survey.

With the above assumptions and methods, pedestrian traffic within the north mezzanine study zone is anticipated to increase by 60 percent from 2009 to 2030. This overall growth rate is then validated against the Metropolitan Washington Council of Governments Land Use Forecasts, which project a job growth rate of 59 percent from 2010 to 2030 in the zones surrounding the station.

#### Future Rail Operating Plan and Implications

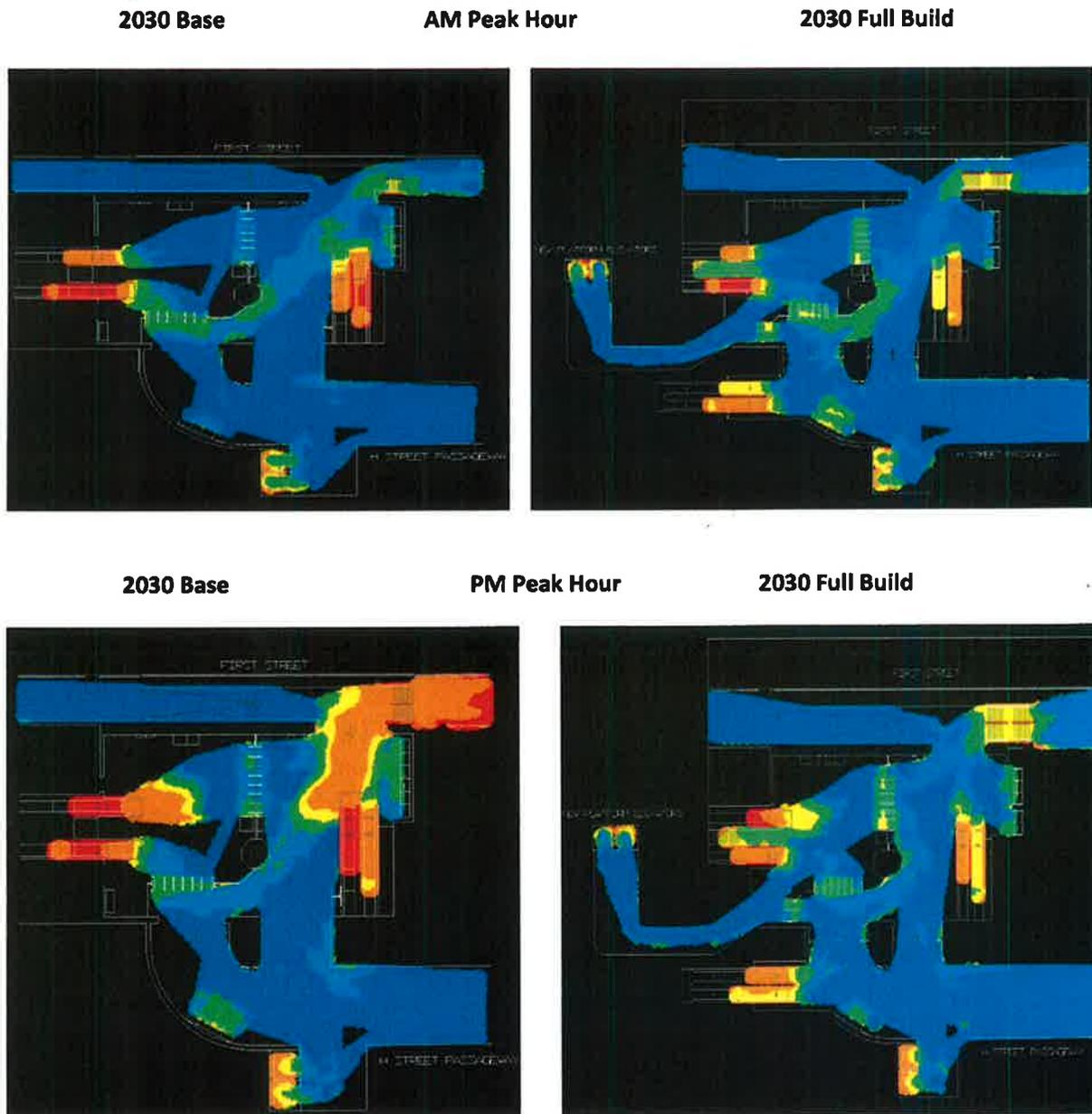
WMATA currently operates the Red Line at a scheduled 2.5-minute headway during the peak, with primarily 6-car trains. WMATA anticipates operating 50 percent eight-car consists before 2015 and 100 percent eight-car trains by 2020.

Both longer trains and more riders will aggravate today's platform crowding and extend queues at escalators. New residential and hotel development around Union Station and additional rail service at Union Station will generate additional riders originating at the station, occupying the platform waiting for trains. This increased level of multi-directional commuting will increase passenger boarding and alighting conflicts on the platform.

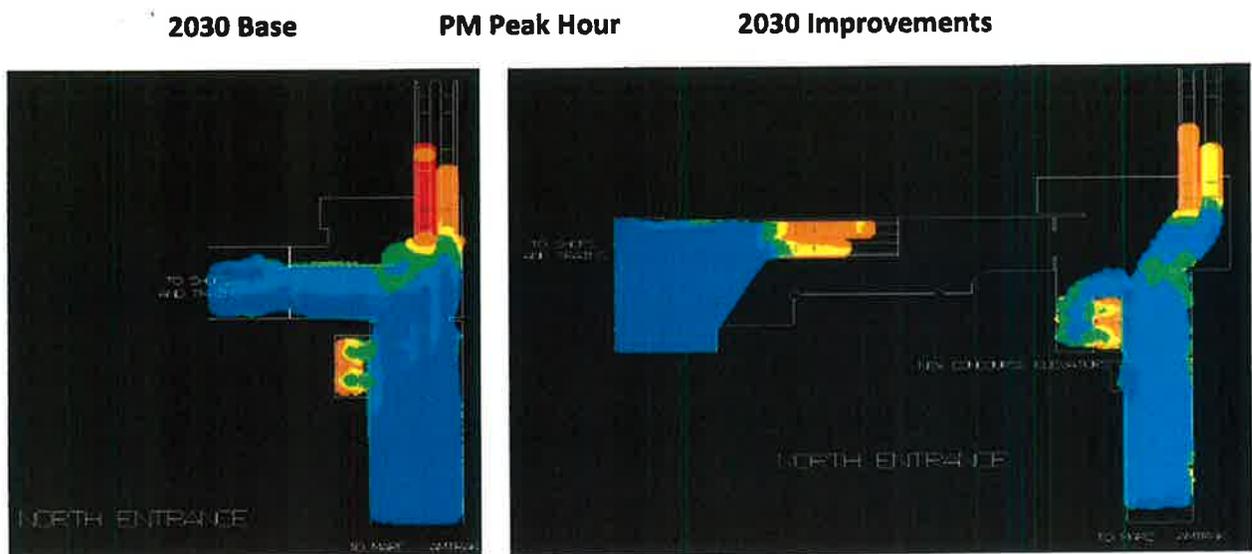
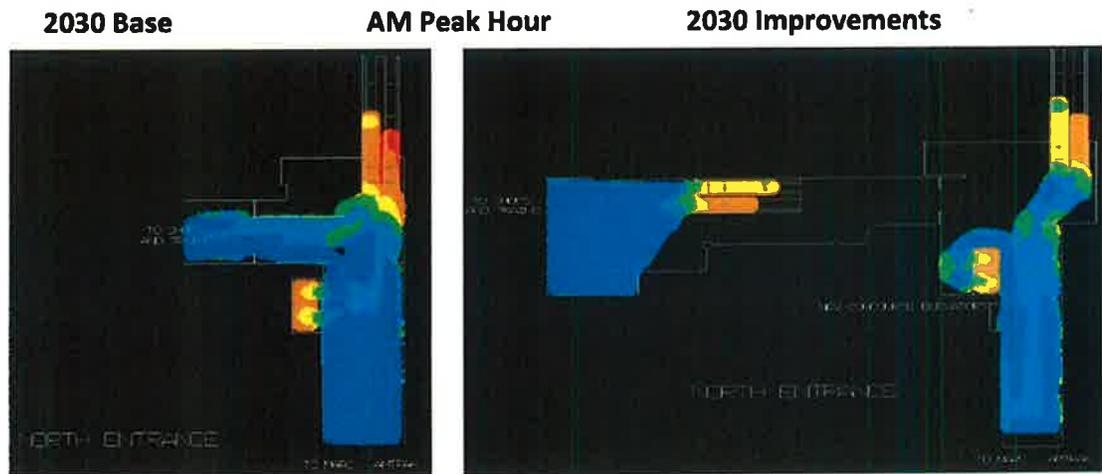
#### 2030 Station Performance

Pedestrian modeling for 2030 conditions compares a Base scenario, with some access and capacity improvements constructed, against a Full Build scenario with all of the proposed DDOT and WMATA access and capacity improvements in place. The Base scenario assumes the relocation of the 1st Street entrance, new mezzanine-to-train concourse elevators and the opening of the H Street passageway to the north. The 2030 Full Build scenario adds the elevators to H Street, mezzanine-to-platform elevators and mezzanine-to-concourse escalators to the 2030 Base. The modeling results clearly show that the full package of access and capacity improvements is necessary to accommodate 2030 passenger loads.

Zone 1 - Metrorail Mezzanine With the proposed station capacity improvements in the Full Build scenario, the mezzanine would achieve very substantial performance improvements. Both escalator sets would achieve reductions in passenger queue and clearance time in the morning and evening, resulting from the addition of a new stairway on the platform and one new set of elevators on the platform and concourse respectively. The most significant improvement from the Full Build is the elimination of PM peak crowding in the free-zone area of the mezzanine.



**Zone 2 – Amtrak Concourse Approach** With the proposed Full Build, LOS F would be nearly eliminated from this zone, except for occasional moments on the up escalator to the concourse. Besides, the concourse approach would offer a new set of alternative escalators to the left, diverting flows from the existing escalator set. In both 2030 Base and Full Build scenarios, the open area on the concourse approach would perform at LOS C or better.

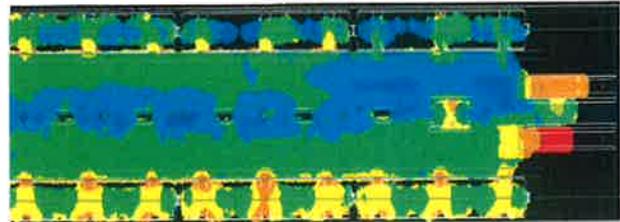
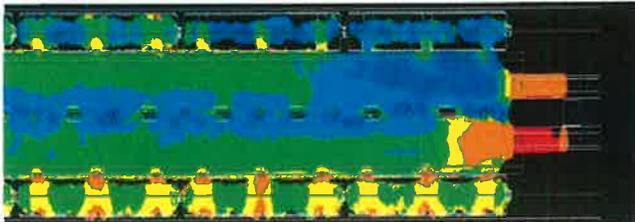


**Zone 3 – Metrorail Platform** The additions of a new stairway and two elevators as part of the 2030 Full Build would greatly relieve current and future platform crowding. As shown in the figures below, heavy queuing on the approach to escalators observed in both the 2009 Base and 2030 Base would be significantly reduced in both morning and evening peak hours.

**2030 Base**

**AM Peak Hour**

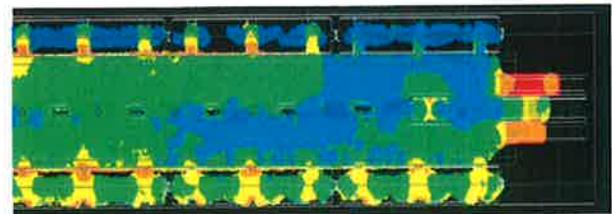
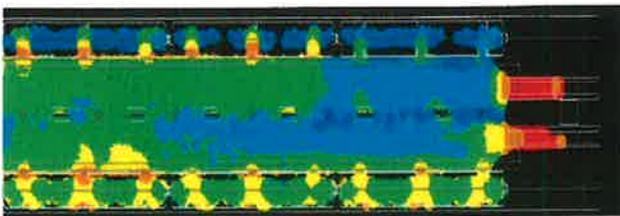
**2030 Improvements**



**2030 Base**

**PM Peak Hour**

**2030 Improvements**



**Queue Clearance Time.** Queue clearance times for the existing escalators would be reduced, as shown in Table 2. In the 2030 Full Build, escalators would not only operate smoothly but also outperform the 2009 conditions for the Amtrak concourse movements. In contrast, without the new platform stairway and elevator, the 2030 Base would yield significant congestion.

**Table 2: 2030 Average Escalator Clearance Time (Peak Hour)**

	AM: 2009 Current	AM: 2030 Base	AM: 2030 Full Build	PM: 2009 Current	PM: 2030 Base	PM: 2030 Full Build
<b>Metrorail Platform</b>						
Down Escalator	00:20	00:45	00:27	00:27	19:42	02:02
Up Escalator	00:47	07:10	01:34	01:09	02:08	00:59
<b>Amtrak Concourse Approach</b>						
Down Escalator	00:59	02:37	00:39	00:49	00:40	00:27
Up Escalator	00:21	01:02	00:24	05:35	07:53	01:18

Note: number represents mm:ss

**Time Savings Summary**

The proposed capacity improvements significantly expand capacity at Metrorail's north mezzanine. The additions of a new stairway and two elevators on the Metrorail platform would

clear passengers before the arrival of other trains. The relocation and widening of the 1st Street entrance would reduce traffic conflicts in the free-zone area, eliminate spill-over crowding outside the 1st Street entrance, and shorten the path to the Amtrak concourse. The opening of the pedestrian passageway to H Street would offer a direct connection to new development and the planned intercity bus terminal, reduce new pedestrian traffic at the 1st Street entrance and provide quick access to Metrorail and Amtrak.

### **Livability**

Today Union Station sits between two redeveloping DC neighborhoods divided by railroad tracks and a grade separation. H Street, NE ([www.hstreet.org](http://www.hstreet.org)) is a growing fifteen block stretch of entertainment and arts venues, restaurants and shops running directly east of the project area. The North of Massachusetts Ave. neighborhood or NoMa ([www.nomabid.org](http://www.nomabid.org)) is a high density, mixed-use redevelopment area of 17.5 million square feet (south of L Street) at full build out. Nearly half of that buildable square feet is open or under construction. NoMa is home to federal agencies, a new supermarket, rental apartment buildings and office and retail development. The southeast corner of the NoMa district abuts the Union Station project area and the project's planned H Street passageway to Metrorail and elevators to H Street will directly benefit the neighborhood.

Poised to further bridge the physical divide between neighborhoods is Akridge's Burnham Place air rights development over Union Station. The illustration shows the planned Burnham Place development in red and NoMa neighborhood to the northwest. The H Street elevators will connect to the bridge on the north side of the parking garage shown behind Union Station. See more at: ([http://www.akridge.com/properties/property\\_detail.asp?ID=21](http://www.akridge.com/properties/property_detail.asp?ID=21))



This 3 million square foot development, to be built on a platform over the rail yards, is projected to include 600 residential units, 150,000 sq. ft. of retail space, 400 hotel rooms, 2 million sq. ft. of office space and a new passenger waiting room concourse for Amtrak to the east of the existing parking garage. Given its location and the planned Metrorail access and capacity improvements, Akridge and the DC Office of Planning are working together to design

Burnham Place with some of the highest transit trip mode shares, over 75 percent for some trips, of any TOD in the District.

Further connecting these neighborhoods is the H Street – Benning streetcar line under construction along H Street east of Union Station. DDOT intends to construct an interim western terminal for this streetcar line in the unused H Street underpass which

(<http://ddot.dc.gov/DC/DDOT/On+Your+Street/Mass+Transit+in+DC/View+All/DC+Streetcar>) terminates at 1<sup>st</sup> Street, NE adjacent to the Metrorail H Street passageway and planned elevators. (Please refer to the preliminary design drawings in Appendix B for greater detail.)

The Union Station Metrorail Station Access and Capacity Improvements project provides the transportation and access links to tie these DC neighborhoods together and greatly expand connectivity for the neighborhoods to the east along H Street and then Benning Road. That corridor is home to a transit-riding collection of neighborhoods currently served by WMATA's X1 and X2 bus routes. Combined these routes carry an average of 312,000 riders a month, which makes it one of the five most popular bus corridors in the WMATA system. When the H Street elevators are constructed X route bus riders will have direct access to Union Station and the Metrorail Red line for the first time ever. The connection will allow transfer options that are now hard to reach from stops several blocks away from the station to the east and west on H Street. As the transit-oriented development projects of NoMa and Burnham Place open streetcar, bus, Metrorail, Amtrak and commuter rail options will all be a convenient, relatively short walk away along landscaped, well-lighted streets and climate-controlled passageways. Residents and office workers will have many of their retail shopping needs within a short walk.

The neighborhoods around Union Station are home to a significant number of affordable housing sites. The National Low Income Housing Coalition prepared a series of maps of affordable housing locations in the District which are shown via this link <http://nlihc.org/doc/dcpreservationcatalog-maps.pdf> and also in the appendix . The residential neighborhoods surrounding Union Station, particularly to the north and east, have significant amounts of affordable housing supporting the middle-class, working class and low-income residents there. The census tracts adjacent to Union Station on the north and east and the tracts along H Street and Benning Road have minority populations ranging from 38 to 100 percent. Transit commutation use in these thirteen census tracts averages almost 32 percent and approximately 25 percent of the residents lived below the poverty line in 2000.

A 2008 study prepared for the DC Office of Planning titled the "State of Washington's Neighborhoods" provides a variety of demographic data on 39 neighborhood clusters. Shown here: <http://www.planning.dc.gov/planning/lib/planning/citywide/neighborhoodindicators.pdf> Appendix I highlights conditions in five neighborhood clusters adjacent to Union Station or along the H Street-Benning Road corridor. Housing costs are at or below the District median and food stamp use ranges from 18.7 to 34.7 percent of the population.

### **Sustainability**

With respect to construction, most TIGER II projects will be similar in their planned use of sustainable principles of construction, installation of high efficiency lighting and machinery where appropriate and reuse of materials where possible. This project can claim credit for a small construction footprint within an existing built environment. DDOT and WMATA seek to leverage and expand the access, capacity and usability of an existing rail transit station and

extend its high level functionality for another 30 years. Both agencies seek to induce additional transit trips by improving the customer experience with less crowding and improved access.

The planned actions benefit an electrified rail transit system along with users of Amtrak's all-electric Northeast Corridor rail service and DC's (under construction) electric streetcar line, all systems which are among the most energy-efficient means of moving people, far better than travel by automobile or airplane. Secondly they benefit users of diesel powered commuter and intercity passenger trains and urban transit buses, which are more energy efficient than cars. Energy efficiency is discussed in the Transportation Energy Data Book at the Oak Ridge Laboratory site: <http://cta.ornl.gov/data/Index.shtml>. Quantified energy savings are detailed in the benefit-cost analysis below.

### **Safety**

The project provides two safety benefits. First, it shifts some intercity travelers from automobiles to safer methods of travel. This benefit is described in the benefit-cost analysis. Second, by expanding the egress capacity of the Metrorail station as well as Union Station, the project improves the evacuation capacity of both stations in the event of an emergency.

### **Evaluation of Expected Project Benefits and Costs**

A benefit-cost analysis (BCA) was performed for the project, consistent with the guidelines presented in the TIGER II Grant notice. More details on the methodology and assumptions used in the analysis, including the calculations of benefits and costs for each year included in the BCA evaluation, are presented in the attached BCA report. This section summarizes the project's economic benefits and costs. The economic benefits derived from the Union Station project quantified in this analysis can be grouped into two general categories:

- **Travel time (walk time) savings.** Walk time savings will be created by the circulation improvements to the North Mezzanine as well as by the creation of a shorter connection between the intercity bus terminal and Metrorail. Nearly all Metrorail riders who use the North Mezzanine are expected to benefit from the North Mezzanine circulation improvements, and people transferring between Metrorail and the intercity bus terminal are expected to benefit from opening the H Street passageway. The time savings is an economic benefit for facility users and contributes to the economic competitiveness of the region and nation.
- **Reduced Vehicle Miles Traveled (VMT) on intercity roads.** As the intercity bus becomes a more attractive option due to better connections between the Metrorail and the bus terminal, a marginal number of intercity travelers are likely to switch modes from auto to bus. This shift would result in reduced VMT on roads. Reduced VMT results in numerous secondary benefits, including a reduction in the cost of auto operation and usage for travelers who switch modes (an economic competitiveness benefit), a reduction in society's accident-related costs (a safety benefit), and a reduction in

society's environmental costs (a sustainability benefit). These benefits can then be monetized to estimate the overall economic benefit of reduced intercity auto VMT.

#### *Key Analytical Assumptions and Benefits Included in the Evaluation*

Benefits and costs are valued in constant dollars and a 7 percent real discount rate is used. The evaluation period matches the useful life of the asset. This section identifies the benefits that were included in the quantitative benefit-cost analysis as well as how those benefits were estimated.

#### Walk Time Savings

The primary benefit of this project for all users of Union Station's North Mezzanine – walk time savings due to improved pedestrian circulation in the vicinity of the mezzanine – was obtained from WMATA modeling of pedestrian circulation in this area. This analysis estimated the peak period walk time savings within the North Mezzanine to be 123 person-hours per day (and 33,456 person-hours per year) in 2030. To be conservative, the analysis assumed that there was no walk time savings during any of the off-peak periods in an average work day. Total annual walk time savings in 2014 due to the North Mezzanine improvements is estimated to be 20,849 person-hours. On a present value basis, the value of this benefit is estimated to be \$8.8 million over the evaluation period.

The project will also save time for some people who will be walking between Metrorail and the Burnham Place development. The residents and employees accessing this development via Metrorail will benefit from reduced walk time as a result of the H Street vertical circulation improvements, which will allow some of them to avoid walking through Union Station or all the way to North Capitol Street. WMATA estimates that a total of 6,768 persons will access the Metrorail everyday from Burnham Place after full build out. Of these, 60 percent or 4,034 persons will access the Metrorail station via the H Street elevators and passageway. For these Burnham Place travelers, total annual walk time savings in 2015 due to the H Street connection is estimated to be 3,046 hours, growing to 30,464 hours by 2024 with no growth thereafter. The present value of these benefits is estimated to be \$6.0 million over the evaluation period.

Without the H Street passageway, people transferring between the intercity bus terminal and Metrorail will need to walk a distance of 1,430 feet via the Union Station parking garage and through the Amtrak passenger concourse. WMATA modeling of Union Station demand estimates that 2,880 people per day will transfer between Metrorail and the intercity bus terminal at Union Station in 2030.<sup>1</sup> This project results in 4 minutes of time savings for each person making this transfer (due to a more direct connection via the H Street elevators and passageway), resulting in a daily walk time savings in 2030 of 192 person-hours. Annual walk time savings resulting from the H Street passageway's more direct route were calculated to be

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<sup>1</sup> The BCA implies that 1,742 bus riders would transfer between Metrorail and intercity bus everyday in 2010 if the intercity bus terminal were already relocated to the north end of the Union Station complex. This is in line with the 1,500-2,000 people per day that use the current Greyhound terminal.

43,073 person-hours per year in 2014, growing to 69,120 person-hours per year in 2030. On a present value basis, the value of this benefit is estimated to be \$18.4 million over the entire evaluation period.

### Highway Travel Benefits

#### *Reduction in Auto Travel*

Intercity bus riders that use Metrorail to access the intercity bus terminal will benefit from better connectivity and reduced walk times between Metrorail and the terminal. It is reasonable to expect that the Union Station capacity and circulation improvements will lead to (or induce) a marginal increase in demand for intercity bus, albeit a small increase. For the purpose of this analysis, it was assumed that in 2030, 58 travelers per day (equating to 2 percent of the number of people taking intercity bus and traveling to/from the intercity bus terminal via Metrorail in that year) who would have otherwise used personal vehicles for their intercity travel, will switch to intercity bus as a result of the improvements. In 2014, it is expected that 36 people per day would make this switch. As discussed further in the BCA report, the BCA assumes that this project will reduce intercity vehicle trips by 30 trips per day in 2030, for an estimated savings of 6,821 vehicle-miles per day.

#### *Accident Cost Savings*

Reductions in VMT lower the incidence of traffic accidents. The cost savings from reducing the number of accidents include direct savings (e.g., reduced personal medical expenses, lost wages, and lower individual insurance premiums) as well as significant avoided costs to society (e.g., second party medical and litigation fees, emergency response costs, incident congestion costs, and litigation costs). The value of all such benefits – both direct and societal – could also be approximated by the cost of service disruptions to other travelers, emergency response costs to the region, medical costs, litigation costs, vehicle damages and economic productivity loss due to workers inactivity.

This analysis estimates that, for the first year after the project is completed (2014), the project would result in an annual savings of 0.02 fatalities, 1.0 injury, and 2.9 property-damage-only accidents on our nation's roadways. By 2030, the annual savings is estimated to grow to 0.03 fatalities, 1.5 injuries and 4.8 property-damage-only accidents.

#### *Auto Operating and Usage Cost Savings*

The small number of intercity travelers who are expected to switch from auto to bus will result in fewer VMT, which results in quantifiable vehicle operating and usage cost savings. In terms of operating costs, shifting from auto to bus would reduce overall VMT, which would provide savings in the marginal costs of auto travel (fuel, maintenance and tires). It would also result in less vehicle depreciation (higher vehicle resale value), hence longer life and reduced ownership of personal vehicles over the long term.

Using the Internal Revenue Service (IRS) standard mileage rate of \$0.50 per mile in 2010 dollars for the fixed and variable costs of automobiles, the VMT reduction is estimated to save \$765,000 per year in 2014, growing to \$1.23 million per year in 2030 in vehicle operating and usage costs. These benefits accruing from the Union Station project are estimated to have a present value of \$12.2 million over the evaluation period.

*Environmental Benefits*

One important benefit of a reduction in VMT is a reduction in air emissions. With fewer vehicles on the road, there will be a reduction in such pollutants as carbon dioxide (the primary greenhouse gas), sulfur dioxide, particulate matter, nitrogen oxides, and volatile organic compounds. The present value of the monetary benefits accrued due to reduced emissions over the life time of the project is estimated at \$0.9 million.

Benefits Not Included in the Evaluation

Some types of benefits generated by the project were either challenging to estimate or do not lend themselves to quantification in terms that can be assigned a monetary value. The benefits are listed here and discussed in Appendix C.

- North Mezzanine Walk Time Savings during Off-Peak Periods
- Station Connection with the DC Streetcar, H Street Buses and Adjoining Neighborhoods
- Improved ADA Access Reliability
- Safety and Security Benefits
- Intercity Highway Congestion Reduction
- Additional Amtrak, MARC and VRE Ridership
- Increased Use of Metrorail to/from the New Intercity Bus Terminal
- Benefits of Relocating the Intercity Bus Terminal to Union Station

*Economic Costs Included in the Evaluation*

This benefit-cost analysis includes both upfront capital investment costs as well annual operating and maintenance (O&M) costs that have been estimated for the project and expressed in 2010 dollars. The distribution of capital costs and the construction spending timeline is presented in Table 4. Although the benefit-cost analysis only analyzes costs in 2010 dollars, it should be noted that the capital cost estimate uses a 3.5 percent escalation rate to escalate the 2010 costs to year-of-expenditure dollars. The unescalated costs in 2010 dollars are \$32.9 million. At a discount rate of 7 percent the PV of the capital costs is \$27.5 million.

**Table 4: Capital Cost Breakdown**

	Costs in Millions of Dollars			
	2011	2012	2013	Total
Year of Expenditure \$	\$2.15 M	\$8.60 M	\$25.25 M	\$36.0 M
2010 \$	\$2.08 M	\$8.03 M	\$22.78 M	\$32.88 M

The benefit-cost analysis includes an additional O&M cost of \$200,000 (in 2010 dollars) per year for every year in the evaluation period after the completion of project construction (i.e., beginning in 2014). The project will result in a net increase of five elevators and two escalators. The analysis assumes O&M costs remain constant in real terms throughout the evaluation period (i.e., no growth beyond inflation). At a discount rate of 7 percent the PV of the operating and maintenance costs is \$2.2 million. The present value of all costs (both capital and O&M) is estimated to be \$29.7 million.

**Table 5: Summary of Project Benefits**  
(at 7 percent Real Discount Rate in the Base Case Scenario)

Benefit Type	Total Discounted Value of Benefits (2010 \$)
Walk Time Savings Resulting from North Mezzanine Improvements	\$8.9 M
Walk Time Savings for Transfers Between Intercity Bus and Metrorail	\$18.4 M
Walk Time Savings Benefits for Burnham Place Travelers	\$6.0 M
Vehicle Operating & Usage Cost Savings Benefits	\$12.2 M
Accident Reduction Safety Benefits	\$27.5 M
Environmental Benefits	\$0.9 M
<b>TOTAL BENEFITS</b>	<b>\$73.9 M</b>

**Benefit-Cost Analysis Results**

The results of the BCA's benefits analysis are summarized in Table 5. The first four benefit types are considered economic competitiveness benefits, accident reduction is a safety benefit, and the environmental benefits are sustainability benefits. At a 7 percent real discount rate the present value of the project's total benefits is \$73.9 million (in 2010 dollars). Similarly, the PV of project costs is \$29.7 million (in 2010 dollars). The Net Present Value (NPV) of the project is \$44.2 million.

This base case scenario results in a benefit-cost ratio of 2.5 and an economic rate of return of 15.5 percent. To test the robustness of the project's benefit-cost analysis results, DDOT and WMATA looked at other scenarios. At a 3 percent discount rate the 2010 NPV of project benefits and costs is \$130.2 million, and the benefit-cost ratio increases to 4.8 (the present value of each benefit and cost category for this scenario is presented in the BCA report). If costs were 10 percent higher than expected and benefits 10 percent lower than expected the outcome would be a benefit-cost ratio of 2.0 and an NPV of \$34 million using a 7 percent discount rate and a benefit-cost ratio of 3.9 and an NPV of \$110 million using a 3 percent discount rate.

### Evaluation of Project Performance

DDOT suggests that the best measurement of short-to-intermediate stage project success will be the calculation of actual travel time and queuing time reductions for Metrorail customers in the north mezzanine once the project is completed. Additional performance evaluation measurements should include ridership volumes on the new H Street elevators and pedestrian counts in the completed H Street passageway. Over time DDOT will evaluate qualitative and quantitative measurement of real estate development in NoMa, H Street, NE and at Burnham place. DDOT will work with U.S. DOT to establish the final list of desired measurement factors.

### Job Creation and Economic Stimulus

Using the job creation calculations generated by the President's Council of Economic Advisors in their May, 2009 report, "Estimates of Job Creation from the American Recovery and Reinvestment Act of 2009", the Union Station improvements will create 391.3 jobs in its expected three year design and construction duration. DDOT estimates that approximately 15 percent of the project value, representing the cost of elevator and escalator fabrication and other large components, will be spent at United States locations outside of the DC area. Once the project is put into service there will be ongoing equipment maintenance positions for the new elevators and escalators as well as the ventilation and cooling equipment servicing the H Street passageway. WMATA estimates that the improvements will require the hiring of one additional person for on-going station cleaning.

While the District of Columbia currently has an unemployment rate only slightly higher than the national rate (10.0 vs. 9.5 percent) there are wide variations in the rate by Ward. Wards 5, 7 and 8 on the eastern side of the District have unemployment rates significantly higher than the District average. DDOT and WMATA will work with the contractors selected for this work to develop an aggressive job recruitment campaign. Both agencies will also reach out to trade union representatives to work with them on recruiting for represented positions and jobs filled through hiring halls. We will present a plan to U.S. DOT shortly after any grant award.

As managers of hundreds of millions of dollars of federally-funded construction contracts, both DDOT and WMATA work with experienced contractors familiar with and observant of state and federal safety regulations and labor work rules. Both agencies maintain DBE and WBE goals for contract spending and have aggressive affirmative action programs.

## 5. Secondary Selection Criteria

### Innovation

WMATA's Capital Project department uses a design-build methodology for most projects and this project should work well using that approach. The design guidelines are established and the contracting community is familiar with the replacement of existing station elements such as elevators. The 1<sup>st</sup> Street entrance relocation lends itself to an accelerated schedule as it is a

discreet portion of the work that is relatively low-cost and yields immediate congestion relief in the north mezzanine area. DDOT hopes to accelerate completion of that portion of the project.

The project parties may also consider a design and build-to-budget approach where contractors submit bids for the portion of the project they would build for a pre-established lump sum. DDOT recently used this bidding methodology very successfully on the FHWA-funded 11<sup>th</sup> Street bridge project.

**Partnership**

Until recently getting all of the many public and private sector stakeholders to work cooperatively on complex and expensive improvement projects had been difficult. With passage of the Passenger Rail Investment and Improvement Act of 2008 and some Congressional encouragement, however, the stakeholders have completed a working master plan of desired station improvements and established working groups to advance the major projects. The Union Station Metrorail Station Access and Capacity Improvements project has broad support from the station’s transportation providers (Amtrak, MARC, VRE and Greyhound), private sector investors and the neighboring communities.

**6. Project Readiness**

**Project Schedule**

Using local funds, DDOT initiated the conceptual design of the Metrorail station improvements with WMATA and design consultants in July, 2009. Working with other Union Station stakeholders, the preliminary design process identified various options for capacity and access improvements. The conceptual design is now complete, as demonstrated in the design drawings attached to this application, and DDOT and WMATA are ready to move quickly to initiate a design-build process for the package of improvements. While DDOT awaits a decision on its grant application the agency intends to continue design work on the 1<sup>st</sup> Street, NE entrance relocation and the associated Section 106 historic preservation review.

**Table 6: Projected Cash Spend Rate by Years for Station Improvements**

CASH FLOW SCHEDULE	SPEND YEAR			TOTAL
	2011	2012	2013	
TASKS				
Sec. 106/ Public Hearing/ Easements	\$1,250,000	\$0	\$0	\$1,250,000
PE/Contract Documents	\$650,000	\$100,000	\$0	\$750,000
Project Management	\$250,000	\$1,000,000	\$1,306,000	\$2,556,000
Design/Build Contract	\$0	\$7,500,000	\$23,544,000	\$31,044,000
Contingency	\$0	\$0	\$400,000	\$400,000
Annual Draw	\$2,150,000	\$8,600,000	\$25,250,000	\$36,000,000

The cash spend table above represents a conservative estimate of the project cash flow. If U.S. DOT funds the grant application, DDOT and WMATA will try and advance the 1<sup>st</sup> Street entrance relocation project, a \$2.0 million, discreet and straight-forward element of the project with very significant congestion relief results, as an early-start activity in 2011.

#### Environmental Approvals

On August 12 FTA Region III issued a Probable Class of Action letter to DDOT classifying the project as a Class II action with a Section 106 consultation. In a July 2 letter, the District of Columbia's State Historic Preservation Office acknowledged DDOT's request to initiate a Section 106 process primarily for historic stone walls. Much of the original stone retaining wall along 1<sup>st</sup> Street, NE was torn out and replaced during the construction of the Metrorail station, and the project's proposed alterations will primarily affect areas of the wall which are reproductions of the original stone. (Both letters are included in the Appendix to the application.)

#### Legislative Approvals

The project requires no legislative approvals. As noted in the Financing section, on June 24, 2010 the WMATA Board of Directors authorized the establishment of a nickel surcharge for station specific capital improvements at up to six stations in the Metrorail system. If DDOT and WMATA are successful in obtaining grant funding, the WMATA Board of Directors must authorize the collection of the nickel fare surcharge on entries and exits at Union Station.

In addition to SHPO review and approval of modifications to certain historic retaining walls, the National Capital Planning Commission (NCPC) and the U.S. Commission of Fine Arts (CFA) have the right to review all aspects of the design. DDOT and WMATA have already made two project presentations to the staff of the NCPC and CFA. They have expressed general support for the concept of the Metrorail station improvements.

#### State and Local Planning

The project is included in the National Capital Region Transportation Planning Board's FY 2010-2015 Transportation Improvement Program under Pedestrian Passageway/Tunnel (TIP ID: 2597) and Union Station Access Enhancements (TIP ID: 5708). A copy of the TIP may be found at [http://www.mwcog.org/clrp/projects/tip/fy1015tip/DC\\_FY\\_2010-2015\\_TIP.pdf](http://www.mwcog.org/clrp/projects/tip/fy1015tip/DC_FY_2010-2015_TIP.pdf).

#### Technical Feasibility

In July of 2009 DDOT and WMATA initiated a conceptual design process for the Metrorail station improvements. The project management team retained a pedestrian modeling consultant to confirm existing congestion problems and analyze the impact of projected ridership growth on crowding and congestion out to 2030. WMATA also initiated preliminary engineering and design work with consultants to examine options for increasing vertical access capacity at the station along with completing the partially constructed H Street passageway.

During the past twelve months the design team considered a range of elevator, escalator and stair improvements and adopted a recommended set of improvements that are constructible and affordable, have a manageable impact on other stakeholders and provide the needed congestion relief and access improvements. The design work is shown in Appendix B.

Roughly 70 percent of the project will be constructed within the existing WMATA station or existing WMATA easements. The remainder of the project requires temporary and permanent easements from either Amtrak or the USRC. This summer, the Union Station stakeholders initiated a consultant contract for legal and technical assistance in examining the easement requirements and property ownership issues associated with construction outside of WMATA-owned property.

#### Financial Feasibility

DDOT is confident in the financing package for the project. The USRC has a strong balance sheet and a positive cash flow from parking garage revenues and commercial lease income. A copy of its 2009 audited financials is attached in Appendix H. The WMATA Board of Directors has approved the surcharge concept for capital improvements and is familiar with the Union Station improvement project.

In 2003 the WMATA Board of Directors issued \$35.6 million of bonds backed by a fare surcharge to accelerate elevator and escalator capital projects. These bonds were paid off in the summer of 2010. The proposed bonds for Union Station capital improvements will be similar. A nickel surcharge at the station (in and out) would generate approximately \$960,000 in annual revenue which is adequate to borrow at least \$10 million for twenty years. Given the current favorable interest rate environment, it may be possible to shorten the duration of the borrowing. WMATA has an investment-grade bond rating.

Both WMATA and DDOT are long-time recipients of significant amounts of federal capital assistance. DDOT annually commits over \$120 million in FHWA formula funds to maintain and reconstruct its federal-aid highway and arterial street network. DDOT has successfully managed the obligation of additional FHWA funds in 2009 and 2010 under ARRA. Similarly WMATA manages an annual capital program of approximately \$700 million of which roughly \$390 million is FTA-funded. With the recent expansion of WMATA's capital budget the agency is hiring additional staff to manage its capital program.

WMATA and DDOT intend to stay within the \$36 million project budget. In the event of higher-than-anticipated bids to build the project the agencies will use value engineering actions to lower project costs. In addition, in the House-passed FY11 Transportation and Infrastructure appropriations bill there is an additional \$500,000 appropriated towards this project which is not included in the current project financial plan.

## **7. Federal Wage Rate Certification**

See Appendix G for a copy of DDOT's federal wage rate certification.

## **8. Update to DDOT Project Pre-Application**

Since the pre-application the FTA issued a determination of probable class of action for this project as a Documented Categorical Exclusion with a Section 106 consultation requirement. Additionally, the project has received \$6.0 million in local funding support from the USRC. As clarification to the pre-application submission, the project state is the District of Columbia. Project benefits will flow primarily to Maryland residents (based on state of origin Metrorail surveys) as well as residents of the District of Columbia and the Commonwealth of Virginia.