BENNING ROAD & BRIDGES TRANSPORTATION IMPROVEMENTS

ENVIRONMENTAL ASSESSMENT

DRAFT MAY 2016

ENVIRONMENTAL ASSESSMENT

FOR THE

BENNING ROAD & BRIDGES TRANSPORTATION IMPROVEMENTS WASHINGTON, DC

Prepared pursuant to 42 U.S.C. 4332(2)(c) by:
U.S. Department of Transportation Federal Highway Administration
District Department of Transportation

in cooperation with Federal Transit Administration
National Park Service
National Capital Planning Commission

4/7/16
Date of Approval

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4/11/16
Date of Approval

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EXECUTIVE SUMMARY

The District Department of Transportation (DDOT), in conjunction with the Federal Highway Administration (FHWA), is proposing transportation improvements (the proposed action) along the Benning Road corridor in Washington, DC. The proposed action would improve transportation infrastructure conditions, enhance safety and operations along the corridor and at key intersections, enhance pedestrian and bicycle facilities, and extend streetcar transit service. FHWA is the lead federal agency for the Benning Road and Bridges Transportation Improvements Environmental Assessment (EA), with DDOT (the Applicant) as joint lead. The Federal Transit Administration (FTA), National Capital Planning Commission (NCPC), and National Park Service (NPS) are cooperating agencies.

The proposed improvements are anticipated to be predominantly within DDOT right-of-way (ROW). The proposed action would also include FHWA approval to allow DDOT to use Federal Aid Route ROW on Benning Road for streetcar operations. FHWA concurred with the use of this ROW for mass transit use in a letter to DDOT dated April 18, 2013. The project is included in the adopted National Capital Region Transportation Planning Board Transportation Improvement Program (TIP) and the Financially Constrained Long Range Plan (CLRP). Where noted, the "Benning Road and Bridges Transportation Improvements EA Project Team" as listed includes the technical team members also listed in **Chapter 6**, **List of Preparers**.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508), FHWA's *Environmental Impact and Related Procedures* (23 CFR 771 and 774), FHWA's *Technical Advisory Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (T6640.8A), and DDOT's *Environmental Process Manual*. The project also includes the evaluation of potential effects to cultural resources in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 300101 et seq.).

The EA for the Benning Road and Bridges Transportation Improvements project ("the project") includes the Purpose and Need, Alternatives, Affected Environment, Environmental Consequences and Public and Agency Coordination, as outlined below.

ES-1 PURPOSE AND NEED

The purpose of the Benning Road and Bridges Transportation Improvements project is to address deficiencies in transportation infrastructure conditions, improve safety conditions and operations for both motorized and non-motorized access, and to provide for increased mobility and accessibility by improving transit operations and options between the intersection of Benning Road, and Oklahoma Avenue and the Benning Road Metrorail Station.

The Benning Road corridor is located within the Northeast section of Washington, DC. This area has been part of several studies and plans in the past including the *DC Transit Future System Plan*, the *Benning Road Streetcar Extension Feasibility Study* and the *Benning Road Corridor Redevelopment*

Framework Plan. The need to improve the Benning Road corridor to safely and efficiently accommodate all modes of transportation is a recurring theme in previous planning studies. The specific needs for this project are the following:

- Improve transportation infrastructure conditions;
- Enhance safety and operations along the corridor and at key intersections;
- Enhance and install pedestrian and bicycle facilities; and
- Extend streetcar transit service.

The Purpose and Need was vetted through public and agency coordination (refer to **Chapter 5, Public and Agency Coordination)** and was used to develop and screen alternatives (refer to **Chapter 2, Alternatives**).

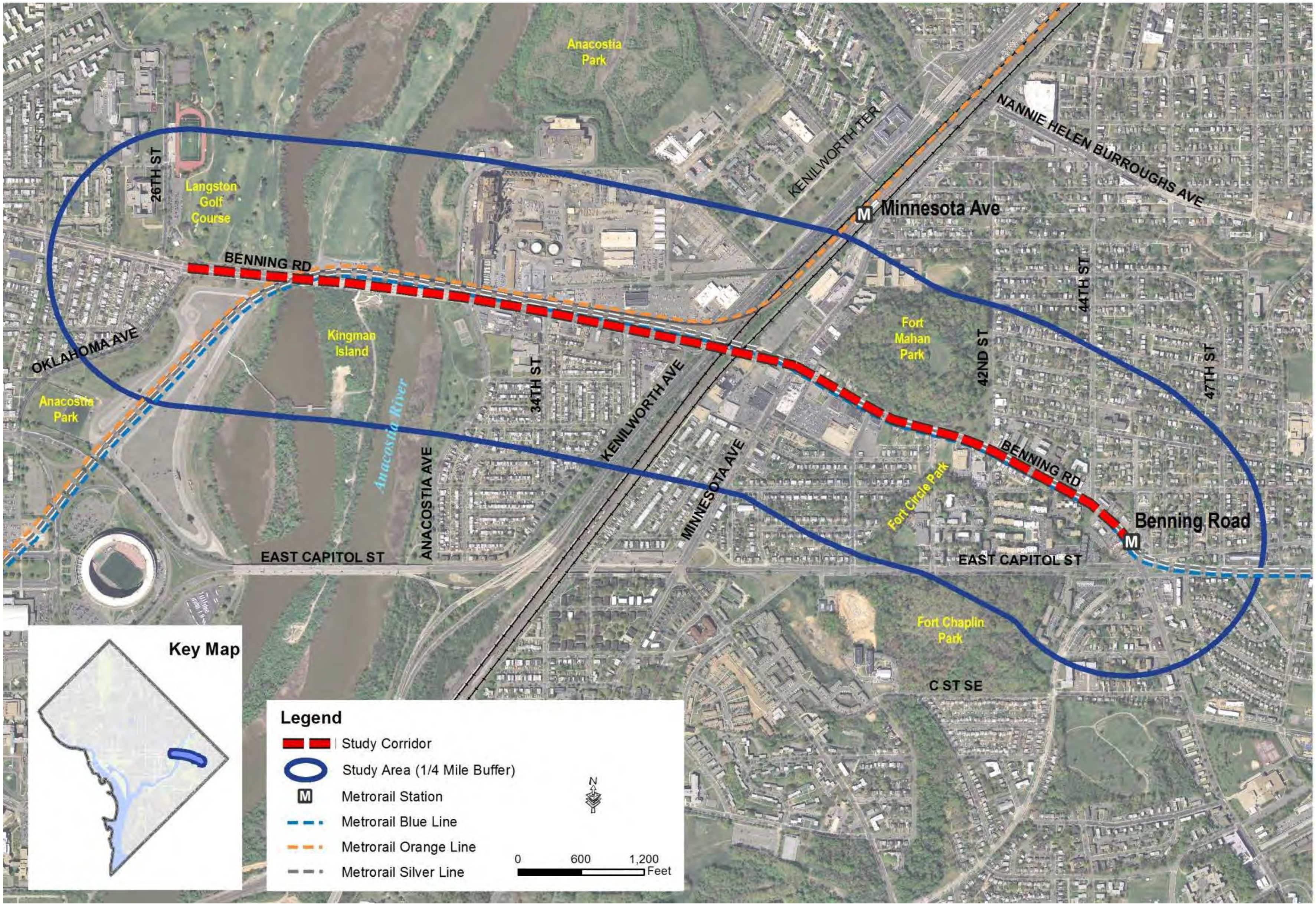
ES-2 PROJECT BACKGROUND

The Benning Road corridor is approximately two miles long. The study area (the "project study area") is shown in **Figure ES-1**. The western terminus for the project is the intersection of Benning Road and Oklahoma Avenue and the eastern terminus is the Benning Road Metrorail Station.

This area has been part of several studies and plans in the past including the *DC Transit Future System Plan*, DDOT *Benning Road Streetcar Extension Study* and *Benning Road Corridor Redevelopment Framework Plan*, all of which highlight the need to improve the Benning Road corridor to safely and efficiently accommodate all modes of transportation.

As described in **Chapter 1, Purpose and Need**, the existing bridges over DC-295 (Kenilworth Avenue) and the CSX Railroad are in need of repair or rehabilitation. The existing bridges also lack adequate sidewalks. The current intersection of Benning Road and Minnesota Avenue provides several safety and operational challenges. Pedestrian and vehicular accidents as well as delays at this intersection are commonly observed. The existing corridor shows heavy transit activity and would benefit from additional transit options such as the extension of the existing H/Benning Streetcar Line that currently terminates at the Oklahoma Avenue and Benning Road intersection.

Figure ES-1: Study Area



Source: DC Office of the Chief Technology Officer (OCTO); Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

ES-3 ALTERNATIVES

Several alternatives for the Benning Road and Bridges Transportation Improvements project were developed in accordance with the project objectives established to meet the project Purpose and Need. The details are provided in **Chapter 2, Alternatives**. Three alternatives, including the No Build Alternative and two Build Alternatives, are analyzed in detail in this EA.

No Build Alternative:

The No Build Alternative includes the existing roadway, bridges, median, sidewalks, and transit services as shown in **Figure ES-2**. It assumes that the currently programmed, committed, and/or funded transportation projects in the project study area would be completed.

While the No Build Alternative does not completely meet the Purpose and Need of the proposed action, it provides a baseline for comparing the environmental consequences of the Build Alternatives.

Build Alternative 1:

Build Alternative 1 would reconstruct portions of the roadway and some structures along Benning Road to enhance safety and operations, enhance and install pedestrian and bicycle facilities, and extend streetcar service along the study corridor. It includes the following infrastructure changes to meet the project Purpose and Need:

Improve transportation infrastructure conditions

- Replacement of the Benning Road Bridges over DC-295 and CSX tracks with one new bridge;

Enhance safety and operations along the corridor and at key intersections

- Reconstruction of the intersection of Benning Road and Minnesota Avenue to provide pedestrian safety improvements;
- Providing a longer turn lane on eastbound Benning Road towards northbound Minnesota Avenue;
- Providing a second left-hand turn lane from northbound Minnesota Avenue to westbound Benning Road, and extending the right-turn pocket lane from southbound Minnesota Avenue to eastbound Benning Road;
- Providing ADA compliant sidewalks on both sides of the bridge;
- Construction of pedestrian safety improvements at Benning Road and 36th Street;

Enhance and install pedestrian and bicycle facilities

- Reconstruction of sidewalks and construction of shared-use paths along the corridor; and

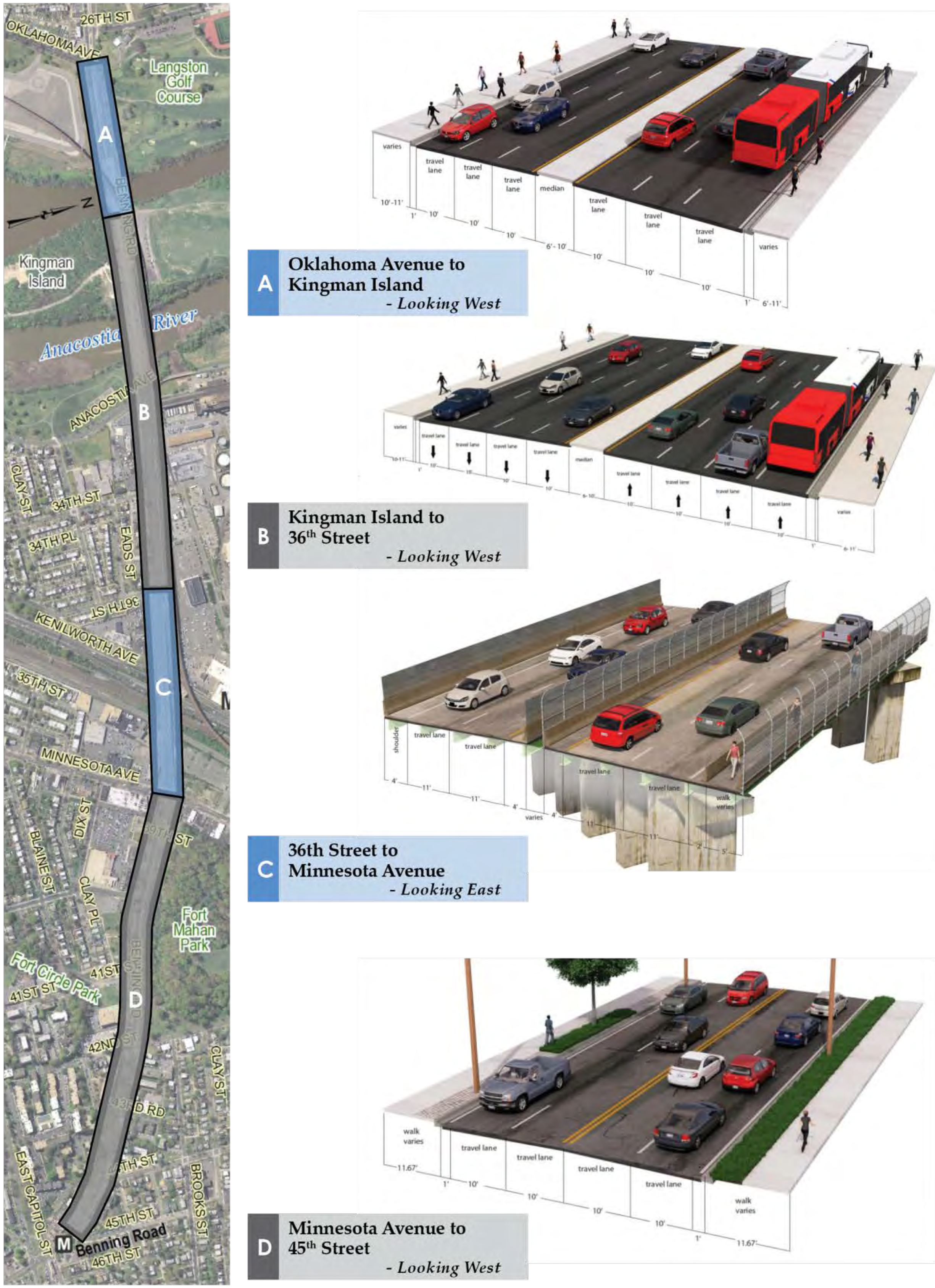
Extend streetcar service

- Construction of shared streetcar lanes and ancillary facilities including platforms and propulsion systems.

Build Alternative 1 would provide a 12-foot, curb-running streetcar shared lane for the length of the Benning Road corridor as shown in **Figure ES-3**. The shared streetcar lane would be constructed in the outside lane adjacent to the curb and pedestrian facilities. It would include all facilities and structures needed for the streetcar operations including traction power substations (TPSS), catenary poles, and streetcar stops. Build Alternative 1 would place passenger loading platforms at locations about a quarter-mile apart and constructed along the eastbound and westbound directions of Benning Road at six locations as shown in **Figure ES-4**:

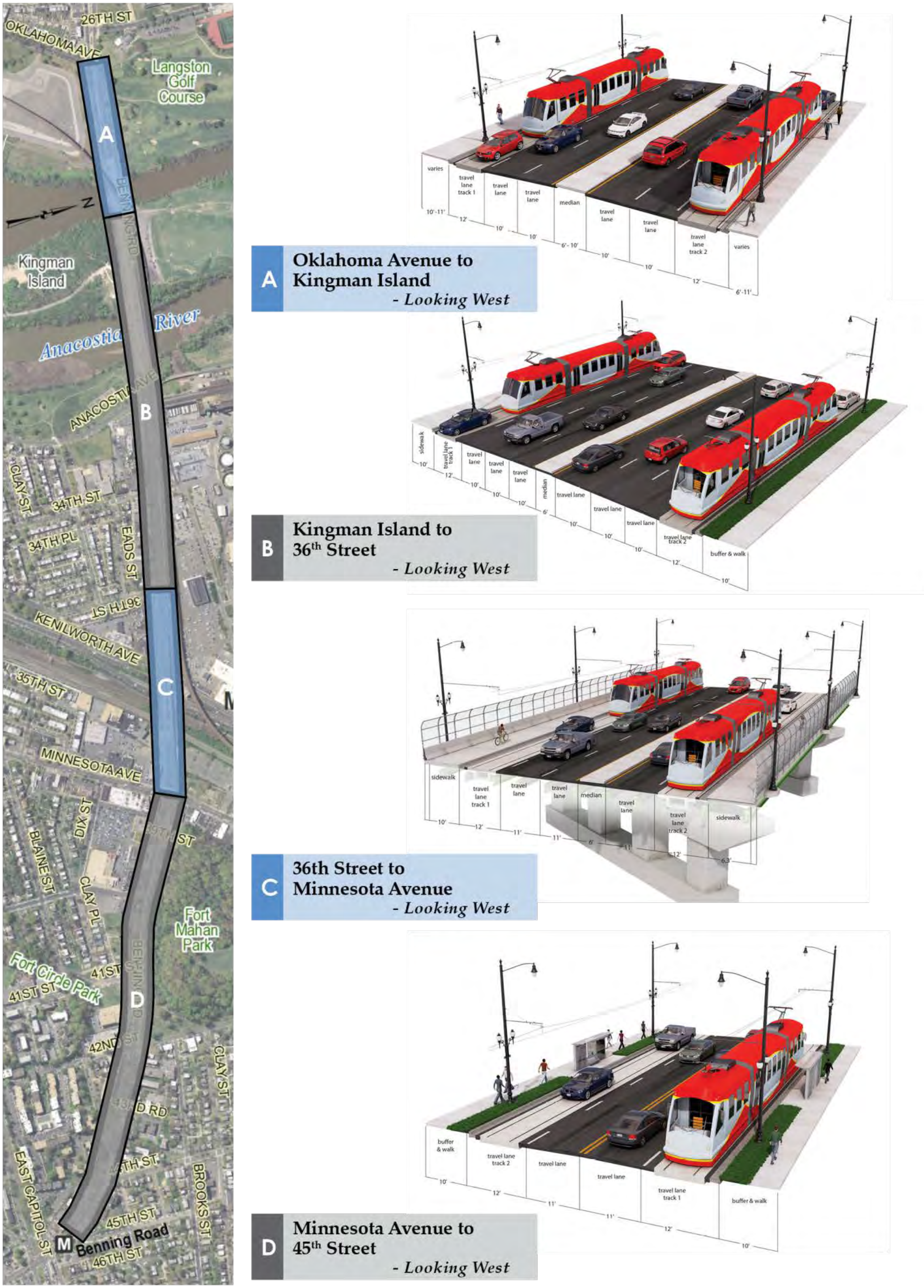
- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metrorail Station (eastern terminus).

Figure ES-2: Existing/No Build Alternative Roadway Typical Sections



**Grassy buffer area varies and is not shown in sections A and B above*

Figure ES-3: Build Alternative 1 Typical Sections (Wired Propulsion System)



Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring

Figure ES-4: Proposed Platform Locations

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Build Alternative 2:

Similar to Build Alternative 1, Build Alternative 2 would reconstruct portions of the roadway and some structures along Benning Road to enhance safety and operations, enhance and install pedestrian and bicycle facilities, and extend streetcar service along the study corridor. The main difference between Build Alternative 1 and 2 is that in Build Alternative 2, the streetcar would be running in the median lane. Build Alternative 2 would also include the following infrastructure changes to meet the project Purpose and Need:

Improve transportation infrastructure conditions

- Replacement of the Benning Road Bridges over DC-295 and CSX tracks with one new bridge;

Enhance safety and operations along the corridor and at key intersections

- Reconstruction of the intersection of Benning Road and Minnesota Avenue to provide pedestrian safety improvements;
- Providing a longer turn lane on eastbound Benning Road towards northbound Minnesota Avenue;
- Providing a second left-hand turn lane from northbound Minnesota Avenue to westbound Benning Road, and extending the right-turn pocket lane from southbound Minnesota Avenue to eastbound Benning Road;
- Providing ADA compliant sidewalks on both sides of the bridge;
- Construction of pedestrian safety improvements at Benning Road and 36th Street;

Enhance and install pedestrian and bicycle facilities

- Reconstruction of sidewalks and construction of shared-use paths along the corridor; and

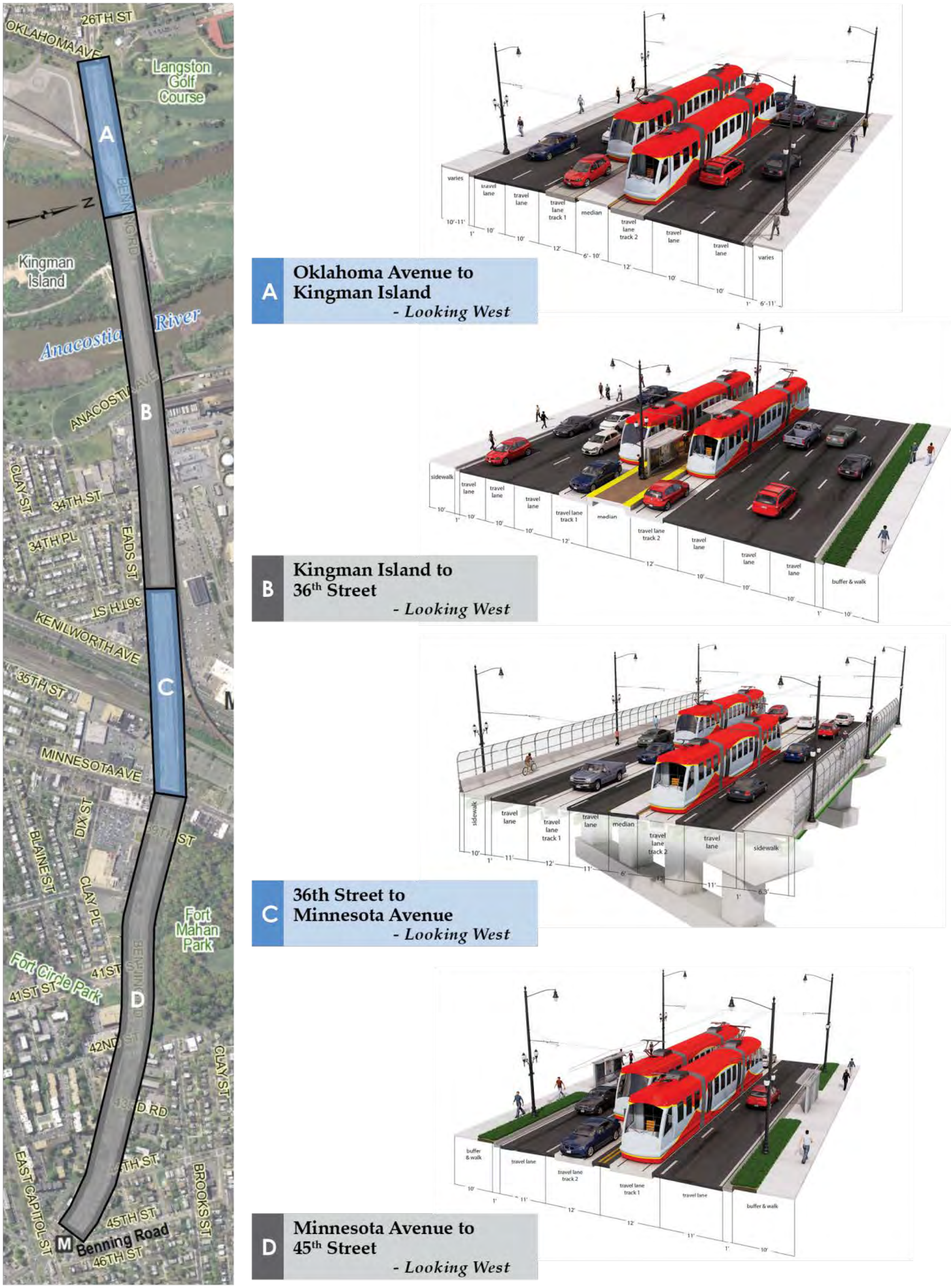
Extend streetcar service

- Construction of shared streetcar lanes and ancillary facilities including platforms and propulsion systems.

Build Alternative 2 would provide a 12-foot, median running streetcar lane for the length of the Benning Road corridor as shown in **Figure ES-5**. The shared streetcar lane would be constructed in the inside lane adjacent to the median. It would include all facilities and structures needed for the streetcar operations included TPSS, catenary poles, and streetcar stops. Build Alternative 2 would place passenger loading platforms at similar locations about a quarter-mile apart and constructed within the median to serve both eastbound and westbound directions of Benning Road at six locations as shown in **Figure ES-4**:

- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metrorail Station (eastern terminus).

Figure ES-5: Build Alternative 2 Typical Sections (Wired Propulsion System)



Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.

ES-4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The EA identifies existing social, economic and natural resources within the project study area. Specific resources areas analyzed in the EA include:

- Zoning and Land Use;
- Neighborhoods and Community Facilities;
- Environmental Justice;
- Development and Joint Development;
- Transportation (including the roadway network, transit, pedestrian and bicycle facilities and freight rail service);
- Section 4(f);
- Public Parklands;
- Cultural Resources;
- Aesthetics and Visual Quality;
- Geology, Topography, and Soils;
- Surface Water Resources;
- Wildlife including Threatened and Endangered Species;
- Trees and Vegetation;
- Utilities;
- Hazardous Materials;
- Noise and Vibration;
- Air Quality; and
- Energy Use and Climate Change.

The EA analyzes reasonably foreseeable direct, indirect, and cumulative environmental impacts associated with the No Build Alternative and the two Build Alternatives for each of the resource areas. These environmental consequences are summarized in **Table ES-1**.

Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7-1508.80).

As shown in **Table ES-1**, based on the environmental analysis no major impacts or long-term impacts are anticipated to the resources for any of the project alternatives.

Table ES-1: Comparison of Alternatives and Impacts

Resource	Impacts		
	No Build Alternative	Build Alternative 1	Build Alternative 2
Right of Way and Relocation Impacts	None	None	None
Zoning and Land Use	None	None	None
Neighborhoods and Community Facilities	None	• On-street parking in perpetuity along Benning Road. While on-street parking along Benning Road is currently limited to off-peak hours and the majority of businesses and community facilities provide off-street parking, the elimination of on-street parking between 42nd Street and 44th Street could impact some of the residences and places of worship located in this area; however, this impact can be minimized through design options. • Exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are also predicted at nine other residences (four at the Car Barn track switches and five near the 42nd Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower	• Exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are predicted at five other residences (four at the Car Barn track switches and one near the 42nd Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower travel speeds. • FTA frequent vibration impact criteria are predicted at 20 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 2 alignment; however, this would be less than the impacts experienced due to Build Alternative 1 and track ballast mats would be used to minimize the vibration from streetcar passbys. These impacts will be mitigated as discussed

Resource	Impacts: No Build Alternative	Impacts: Build Alternative 1	Impacts: Build Alternative 2
		travel speeds. • FTA frequent vibration impact criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 1 alignment; however track ballast mats would be used to decouple the vibration from streetcar passbys. These impacts will be mitigated as discussed in **Section 4.10**.	in Section **4.10**.
Environmental Justice	None	Impacts to the Environmental Justice communities are the same as those noted for neighborhoods and community facilities. With incorporated mitigation, these impacts/effects are not anticipated to be disproportionately high or adverse.	Impacts to the Environmental Justice communities are the same as those noted for neighborhoods and community facilities. With incorporated mitigation, these impacts/effects are not anticipated to be disproportionately high or adverse.
Development and Joint Development	None	None	None
Transportation and Traffic Operations	• Impacts due to intersections operating at an LOS of E and worse during peak periods: – One intersection in the morning and three intersections in the evening in 2018 – Five intersections in the morning and four intersections in the evening in 2040	• Intersections operating at an LOS of E and worse during peak periods: - One intersection in the morning and two intersections in the evening in 2018 - Two intersections in the morning and two intersections in the evening in 2040 • Loss of all existing on-street parking along entire length of Benning Road	• Intersections operating at an LOS of E and worse during peak periods: - One intersection in the morning and one intersection in the evening in 2018 - Two intersections in the morning and two intersections in the evening in 2040 • Relocation of one existing bus stop along Benning Road

Resource	Impacts		
	No Build Alternative	Build Alternative 1	Build Alternative 2
		• Relocation of two existing bus stops along Benning Road	
Section 4(f)	None	None	None
Public Parklands	None	None	None
Cultural Resources	None	No Adverse Effect to historic properties in the APE. (This is a preliminary assessment, subject to consultation with Consulting Parties and the DCSHPO).	No Adverse Effect to historic properties in the APE. (This is a preliminary assessment, subject to consultation with Consulting Parties and the DCSHPO).
Aesthetics and Visual Quality	None	• Impact to Eastern Benning Road viewshed due to loss of trees • Low impact to the following viewsheds: - Western Benning Road - Kingman Park - Benning Road and Minnesota Avenue Intersection - Benning Road Metrorail Station	• Impact to Eastern Benning Road viewshed due to loss of trees • Low impact to the following viewsheds: - Western Benning Road - Kingman Park - Benning Road and Minnesota Avenue Intersection - Benning Road - Metrorail Station
Geology, Topography, and Soils	None	None	None
Surface Water Resources	None	None	None
Wildlife including Threatened and Endangered Species	None	None	None
Trees and Vegetation	None	Some or all of the approximately 175 street trees within the Benning Road right- of-way would need to be removed or relocated.	Some or all of the approximately 175 street trees within the Benning Road right- of-way would need to be removed or relocated.
Utilities	None	Relocations required	Relocations required
Hazardous Materials	None	None	None
Noise and Vibration	None	• Exceedances of the FTA severe criteria are predicted at four residences (Category 2 land uses) due to track switches for the 26th Street track to the Car Barn. • Additionally, exceedances of the	• Exceedances of the FTA severe criteria are predicted at four residences (Category 2 land uses) due to track switches for the 26th Street track to the Car Barn. • Additionally, exceedances of the

Resource	Impacts: No Build Alternative	Impacts: Build Alternative 1	Impacts: Build Alternative 2
		FTA moderate criteria are also predicted at nine other residences under Build Alternative 1. • Exceedances of the FTA frequent vibration criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 1 alignment. • Noise and vibration impacts would also be associated with the construction of the project. • Project noise levels from streetcar operations under Build Alternative 1 are predicted to be well below the existing ambient noise levels due to the slower travel speeds. • As discussed in **Section 4.10**, implementation of proposed mitigation measures would ensure that potential impacts to sensitive resources from noise and vibration would be reduced to a less than significant level.	FTA moderate impact criteria are also predicted at five other residences under Build Alternative 2. • Exceedances of the FTA frequent vibration criteria are also predicted at 20 residences and one institutional receptor (Dorothy I. Height/ Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 2 alignment. • Noise and vibration impacts would also be associated with the one construction of the project. • Project noise levels from streetcar operations under Build Alternative 2 are predicted to be lower than Build Alternative 1 due to the greater distance between the source and the receptors. • As discussed in **Section 4.10**, implementation of proposed mitigation measures would ensure that potential impacts to sensitive resources from noise and vibration would be reduced to a less than significant level.
Air Quality	None	None	None
Energy Use and Climate Change	None	None	None
Total Capital Costs		**$172,599,803**	**$174,509,260**

ES-5 PUBLIC AND AGENCY COORDINATION

As part of the EA process, public and agency coordination was conducted in accordance with NEPA and Section 106. To help identify issues related to the Benning Road and Bridges Transportation Improvements project, key stakeholders that included federal and local agencies and the public were invited to review and comment on the Purpose and Need described in **Chapter 1**. Stakeholders also had the opportunity to review and comment on the 15 preliminary Build Alternatives identified in **Chapter 2**. Public outreach activities also included the development of a project website and newsletter.

Two public meetings were held on April 22 and May 28, 2014 in the project study area. The project was coordinated with agencies through the regular DDOT interagency meeting. The first agency meeting was held on March 4, 2014 at DDOT.

A public hearing for the EA will be held after the release of the EA to the public within the public comment period.

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1 PURPOSE AND NEED

1.1 INTRODUCTION

The District Department of Transportation (DDOT), in conjunction with the Federal Highway Administration (FHWA), is proposing transportation improvements (the proposed action) along the Benning Road corridor in Washington, DC. The proposed action would improve transportation infrastructure conditions, enhance safety and operations along the corridor and at key intersections, enhance pedestrian and bicycle facilities, and extend streetcar transit service. FHWA is the lead federal agency for the Benning Road and Bridges Transportation Improvements Environmental Assessment (EA), with DDOT (the Applicant) as joint lead. The Federal Transit Administration (FTA), National Capital Planning Commission (NCPC), and National Park Service (NPS) are cooperating agencies. The proposed action is anticipated to be predominantly within the DDOT right-of-way (ROW). The proposed action would also include FHWA approval to allow DDOT to use Federal Aid Route ROW on Benning Road for streetcar operations. FHWA concurred with the use of this ROW for mass transit use in a letter to DDOT dated April 18, 2013. The project is included in the adopted National Capital Region Transportation Planning Board Transportation Improvement Program (TIP) and the Financially Constrained Long Range Plan (CLRP).

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508), FHWA's *Environmental Impact and Related Procedures* (23 CFR 771 and 774), FHWA's *Technical Advisory Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (T6640.8A), and DDOT's *Environmental Process Manual*. The project also includes the evaluation of potential effects to cultural resources in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 300101 et seq.).

The Benning Road corridor is located within the northeast section of Washington, DC and is approximately two miles long. The project study area (the study area) is shown in **Figure 1-1**. The western terminus for the project is the intersection of Benning Road and Oklahoma Avenue and the eastern terminus is the Benning Road Metrorail Station. The corridor primarily includes residential areas with heavy retail and business activity around the intersection of Benning Road and Minnesota Avenue. The study area also abuts Langston Golf Course and Fort Mahan Park. Within the study area, Benning Road crosses the Anacostia River, Kingman and Heritage Island Park, DC-295, and Metro and CSX tracks.

Benning Road is a principal arterial and currently carries 26,000 annual average daily traffic (AADT). It carries four lanes of traffic in each direction between Oklahoma Avenue and 36th Street, and two through lanes of traffic in each direction between 36th Street and the Benning Road

Metrorail Station. Benning Road in the study area is adjacent to the H/Benning Streetcar Line. The study area includes two Metrorail stations: Benning Road and Minnesota Avenue.

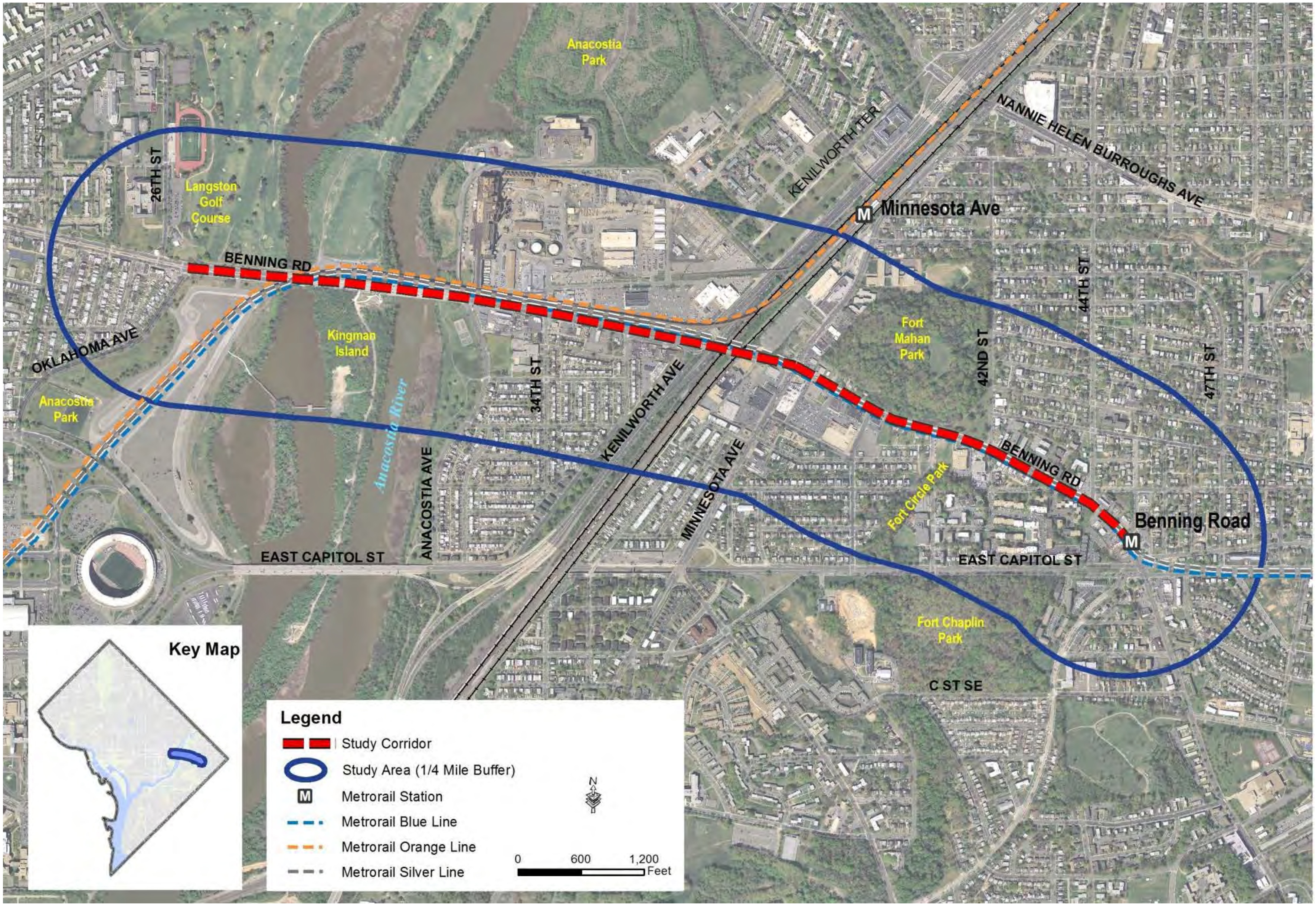
The intersection of Benning Road and Minnesota Avenue is an important intersection with a high volume of pedestrian and vehicular activity. This intersection provides safety challenges and has been continually listed as one of the top five intersections that record both high crash rates and crash frequency within the District. The *Traffic Safety Statistics Report for the District of Columbia* (DDOT, 2011-2013) indicates that the intersection of Benning Road and Minnesota Avenue recorded 120 crashes during the period between 2011 and 2013, with 38 of those crashes resulting in injuries.

The two bridges crossing DC-295 and the CSX tracks in the study area provide both structural and functional challenges. These bridges are in need of repair or rehabilitation, and lack adequate sidewalks. The existing corridor shows heavy transit activity that would benefit from an additional transit option such as the extension of the existing streetcar line that currently terminates at the Oklahoma Avenue and Benning Road intersection. This area has been part of several studies and plans in the past including the *DC Transit Future System Plan* (DDOT, 2010), *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013) and *Benning Road Corridor Redevelopment Framework Plan* (DC Office of Planning, 2008). The need to improve the Benning Road corridor to safely and efficiently accommodate all modes of transportation has been noted in these previous planning studies.

1.2 PROJECT PURPOSE

The purpose of the Benning Road and Bridges Transportation Improvements project is to address deficiencies in transportation infrastructure conditions, improve safety conditions and operations for both motorized and non-motorized access, and to provide for increased mobility and accessibility by improving transit operations and options between the intersection of Benning Road, and Oklahoma Avenue and the Benning Road Metrorail Station.

Figure 1-1: Study Area



Source: *DC Office of the Chief Technology Officer (OCTO); Benning Road and Bridges Transportation Improvements EA Project Team, February 2014*

1.3 PROJECT NEEDS

The needs for this project are the following:

- Improve transportation infrastructure conditions;
- Enhance safety and operations along the corridor and at key intersections;
- Enhance and install pedestrian and bicycle facilities; and
- Extend streetcar transit service.

1.3.1 IMPROVE TRANSPORTATION INFRASTRUCTURE CONDITIONS

Benning Road is a heavily-used principal arterial. It carries approximately 26,000 AADT. It currently operates with four general purpose lanes of traffic in each direction between Oklahoma Avenue and 36th Street, and two through lanes of traffic in each direction between 36th Street and the Benning Road Metrorail Station.

Some sections of the roadway are in need of geometric improvements such as the Benning Road and 36th Street section as well as the intersection of Benning Road and Minnesota Avenue. The intersection of Benning Road and Minnesota Avenue needs to be reconfigured to provide a safer crossing for pedestrians and safer vehicular turning movements as described in **Section 1.3.2**.

The project study area consists of several bridges that cross the Anacostia River, Kingman Island, Kenilworth Avenue or DC-295, and Metro and railroad tracks. The bridges over the Anacostia River and Kingman Island are in good condition; however, the two bridges (the "Viaduct Bridges") crossing over DC-295 and Metro and railroad tracks are in need of structural rehabilitation or replacement. These bridges consist of two parallel structures for the eastbound and westbound lanes with two independent spans. The eastbound bridge was rebuilt in 1961 partially on top of the original piers with a complete deck replacement in 1989. The westbound bridge was re-built in 1982 on top of the existing 1946 plan foundations.

Both eastbound and westbound spans are currently adequate for their intended traffic loads; however, their condition and projected longevities are highly variable. The concrete decks and steel superstructures exhibit satisfactory condition, and the abutments, piers, joints and wearing surfaces have areas that are in need of repair or rehabilitation. Inspections of these bridges by DDOT in 2012 and 2013 indicate that the bridges:

- *Have a fair to poor substructure condition:* Superstructures are in overall good or satisfactory condition, but substructures have cracked and spalled concrete.
- *Have exceeded their lifespan:* The bridges have exceeded their calculated fatigue life.
- *Do not meet current seismic criteria:* The existing bearings are steel rocker type. The roadway pavement conditions of Benning Road also vary. There are several sections that are in good condition; however, there are some sections that need pavement work.

1.3.2 ENHANCE SAFETY AND OPERATIONS

One of the needs for this project is to improve the safety of pedestrians and vehicles using this corridor.

The intersection of Benning Road and Minnesota Avenue has historically been and continues to be listed as one of the top five intersections that records both high crash rates and crash frequency within the District (see **Appendix A** for more detailed crash data and safety analysis). The *Traffic Safety Statistics Report for the District of Columbia* (2011-2013) shows that the intersection of Benning Road and Minnesota Avenue recorded 120 crashes during the period between 2011 and 2013 with 38 of those crashes resulting in injuries (See **Table 1-1**). The *Benning Road Streetcar Extension Feasibility Study (DDOT, 2013)* showed that 443 vehicles turn left during the PM peak period from eastbound Benning Road to northbound Minnesota Avenue, and projected the number of vehicles to increase to 563 by 2040. The length of the left turn lane is not adequate to accommodate the number of buses and cars attempting to make this turn, and traffic attempting to clear the intersection within the allowed signal timings has resulted in numerous left-turn swipes, rear-end vehicle collisions, and pedestrian collisions, as shown in **Figure 1-2**. Conflicts at this intersection affects safety for all modes and an intersection reconfiguration is required to improve the overall level of service and geometry for pedestrians, bicyclists, buses, and vehicles.

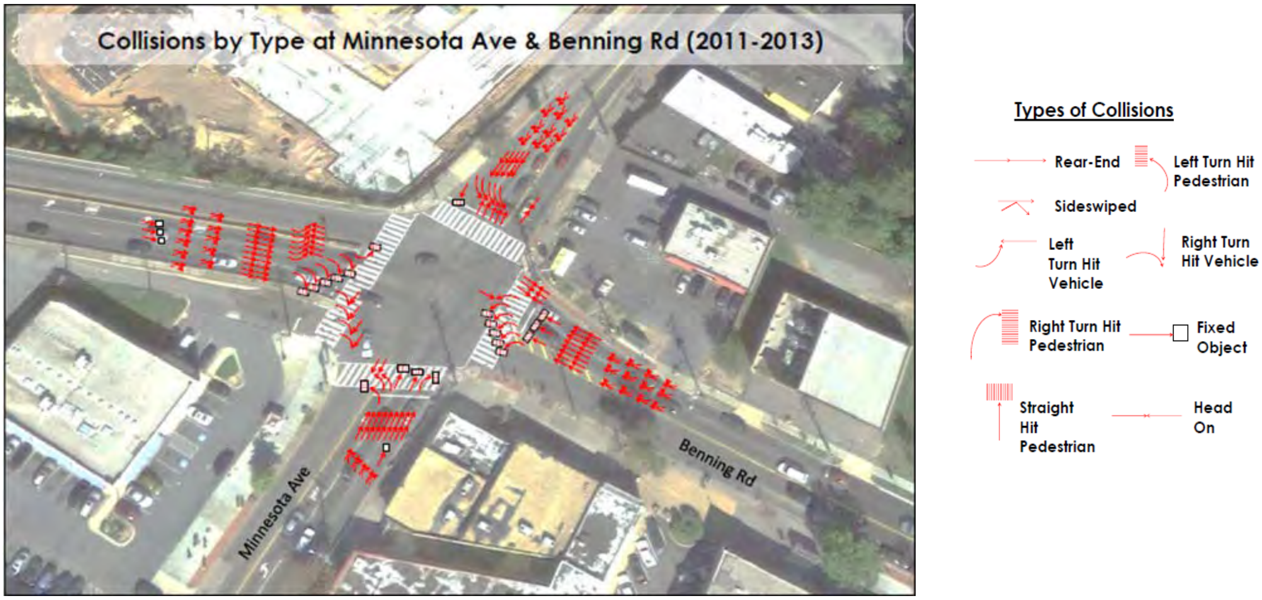
Safe pedestrian crossings are also needed at the intersection of 36th Street where pedestrians must cross the DC-295 expressway ramp to access the Viaduct Bridges. The pedestrian curb ramp at 36th Street is not aligned to the crossing and the curb ramp to access the Viaduct Bridges is not compliant with the Americans with Disabilities Act of 1990 (ADA).

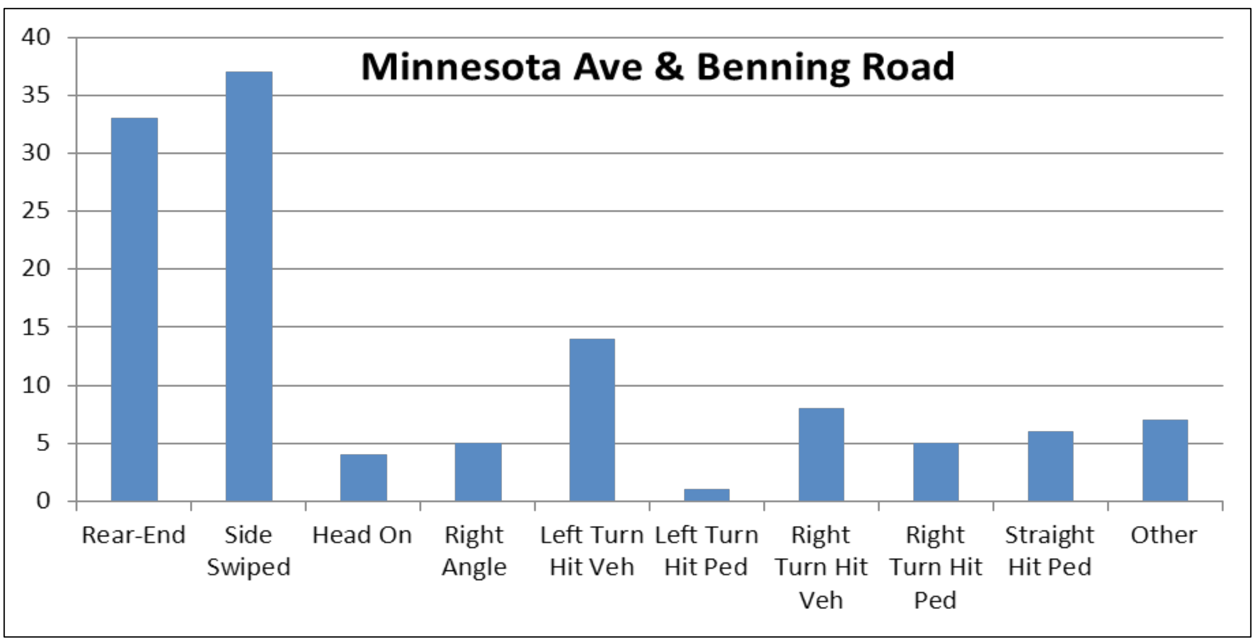
Table 1-1: Benning Road Corridor Crash Data

Intersection	Number of Crashes	Crash Rate (MEV)	Collision Type (2011-2013)									Crashes Resulting in Injury
			Rear-end	Sideswipe	Right Angle	Head on	Left Turn Hit Veh	Left Turn Hit Ped	Right Turn Hit Veh	Right Turn Hit Ped	Straight Hit Ped	
Benning Rd and Anacostia Ave	23	0.46	52%	17%	17%		4%					12
Benning Rd and 34th St	16	0.31	19%	25%	6%	6%	19%		13%			9
Benning Rd and 36th St	26	0.74	46%	31%	4%	4%	8%					14
Benning Rd and Minnesota Ave	120	2.48	28%	31%	4%	3%	12%	1%	7%	4%	5%	38
Benning Rd and 45th St	12	0.49	25%	42%			8%		8%		8%	4
Benning Rd and Central Ave	10	0.43	30%	40%			10%		10%		10%	3
Benning Rd and East Capitol St	90	1.51	26%	27%	8%	4%	6%		9%	2%	7%	32
Minnesota Ave and Dix St	16	0.64	44%	0%	6%		19%		13%		6%	9
Minnesota Ave and Grant St	16	0.72	44%	19%			13%					7
Minnesota Ave and Hayes St	2	0.11	50%	50%								0
Minnesota Ave and Gault Pl	6	0.32	17%	50%			17%					1
Minnesota Ave and NHB Ave	49	1.39	35%	27%	12%	6%	6%		6%			22

Source: *Traffic Safety Statistics Report for the District of Columbia* (DDOT, 2011-2013)

Figure 1-2: Minnesota Avenue and Benning Road Intersection Crash Data





Source: *Traffic Safety Statistics Report for the District of Columbia* (DDOT, 2011-2013)

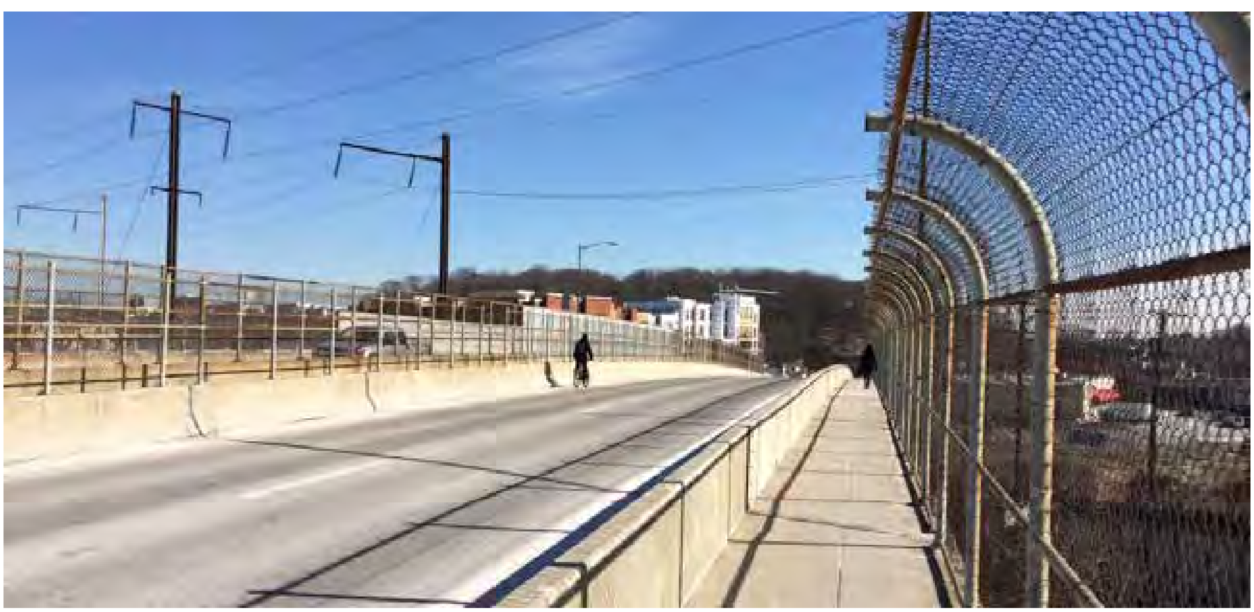
1.3.3 ENHANCE AND INSTALL PEDESTRIAN AND BICYCLE FACILITIES

Sidewalks are located along the north and south sides of Benning Road for much of the length of the corridor; however, in several areas these sidewalks are narrow, not ADA compliant, in poor condition and unwelcoming, as shown in **Figure 1-3**.

The Viaduct Bridges over DC-295 have a narrow sidewalk only on the south side of the bridge. The original bridges did not include facilities for pedestrians or bicycles. A sidewalk on the south side of the bridge was created by adding a Jersey barrier at the edge of the outside travel lane and using the shoulder area as a sidewalk, as shown in **Figure 1-4**. This sidewalk is narrow and does not encourage a pleasant walking experience. With the Jersey barrier on one side and a metal fence on the other side, it also creates a confined experience. The bridge needs to have appropriate and safe sidewalks on both sides of the bridges to enhance pedestrian mobility and access.

Figure 1-3: Existing Sidewalk on North Side of Benning Road near Oklahoma Avenue (looking West)

Figure 1-4: Existing Sidewalk on South Side of Benning Road Viaduct Bridges (looking East)



The study corridor lacks adequate facilities for non-motorized access. There are no existing bike facilities or shared use paths that provide safe bicycle access in the corridor. Benning Road is identified as "poor" condition in the District's *Bicycle Master Plan* (DDOT, 2005). The *Bicycle Master Plan* and the Bicycle Element of the *moveDC Plan* (DDOT, 2014) also identify Benning Road across the Anacostia River, as an off-street trail as part of Anacostia River recreational facilities. With the increase in businesses, facilities, and population along the corridor, and around the Benning Road and Minnesota Avenue intersection area in particular, the need to accommodate non-motorized modes such as bicycles is increasing. In addition, because of the area around the intersection of Benning Road and Minnesota Avenue is an activity hub and a neighborhood destination, and Benning Road's direct access to destinations such as H Street and Anacostia River recreational facilities, there is a need to improve the bicycle connections and access across the Anacostia River and the DC-295 bridges.

1.3.4 EXTEND STREETCAR TRANSIT SERVICES

Benning Road is an important transit corridor exhibiting heavy Metrorail access and bus activity. The Minnesota Avenue and Benning Road Metrorail stations are located within the project study area and provide access to the Orange Line, and Silver and Blue Lines, respectively. In 2012, on an average weekday, 3,257 passengers boarded at the Minnesota Avenue Metrorail Station, while 3,183 boarded at the Benning Road Metrorail Station.

Figure 1-5: Crowded Bus Stop on Minnesota Avenue at Benning Road (looking South)

Bus service in the project study area is provided by the Washington Metropolitan Area Transit Authority (WMATA). Commuter routes X1 and X3 operate in peak hours from the Minnesota Avenue Metrorail Station via Benning Road continuing to Tenleytown and Foggy Bottom, respectively. Route X2 is a major Metrobus service operating between the Minnesota Avenue Metrorail Station via H Street to McPherson Square. Current ridership for X1, X2, and X3 is the fourth highest in the Metrobus system with almost 14,000 passengers per day and approximately 4,700 passengers accessing the routes at the Minnesota Avenue Metrorail Station. MetroExtra Route X9 provides limited-stop rush-hour service from the Capitol Heights Metrorail Station via Benning Road and H Street to Metro Center. Metrobus U8 serves as a neighborhood circulator and feeder to the Minnesota Avenue, Benning Road, and Capitol Heights Metrorail Stations via Benning Road, Minnesota Avenue and Nannie Helen Burroughs Avenue.

WMATA, in cooperation with DDOT, completed a transit assessment study in January 2010 and identified the H Street/Benning Road Metrobus corridor as part of the Metrobus Priority Corridor Network (PCN). The PCN includes 24 high-volume Metrobus corridors across the region. These high-volume corridors account for half of all bus ridership in the current Metrobus system. Key findings from the assessment revealed that buses on the corridor:

- *Experience passenger crowding:* Despite very high combined frequencies of bus routes, buses are approaching or are at capacity not only during peak periods but s at mid- day and in the evenings occasionally. The X lines (X1, X3, X2, and X9) have a combined frequency of 3.5 minutes during the morning peak hour (6:00–7:00 AM) between the Minnesota Avenue Metrorail Station and the H Street corridor. According to 2013 WMATA ridership data, maximum passenger loads on this segment approach the high 40s on standard 40' buses (39 seated load) and the high 60s (Route X2) on the articulated buses (60 seated load). WMATA service standards allow for 120% of the seated load during peak periods. The U8 runs every 15 minutes between the Benning Road Metrorail Station and the Minnesota Avenue Metrorail Station.
- *Do not adhere to schedule*: Schedule adherence is reported to be a problem, along with bus bunching resulting from schedule non-adherence and delays caused by congestion. The frequency in which buses arrive is also reported to be a common issue for X line riders.

The current passenger crowding on these routes indicates the need for an additional transit option that can provide a direct connection to the H Street corridor, Union Station and the downtown area. Neither the Minnesota Avenue Metrorail Station on the Orange Line nor the Benning Road Metrorail Station on the Blue and Silver Lines provide a direct connection to the H Street corridor or Union Station. In addition, the study area is also experiencing an increase in businesses and population. Several new buildings and offices have opened up in the study area in the past few years. With the increase in activity centers and population, the need for an additional transit service is becoming more apparent.

Benning Road is also an important component of the DC Streetcar program. The Benning Road corridor was identified in the *DC Transit Future System Plan* (DDOT, 2010) as part of DDOT's 22-mile priority streetcar system. DDOT recently began operation of its first streetcar line that runs on H Street and Benning Road between Union Station and Oklahoma Avenue (H Street ends at 15th Street and continues as Benning Road westward starting at 15th Street). The H/Benning Streetcar Line operates at 10 to 15 minute headways Monday through Thursday from 6:00 a.m. to midnight; Friday from 6:00 a.m. to 2:00 a.m.; Saturday from 8:00 a.m. to 2:00 a.m.; and closed Sunday (Sunday service may be phased in at a later date). . The Benning Road and Bridges Transportation Improvements project would provide a natural extension of the DC Streetcar system eastwards. It would connect to several activity hubs including the area around the intersection of Benning Road and Minnesota Avenue, a major activity center in Ward 7, as well the Benning Road Metrorail

Station located in close proximity to the District boundary. These activity hubs underline the need to connect this important area of Ward 7 with the H Street corridor, Union Station, and the downtown area with a direct enhanced transit connection through the streetcar system.

1.4 LOGICAL TERMINI

The FHWA regulations outline three general principles at 23 CFR 771.111(f) that are to be used to frame a highway project:

In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, the action evaluated in each environmental impact statement (EIS) or finding of no significant impact (FONSI) shall:

1. Connect logical termini and be of sufficient length to address environmental matters on a broad scope;
2. Have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and
3. Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

This section covers the applicability of these principles to the Benning Road and Bridges Transportation Improvements project.

1. **Connect logical termini and be of sufficient length to address environmental matters on a broad scope:**

The Benning Road and Bridges Transportation Improvements project connects logical termini and is of sufficient length to address environmental matters on a broad scope. This project would connect two major activity centers in northeast Washington, DC. The eastern terminus is at the Benning Road Metrorail Station with the possibility of connecting to the Minnesota Avenue Metrorail Station; two heavily traveled areas and utilized stations. The western terminus is at Benning Road and Oklahoma Avenue, which is heavily traveled by buses and is expected to become a bus transfer area. The Benning Road and Bridges Transportation Improvements project is also a logical extension of the H/Benning Streetcar Line, which goes from H Street behind Union Station to the intersection of Benning Road and Oklahoma Avenue.

The proposed termini for the Benning Road and Bridges Transportation Improvements project are the intersection of Benning Road at Oklahoma Avenue to the west and the Benning Road Metrorail Station to the east.

The proposed western terminus for the project at the intersection of Benning Road and Oklahoma Avenue is also the east terminus for the H/Benning Streetcar Line. Streetcar maintenance facilities are located at 26th Street at a former high school facility, a few hundred feet north of the intersection of Benning Road and Oklahoma Avenue. The intersection of Benning Road and Oklahoma Avenue is also the location of an existing WMATA Metrobus stop for the heavily-used X1, X2, and X3 lines; this location is expected to soon become a transfer area for WMATA bus riders to transfer to the H/Benning Streetcar Line. Oklahoma Avenue is a major route for traffic accessing special events at the RFK Stadium.

The eastern terminus at the Benning Road Metrorail Station is an important origin and destination. It is a multimodal activity center where residents and transit riders access and exit the Metrorail Blue or Silver Line and walk to their homes and or local businesses, or access surface transit via the Metrobus U8 route.

The project limits contain numerous NEPA-related considerations including, from west to east, the NPS Langston Public Golf Course, Waters of the US associated with Kingman Island and the Anacostia River, Anacostia Park, and the Anacostia Riverwalk Trail, hazardous materials associated with a former power generation facility and railroad facilities, new mixed-use development at the corner of Benning Road and Minnesota Avenue, historic resources associated with Fort Mahan Park and the Fort Circle Trail, multiple community facilities and established residential development adjacent to both Benning Road and Minnesota Avenue.

The proposed termini allow for a sufficient range of physical construction alternatives and transit technology options to address the Purpose and Need elements and provide avoidance and minimization opportunities of the identified NEPA concerns.

2. **Have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made**:

The project corridor would have independent utility and would be usable and reasonable even if no additional transportation improvements in the area are made. Benning Road serves as the main transportation corridor within the project area. Several safety, operation and multi-modal improvements are needed on Benning Road and have been studied in previous efforts.

3. **Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements:**

This project does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. Implementation of the transportation improvements, including those that would provide for transit, would not limit future considerations for alternatives within or beyond the project corridor.

In 2003, DDOT initiated the DC's Transit Future (DCTF) System Plan and Alternatives Analysis (AA). The DCTF System Plan and AA consisted of a comprehensive assessment and evaluation of alternative modes and levels of investment in 14 corridors across the District including the H Street/Benning Road corridor. The evaluation compared the performance of Bus Rapid Transit (BRT) and streetcar modes with No Build and Baseline options in each of the system corridors. The evaluation considered more than 30 individual measures that addressed four primary goals: Improve Access and Mobility, Encourage Community and Economic Development, Enhance System Performance, and Promote Environmental Quality. The process resulted in an integrated system of recommended transit service investments in the District that includes combinations of streetcar, BRT, and enhanced bus services in appropriate corridors. The DCTF System Plan and AA was substantially completed in 2005 and subsequently updated in 2008 and 2009.

The proposed western terminus of Benning Road and Oklahoma Avenue is the eastern termini of one of the District's initial streetcar lines, the H/Benning Streetcar Line and the associated Car Barn. The Benning Road and Bridges Transportation Improvements project will consider the extension of the streetcar and other transit technologies into the proposed project study area but will not restrict the alternatives or technologies to be investigated for future improvements beyond the project study corridor.

The Benning Road and Bridges Transportation Improvements project's proposed termini meet the tenets of FHWA's *NEPA and Transportation Decisionmaking, The Development of Logical Project Termini, November 5, 1993*. The project will satisfy identified safety and rehabilitation of existing bridge structures along the facility, and multi-modal capacity improvements within the context of the local socioeconomics, future travel demand and other infrastructure improvements in the area.

1.5 PROJECT GOALS

The project goals were developed by considering the Purpose and Need, agency/public comments, and project area constraints and opportunities. The goals for the Benning Road and Bridges Transportation Improvements project include the following:

- Create a safe facility for all users of the roadway (motorists, transit, pedestrians, and bicyclists);
- Effectively manage stormwater runoff;
- Avoid and minimize use of any additional ROW outside the existing DDOT ROW to the extent possible;
- Preserve and protect environmental resources, both man-made and natural, and retain the current context of the corridor (i.e., visual aesthetic, using context-sensitive solutions in the planning and design phases of the project);
- Provide improved access to transit users and pedestrians;
- Utilize environmentally sensitive materials and practices; and
- Support land use. Between 2000 and 2010, the project study area grew by 6 percent from 9,267 to 9,831 residents. The population is forecast to grow by 10 percent between 2020 and 2040 to approximately 11,455 people. This anticipated growth will create increased demand on the existing transportation network, and mobility improvements identified in land use plans will be essential to meet transportation needs.

In addition to the project goals, the proposed improvements for the Benning Road and Bridges Transportation Improvements project consider design criteria outlined in the American Association of State and Highway Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* (AASHTO, 1999),DDOT *Design and Engineering Manual*, Chapter 28 (DDOT, 2009b), DDOT *Standard Specifications for Highways and Structures* (DDOT, 2009e), DDOT *Bicycle Master Plan* (DDOT, 2005b), DDOT *Bicycle Facility Design Guide* (DDOT, 2005a), DDOT *Environmental Policy and Process Manual* (DDOT, 2008), the *Manual on Uniform Traffic Control Devices (MUTCD) Traffic Controls for Bicycle Facilities, Part 9* (FHWA, 2009), *District of Columbia Pedestrian Master Plan* (DDOT, 2009d),AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities* and 2010 Update of the AASHTO Guide(AASHTO, 2004; Toole, 2010), and other design guidance.

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2 ALTERNATIVES

2.1 INTRODUCTION

This chapter presents a discussion of the alternatives developed for the Benning Road and Bridges Transportation Improvements Environmental Assessment (EA) including alternatives carried forward for detailed evaluation and those eliminated from further consideration. In order to respond to the Purpose and Need for the project, the alternatives carried forward for detailed evaluation or the proposed action would implement improvements to transportation infrastructure conditions, enhance safety and operations along the corridor and at key intersections, enhance pedestrian and bicycle facilities, and improve transit operations and options by extending streetcar transit service. This chapter also describes the physical and operational improvements proposed for each alternative. Where noted, the "Benning Road and Bridges Transportation Improvements EA Project Team" as listed includes the technical team members also listed in **Chapter 6, List of Preparers**.

Multiple concepts were analyzed to address the Purpose and Need described in **Chapter 1**. Streetcar concepts from the *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013) were considered in the development of alternatives. The public was involved in an extensive public involvement process in 2012 as part of the *Benning Road Streetcar Extension Feasibility Study* and again in 2014 as part of the EA (see **Chapter 5** for a more detailed discussion of public involvement). Through stakeholder input and technical analysis, 15 concept designs for the Build Alternative were developed and screened as part of the EA. **Figure 2-1** shows the steps in the process that led up to the selection of the two Build Alternatives which are described in **Sections 2.3** through **2.6**. The three following alternatives were carried forward for additional detailed analysis:

- No Build Alternative;
- Build Alternative 1 – Curbside Running Streetcar; and
- Build Alternative 2 – Median Running Streetcar.

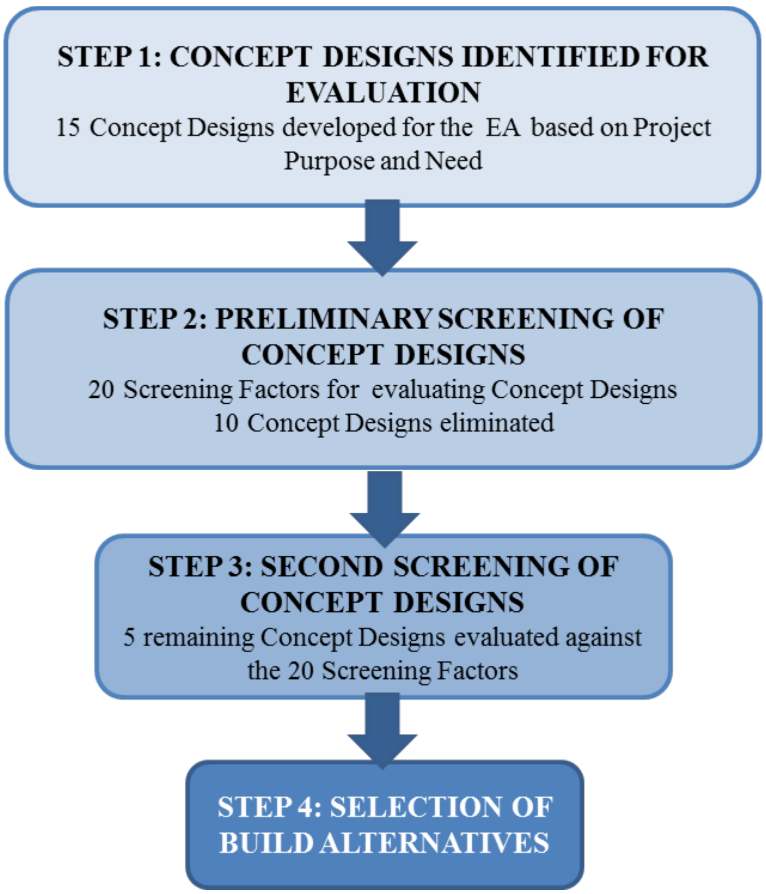
For ease of discussion, the Benning Road corridor is divided into four segments from west to east. The segments are based on existing or proposed transitions in the lane configuration and width of the right-of-way. The four segments are:

- Oklahoma Avenue to Kingman Island;
- Kingman Island to 36th Street;
- 36th Street to Minnesota Avenue; and
- Minnesota Avenue to 45th Street.

No changes are proposed under the No Build Alternative as part of this project, but the alternative would include currently programmed, committed, or funded transportation projects in the study area. While the No Build Alternative does not meet the Purpose and Need for the proposed action, it provides a baseline for comparing the environmental consequences of the Build Alternatives.

The Build Alternatives respond to the Purpose and Need for the proposed action. Both alternatives would originate at Oklahoma Avenue and terminate at the Benning Road Metrorail Station. Both Build Alternatives would involve the reconstruction of portions of the roadway and structures along Benning Road to enhance pedestrian, bicycle and vehicular safety and operations, and extend streetcar service within the corridor. Two areas requiring reconstruction are the intersection of Benning Road at Minnesota Avenue and the Viaduct Bridges over DC-295 and the CSX railroad tracks. The two Build Alternatives are summarized below and described in detail in the following sections.

Figure 2-1: Selection of the Build Alternatives



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Build Alternatives 1 and 2 would reconstruct portions of the roadway and some structures along Benning Road to enhance safety and operations, add and enhance sidewalks and bicycle facilities, and extend streetcar services within the study corridor. **Table 2-1** shows the infrastructure changes included to meet the project Purpose and Need:

Table 2-1: Build Alternatives 1 and 2 – Proposed Infrastructure Changes

Project Needs	Proposed Infrastructure Changes
Improve transportation infrastructure conditions	• Replacement of the Benning Road Bridges over DC-295 and CSX railroad tracks with one new bridge
Enhance safety and operations along the corridor and at key intersections	• Reconstruction of the intersection of Benning Road and Minnesota Avenue • Provision of a longer left-turn lane on eastbound Benning Road towards northbound Minnesota Avenue • Provision of a second turn lane from northbound Minnesota Avenue to westbound Benning Road, and extending the right-turn pocket lane from southbound Minnesota Avenue to eastbound Benning Road • Provision of an ADA-compliant sidewalks on both sides of the bridge • Constructing pedestrian safety improvements at Benning Road and 36th Street
Enhance and install pedestrian and bicycle facilities	• Reconstruction of sidewalks and construction of shared-use paths along the corridor
Extend streetcar transit service	• Construction of shared streetcar lanes and ancillary facilities including platforms and propulsion systems

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Build Alternative 1 would provide a 12-foot, curbside running shared streetcar lane for the length of the Benning Road corridor. Streetcar tracks would be constructed in the lane adjacent to the outside curb and pedestrian facilities. Build Alternative 1 would include all facilities and structures needed for the streetcar operations including traction power substations (TPSS), wired propulsion system poles, and streetcar stops. Build Alternative 1 would place stop platforms at six locations about a quarter-mile apart along the eastbound and westbound directions of Benning Road.

Where feasible, streetcar stops and WMATA bus stops would be co-located; this would require some changes to existing transit services. The streetcar passenger loading platforms would be generally 60 to 70 feet long to accommodate the double articulated, 66-foot low floor streetcar vehicle. A platform height of 8 to 10 inches will enable nearly level boarding for the streetcar while also allowing compatibility when shared with WMATA buses. Amenities such as benches, lighting, and shelters can be shared at the joint streetcar and bus stops. Schedule coordination between the streetcar and bus services would minimize the likelihood of simultaneous arrivals at the shared stops.

As shown in **Table 2-1**, Build Alternative 2 would include the same infrastructure improvements as Build Alternative 1. The main differences between Build Alternatives 1 and 2 are the location of streetcar tracks and stop platforms and the Overhead Contact System (OCS) design.

Build Alternative 2 would provide a 12-foot, median running shared streetcar lane for the length of the Benning Road corridor. Streetcar tracks would be constructed in the inside lane adjacent to the median. It would include all facilities and structures needed for the streetcar operations including TPSS, catenary poles, and streetcar stops. Streetcar stops would not be shared with local bus service, which will continue to board and alight at the curbside stops along the corridor. Build Alternative 2 would place platforms at six locations, similar to Build Alternative 1, about a quarter-mile apart and constructed within the median to serve both eastbound and westbound directions of Benning Road. Unlike Build Alternative 1, the proposed median platform at 34th Street proposed with Build Alternative 2 would eliminate the existing left turn lane into the Pepco facility.

2.2 NO BUILD ALTERNATIVE

The No Build Alternative includes the existing roadway, bridges, sidewalks, and transit services. Transit operations, including Metrobus service, would continue as they exist now. Service frequency and routing would remain the same.

The No Build Alternative assumes currently programmed, committed, or funded transportation projects in the study area would be completed. These improvements are described in **Sections 2.2.1** and **2.2.2**. No additional physical or operational improvements were identified as part of the project for the No Build Alternative. Typical sections along the existing roadway corridor are shown in **Figure 2-2**.

The No Build Alternative would not meet the project Purpose and Need because it would not address deficiencies in transportation infrastructure conditions, improve safety conditions and operations for both motorized and non-motorized access, or provide for improved transit operations and options through the extension of streetcar service between the intersection of Benning Road and Oklahoma Avenue and the Benning Road Metrorail Station. However, the No Build Alternative provides a baseline for comparing the environmental consequences of the Build Alternatives.

2.2.1 PHYSICAL IMPROVEMENTS

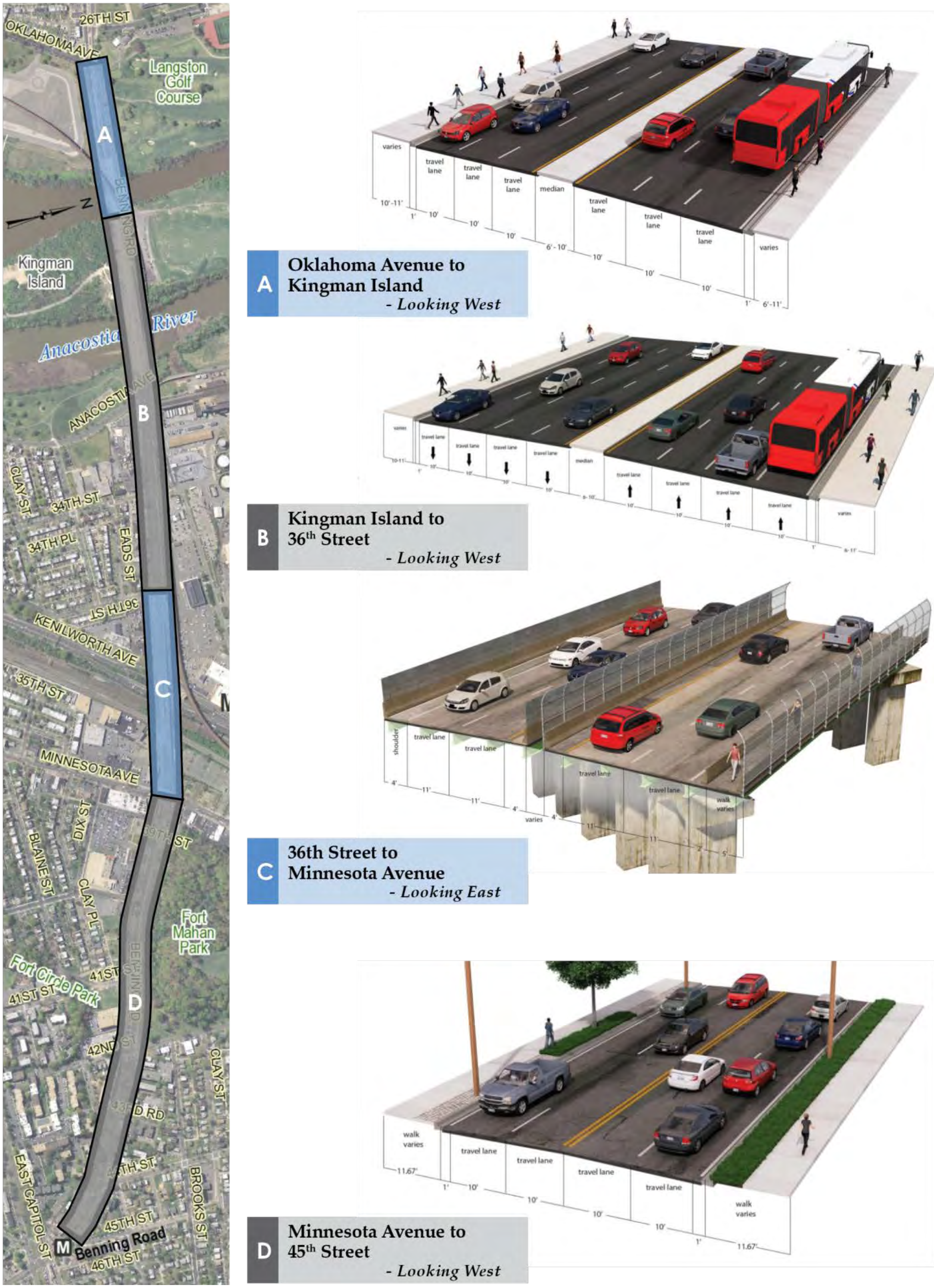
Programmed, committed, and funded transportation projects in the study area would be completed under the No Build Alternative.

The Minnesota Avenue Revitalization project (TIP #2922) includes streetscape changes to Minnesota Avenue from A Street northward to 300 feet south of the Benning Road intersection (Phase I). Construction of Phase I of the Minnesota Avenue Revitalization project began in August 2015 and is anticipated to be complete in the spring of 2017. Future phases of the Minnesota Avenue Revitalization project are dependent on the results of this study regarding the eastern streetcar terminus, but will include roadway and streetscape improvements from Benning Road northward to Nannie Helen Burroughs Avenue.

2.2.2 OPERATIONAL IMPROVEMENTS

The No Build Alternative includes a new traffic signal that is proposed as a future phase of the Minnesota Avenue Revitalization project. This signal would be located at the entrance to the parking garage behind the Department of Employment Services (DOES) Building.

Figure 2-2: Existing/No Build Alternative Roadway Typical Sections



**Grassy buffer area varies and is not shown in sections A and B above*
Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.3 CONCEPT DESIGNS IDENTIFIED FOR EVALUATION

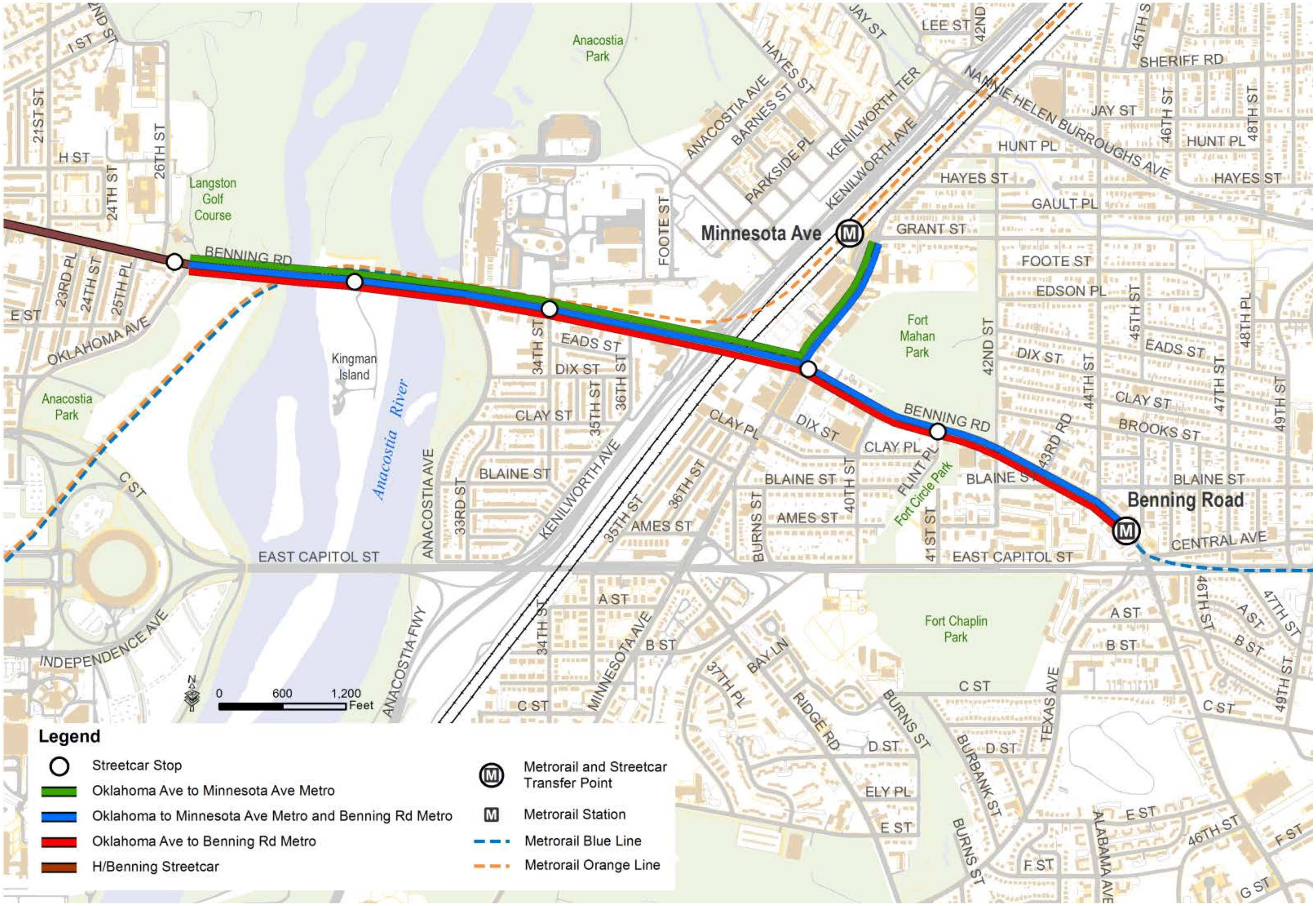
NEPA requires federal agencies to rigorously explore and objectively evaluate all reasonable alternatives, and briefly discuss the reasons for alternatives to have been eliminated from detailed study (40 CFR §1502.14(a)). The following sections describe the process that led to the development of the 15 concept designs identified for evaluation as part of the Benning Road and Bridges Transportation Improvements EA.

2.3.1 STREETCAR CONCEPTS

The Build Alternatives include the extension of streetcar service from the eastern terminus of the H/Benning Streetcar Line to the Benning Road Metrorail Station. This service would complement other surface transit options using Benning Road and serving the project study area.

As part of the *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013), three streetcar concepts were explored and are being carried forward into this EA. The first streetcar corridor would extend the H/Benning Streetcar Line from the line's eastern terminus at Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. The second streetcar corridor would begin at Oklahoma Avenue and terminate at the Benning Road Metrorail Station. A third streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. The streetcar corridor concepts are shown in **Figure 2-3**.

Figure 2-3: Streetcar Corridor Concepts



Source: Benning Road Streetcar Extension Feasibility Study (DDOT, 2013)

2.3.2 STREETCAR ALIGNMENTS AND TYPICAL SECTIONS

For each of the three streetcar concepts, four options were developed for locating the streetcar track and platforms within the roadway right-of-way.

Two options were developed for a curbside running track and include:

- *Option 1*: A raised streetcar-only lane; and
- *Option 2*: A shared travel lane that would accommodate both streetcars and other vehicles.

Similarly, two options for a median running track were developed and include:

- *Option 3*: An exclusive, raised streetcar-only lane; and
- *Option 4*: A shared travel lane that would accommodate both streetcars and other vehicles.

In addition to the streetcar corridor concepts the inclusion of an exclusive bike lane was explored for each of the three streetcar corridor concepts.

- *Option 5*: Exclusive bike lane.

An example of existing streetcar platforms adjacent to shared travel lanes are shown in **Figure 2-4**. Typical sections for curbside running streetcar in a shared lane (Option 2) and a median running streetcar in a shared lane (Option 4) are shown in **Figure 2-5** and **Figure 2-6**, respectively. Each typical section displays both wired and wireless propulsion systems as discussed in **Section 2.9**. Typical sections for Options 1 and 3 are similar to Options 2 and 4 respectively, but with exclusive streetcar lane operations.

Figure 2-4: Existing Streetcar Platform *(Shared Travel Lane)*

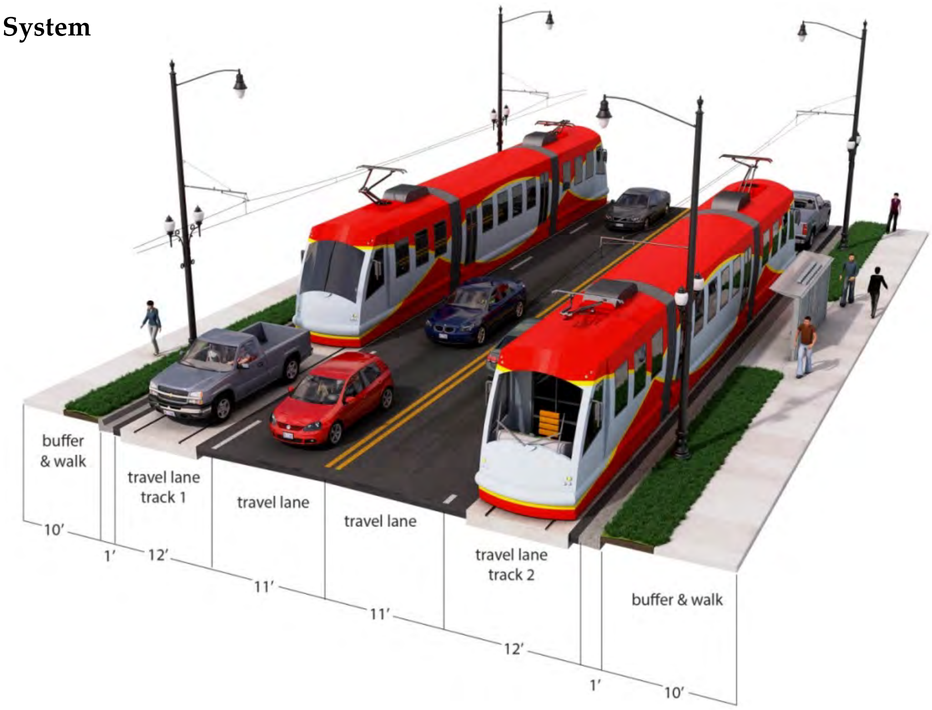
Median Streetcar Platform on Benning Road at Oklahoma Avenue (looking west)

Curbside Streetcar Platform on H Street at 8th Street (looking west)

Source: Google Maps, May 2014

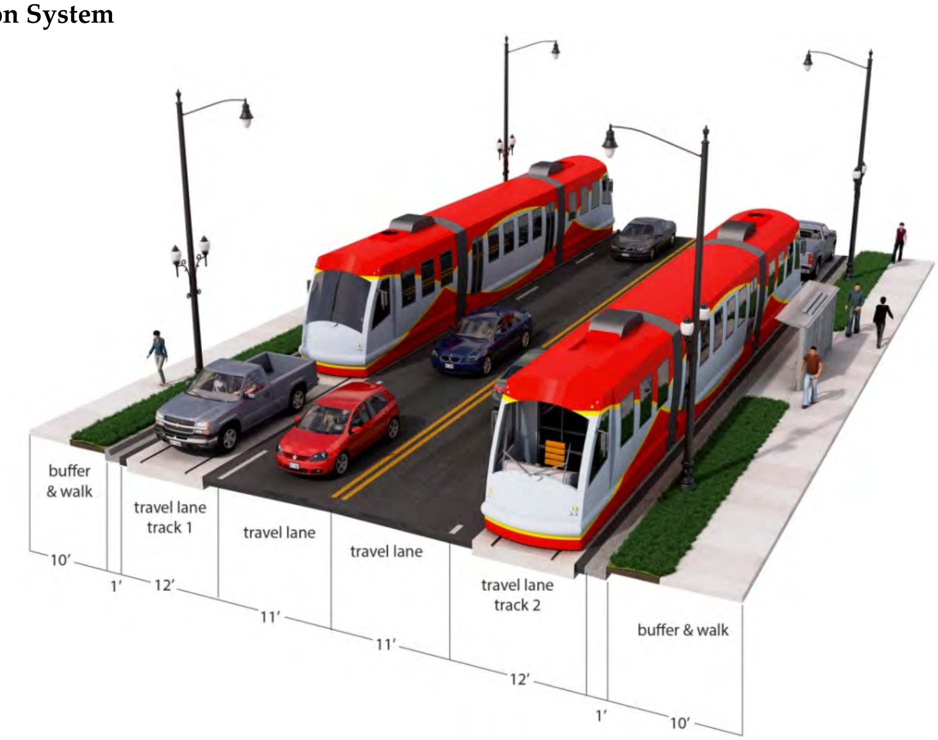
Figure 2-5: Curbside Running Typical Section *(Option 2- Shared Travel Lane)*

Wired Propulsion System



**Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.*

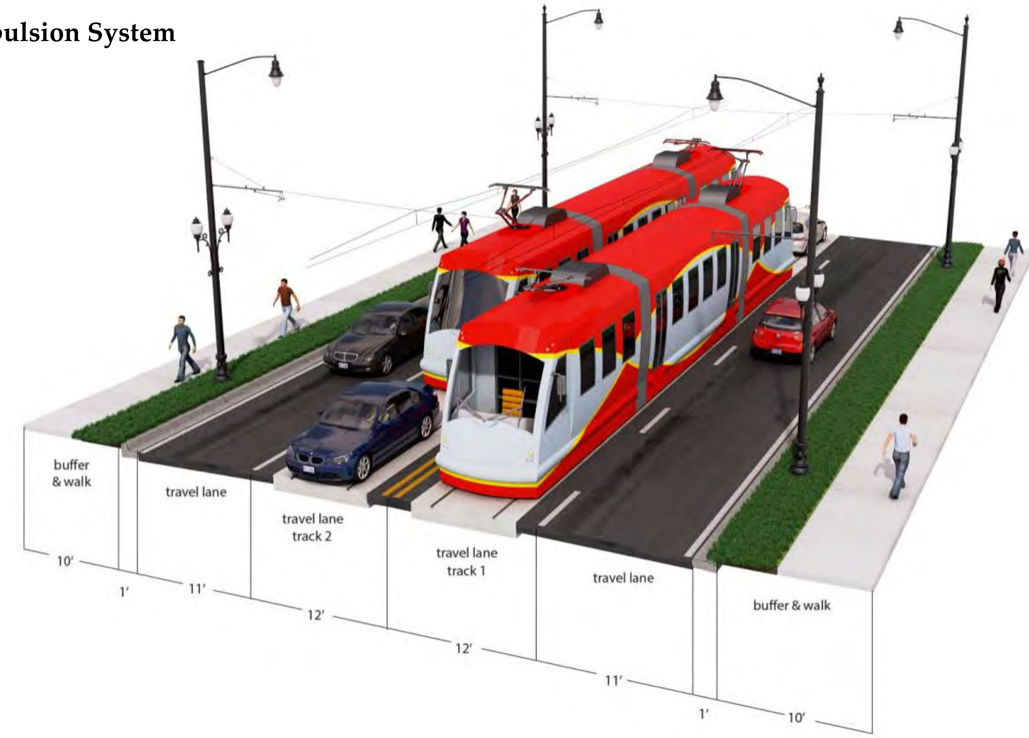
Wireless Propulsion System



Source: *Benning Road and Bridges Transportation Improvements EA Project Team*

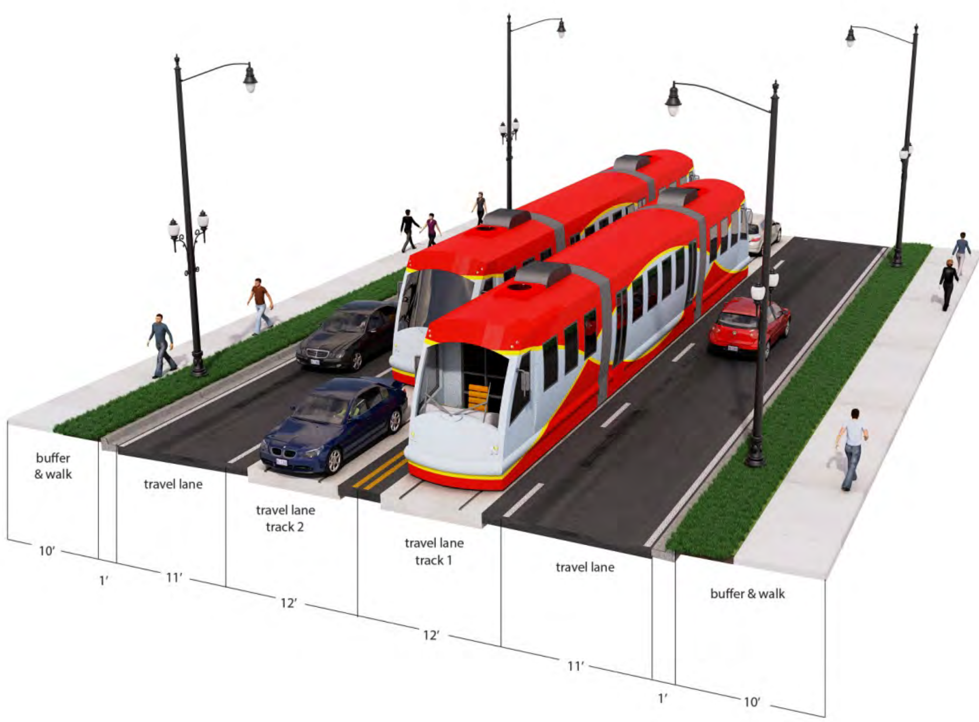
Figure 2-6: Median Running Typical Section *(Option 4 - Shared Travel Lane)*

Wired Propulsion System



**Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.*

Wireless Propulsion System



Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.3.3 CONCEPT DESIGNS – POTENTIAL BUILD ALTERNATIVES

Combining the three streetcar corridor concepts from the *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013) and identified in **Section 2.3.1**, with the four streetcar alignment options and an option for bike facilities (as described in **Section 2.3.2**), yielded 15 different preliminary Build Alternative concepts as shown in **Table 2-2** .

Table 2-2: Preliminary Build Alternative Concepts

	Option 1 Curb – Exclusive	Option 2 Curb – Shared	Option 3 Center – Exclusive	Option 4 Center – Shared	Option 5 Bike Lane
Oklahoma to Minnesota Avenue Metro	Concept 3	Concept 1	Concept 4	Concept 2	Concept 5
Oklahoma to Benning Road Metro	Concept 8	Concept 6	Concept 9	Concept 7	Concept 10
Oklahoma to Minnesota Avenue and Benning Road Metro	Concept 13	Concept 11	Concept 14	Concept 12	Concept 15

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The 15 concepts are described below:

- **Concept 1 (Oklahoma to Minnesota Avenue Metro – Curb –Shared):** The streetcar corridor would extend the H/Benning Streetcar Line from Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. A curbside running track would accommodate both streetcars and other vehicles.
- **Concept 2 (Oklahoma to Minnesota Avenue Metro – Center –Shared):** The streetcar corridor would extend the H/Benning Streetcar Line from Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. A median running track would accommodate both streetcars and other vehicles.
- **Concept 3 (Oklahoma to Minnesota Avenue Metro – Curb –Exclusive):** The streetcar corridor would extend the H/Benning Streetcar Line from Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. A curbside running track would be provided on a raised streetcar-only lane.
- **Concept 4 (Oklahoma to Minnesota Avenue Metro – Center –Exclusive):** The streetcar corridor would extend the H/Benning Streetcar Line from Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. A median running track would be provided on a raised streetcar-only lane.
- **Concept 5 (Oklahoma to Minnesota Avenue Metro – Bike Lane):** The streetcar corridor would extend the H/Benning Streetcar Line from Oklahoma Avenue along Benning Road then turn north along Minnesota Avenue and terminate near the Minnesota Avenue Metrorail Station. This concept would include an exclusive bike lane.
- **Concept 6 (Oklahoma to Benning Road Metro – Curb – Shared):** The streetcar corridor would begin at Oklahoma Avenue and end at the Benning Road Metrorail Station. A curbside running track would accommodate both streetcars and other vehicles.
- **Concept 7 (Oklahoma to Benning Road Metro – Center – Shared):** The streetcar corridor would begin at Oklahoma Avenue and end at the Benning Road Metrorail Station. A median running track would accommodate both streetcars and other vehicles.

- **Concept 8 (Oklahoma to Benning Road Metro – Curb – Exclusive):** The streetcar corridor would begin at Oklahoma Avenue and end at the Benning Road Metrorail Station. A curbside running track would be provided on a raised streetcar-only lane.
- **Concept 9 (Oklahoma to Benning Road Metro – Center – Exclusive):** The streetcar corridor would begin at Oklahoma Avenue and end at the Benning Road Metrorail Station. A median running track would be provided on a raised streetcar-only lane.
- **Concept 10 (Oklahoma to Benning Road Metro – Bike Lane):** The streetcar corridor would begin at Oklahoma Avenue and end at the Benning Road Metrorail Station. This concept would include an exclusive bike lane.
- **Concept 11 (Oklahoma to Minnesota Avenue and Benning Road Metro – Curb – Shared):** The streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. A curbside running track would accommodate both streetcars and other vehicles.
- **Concept 12 (Oklahoma to Minnesota Avenue and Benning Road Metro – Center – Shared):** The streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. A median running track would accommodate both streetcars and other vehicles.
- **Concept 13 (Oklahoma to Minnesota Avenue and Benning Road Metro – Curb – Exclusive):** The streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. A curbside running track would be provided on a raised streetcar-only lane.
- **Concept 14 (Oklahoma to Minnesota Avenue and Benning Road Metro – Center – Exclusive)**: The streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. A median running track would be provided on a raised streetcar-only lane.
- **Concept 15 (Oklahoma to Minnesota Avenue and Benning Road Metro – Bike Lane):** The streetcar corridor would provide streetcar tracks to both the Minnesota Avenue Metrorail Station and the Benning Road Metrorail Station. This concept would include an exclusive bike lane.

2.4 PRELIMINARY SCREENING OF CONCEPT DESIGNS

The intent of the screening process was to evaluate the ability of each concept to meet the project Purpose and Need based on input from stakeholders (summarized in **Chapter 5**). Nineteen screening factors were developed by the project team, which were used to compare and identify the Build Alternative concept that best met the Purpose and Need. The screening criteria used in the analysis are summarized in **Table 2-3**.

Table 2-3: Preliminary Concepts Screening Factors

Screening Factor	Description
No Geometric Deficiencies	This metric considered whether the concept would encounter geometric deficiencies that would preclude the implementation of streetcar tracks and therefore streetcar operations.
Improves Structural Conditions	This metric considered whether the concept would remove structural deficiencies of the Viaduct Bridges over DC-295/CSX railroad tracks which is a project independently programmed into the region's CLRP.
Requires Bridge Reconstruction	This metric considered whether the concept would facilitate the reconstruction of the Viaduct Bridges over DC-295/CSX railroad tracks; both bridges are functionally obsolete for pedestrians and bicyclists, as well as clearance for CSX trains traveling beneath. Inspection reports prepared by DDOT in 2012 found the substructures of the Viaduct Bridges to be in fair to poor condition.
Improves Pavement Conditions	This metric considered whether the concept would improve pavement conditions in the corridor. Portions of Benning Road between Minnesota Avenue and 42nd Street have recently been improved through the reconstruction of Benning Road; however east of 42nd Street, Benning Road has not been repaved or repaired in several years. Also, Minnesota Avenue, within the study are, is in need of repair and repaving.
Improves Roadway Operations	This metric evaluated whether the concept would affect pedestrian safety and traffic operational issues along Benning Road and Minnesota Avenue.
Improves Operations of Benning/Minnesota Intersection	This metric assessed whether the concept would improve vehicular operations over current conditions. This intersection is a high accident location for vehicle collisions.
Offers Additional Transit	This metric considered whether the concept would provide new transit options in the corridor.
Provides Connectivity to Existing Streetcar Line	This metric considered whether the concept would provide a contiguous movement to the existing streetcar network; and would not require transfers or walking to a different location.
Improves Safety of Benning/Minnesota Intersection	This metric assessed whether the concept would enhance the safety of the intersection of Benning Road and Minnesota Avenue over current conditions. This intersection is a high accident location for collisions involving vehicles and pedestrians.
Improves Pedestrian Safety	This metric evaluated whether the concept would address cumulative pedestrian safety issues along the corridor including: sidewalks on both the north and south sides of the Viaduct Bridges; enhancement of the pedestrian movements at 36th Street, bringing sidewalks to current standards between 42nd Street and the Benning Road Metrorail Station.
Improves Vehicular Safety	This metric considered whether the concept would enhance the safety of vehicles along the corridor.
Improves Bicycle Safety	This metric considered whether the concept would provide additional space and safety for bicyclists along the corridor between Oklahoma and Minnesota Avenues.

Screening Factor	Description
Improves Transit Safety	This metric considered whether the concept would enhance the safety of transit passengers boarding and alighting to/from transit vehicles.
Provides Pedestrian Access on Both Sides of Roadway	This metric evaluated whether the concept would bring sidewalks along the corridor to current standards.
Meets ADA Requirements	This metric evaluated whether the concept meets ADA requirements.
Provides Bicycle Access	This metric evaluated whether the concept provides bicycle access over the Viaduct Bridges.
Improves Access to Activity Hubs	This metric considered whether the concept provides improved access to activity hubs along Benning Road and Minnesota Avenue.
Within Existing Right-of-Way (ROW)	This metric evaluated whether the concept could be constructed within existing ROW or whether additional ROW would be needed.
Keeps or Adds Parking	This metric evaluated whether the concept maintained or eliminated on- street parking.

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The screening factor, geometric deficiencies, eliminated Concepts 1 through 5 (streetcar between Oklahoma Avenue and Minnesota Avenue Metrorail Station) and Concepts 11 through 15 (streetcar from Oklahoma to Minnesota Avenue Metrorail Station and to the Benning Road Metrorail Station) in the preliminary screening process. Physical and geometric constraints of the intersection of Benning Road and Minnesota Avenue complicate streetcar track and roadway construction. Further, accommodation of a track and platform near the intersection could negatively affect overall traffic operations or create new safety issues for pedestrians. Thus, a terminus at the Minnesota Avenue Metrorail Station, integral to Concepts 1 through 5 and Concepts 11 through 15, was eliminated.

2.5 SECOND SCREENING OF CONCEPT DESIGNS

The summary evaluation matrix of the five remaining preliminary Build Alternative concepts (Concepts 6 through 10) is displayed in **Table 2-4**. **Table 2-4** also shows how the No Build Alternative performed when evaluated under each of the screening factors.

As shown in **Table 2-4**, Concept 7, a streetcar corridor that begins at Oklahoma Avenue and ends at the Benning Road Metrorail Station with median running track in a shared lane, performed the best against the 20 screening factors, with the exception of the screening factor related to parking. Concept 6, a streetcar corridor between Oklahoma Avenue and the Benning Road Metrorail Station with curbside running tracks in a shared lane, performed similarly to Concept 7. These two concepts were carried forward for detailed study and are Build Alternative 1 (Concept 6 on **Table 2-4**), a curbside running streetcar, and Build Alternative 2 (Concept 7 on **Table 2-4**), a median running streetcar, and described in additional detail in **Sections 2.7** and **2.8**, respectively.

Concepts 8 and 9, the sections with the exclusive streetcar lanes, were not carried forward because the elimination of a travel lane would result in new impacts, such as delays and longer travel times, to bus operations and the forecasted volume of vehicles. Concept 10 was combined with the proposed streetcar concepts (Build Alternatives 1 and 2) for detailed study.

Table 2-4: Summary Evaluation Matrix of the No Build and Concepts 6 through 10

Screening Factor	No Build	Concept 6	Concept 7	Concept 8	Concept 9	Concept 10
	No Build	Oklahoma to Benning Road Metro – Curb – Shared	Oklahoma to Benning Road Metro – Center – Shared	Oklahoma to Benning Road Metro – Curb – Exclusive	Oklahoma to Benning Road Metro – Center – Exclusive	Oklahoma to Benning Road Metro – Bike Lane
No Geometric Deficiencies	N	Y	Y	Y	Y	Y
Improves Structural Conditions	N	Y	Y	Y	Y	Y
Requires Complete Bridge Reconstruction	N	Y	Y	Y	Y	Y
Improves Pavement Conditions	N	Y	Y	Y	Y	Y
Improves Roadway Operations	N	Y	Y	N	N	N
Improves Operations of Benning/Minnesota Intersection	N	Y	Y	N	N	N
Offers Additional Transit	N	Y	Y	Y	Y	Y
Provides Connectivity to Existing Streetcar Line	N	Y	Y	Y	Y	Y
Improves Safety of Benning/ Minnesota Intersection	N	Y	Y	N	N	Y
Improves Pedestrian Safety	N	Y	Y	Y	Y	Y
Improves Vehicular Safety	N	Y	Y	N	N	N
Improves Bicycle Safety	N	Y	Y	N	N	Y
Improves Transit Safety	N	Y	Y	Y	Y	Y
Provides Pedestrian Access on Both Sides of Roadway	N	Y	Y	Y	Y	Y
Meets ADA Requirements	N	Y	Y	Y	Y	Y
Provides Bicycle Access	N	Y	Y	N	N	Y
Improves Access to Activity Hubs	N	Y	Y	Y	Y	Y
Within Existing ROW	Y	Y	Y	N	N	N
Keeps or Adds Parking	Y	N	Y	N	N	N

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.6 OTHER BUILD ALTERNATIVE CONSIDERATIONS

Development of the Build Alternatives required an investigation of the operational issues along Benning Road and an assessment of the bridges for functional and structural conditions.

The first item reviewed to develop the Build Alternatives was the performance of 2040 No Build forecast traffic volumes (conducted using VISSIM, a traffic micro-simulation model) to determine if new lane capacity would be needed along Benning Road. It was determined that the 2040 No Build forecasted traffic volumes can be adequately served by existing traffic lanes for the four project segments. Benning Road between Oklahoma Avenue and Kingman Island, between Kingman Island and 36th Street, and between 36th Street and Minnesota Avenue would maintain their existing lane configurations. Benning Road, from Minnesota Avenue to the Benning Road Metrorail Station at 45th Street, would remain a four-lane facility.

Known operational and safety issues were then assessed with the forecasted volumes to determine if changes were required at specific intersections along the corridor. The following focus areas and considerations were identified:

- **Benning Road and Minnesota Avenue Intersection:** To address operational and safety issues at the intersection and because of the proximity of the intersection to the Viaduct Bridges and high volumes of pedestrian activity;
- **Benning (Viaduct Bridges) Over DC-295/CSX:** To address pedestrian and bicycle conditions on the Viaduct Bridges and improve the pedestrian transition area from the Viaduct Bridges to the sidewalk near 36th Street; and
- **Benning Road and 36th Street Intersection**: To address pedestrian and vehicular conflict areas, and to enhance pedestrian safety at the intersection.

2.6.1 BENNING ROAD AT MINNESOTA AVENUE INTERSECTION IMPROVEMENTS

The intersection of Benning Road and Minnesota Avenue has historically been and continues to be listed as one of the top intersections that record both high crash rates and crash frequency within the District. Many of the crash issues are related to the high volume of vehicles travelling through the intersection, as well as the high volume of pedestrians boarding and alighting transit vehicles in the vicinity of the intersection. The high volumes of traffic attempting to clear the intersection within the allowed signal phases have resulted in numerous left-turn swipes, rear-end vehicle collisions, and pedestrian collisions.

The existing lane configuration of the Benning Road at Minnesota Avenue Intersection is shown in **Figure 2-7**. The existing lane configuration consists of one through lane, one shared through and right-turn lane, and one dedicated left-turn lane in the eastbound direction. In the westbound direction the lane configuration consists of one shared left and through lane, and one shared through and right-turn lane. In the northbound direction along Minnesota Avenue the lane configuration consists of one through northbound lane, one shared through and right-turn lane, and a dedicated left-turn lane, while in the southbound direction there is one through lane, one dedicated left-turn lane as well as a short, dedicated right-turn lane.

The traffic analysis conducted for this intersection found that the high volume of eastbound Benning Road to northbound Minnesota Avenue movements required additional left-turn lane capacity. Two concepts were reviewed: a single extended left-turn lane and a dual left-turn lane.

The single extended left-turn lane was selected as the preferred concept over the dual left-turn lane as part of the Build Alternatives. This left-turn lane would be extended from 350 feet to 500 feet in length and would extend onto the Viaduct Bridge over DC-295/CSX railroad tracks. The proposed lane configuration improvements to the intersection of Benning Road and Minnesota Avenue are shown in **Figure 2-8**. Proposed improvement concepts for the Build Alternatives would also include adding a second left-turn lane in the northbound direction of Minnesota Avenue to westbound Benning Road and extending the southbound right-turn lane a distance of 150 feet.

2.6.2 BENNING (VIADUCT BRIDGES) OVER DC-295/CSX IMPROVEMENTS

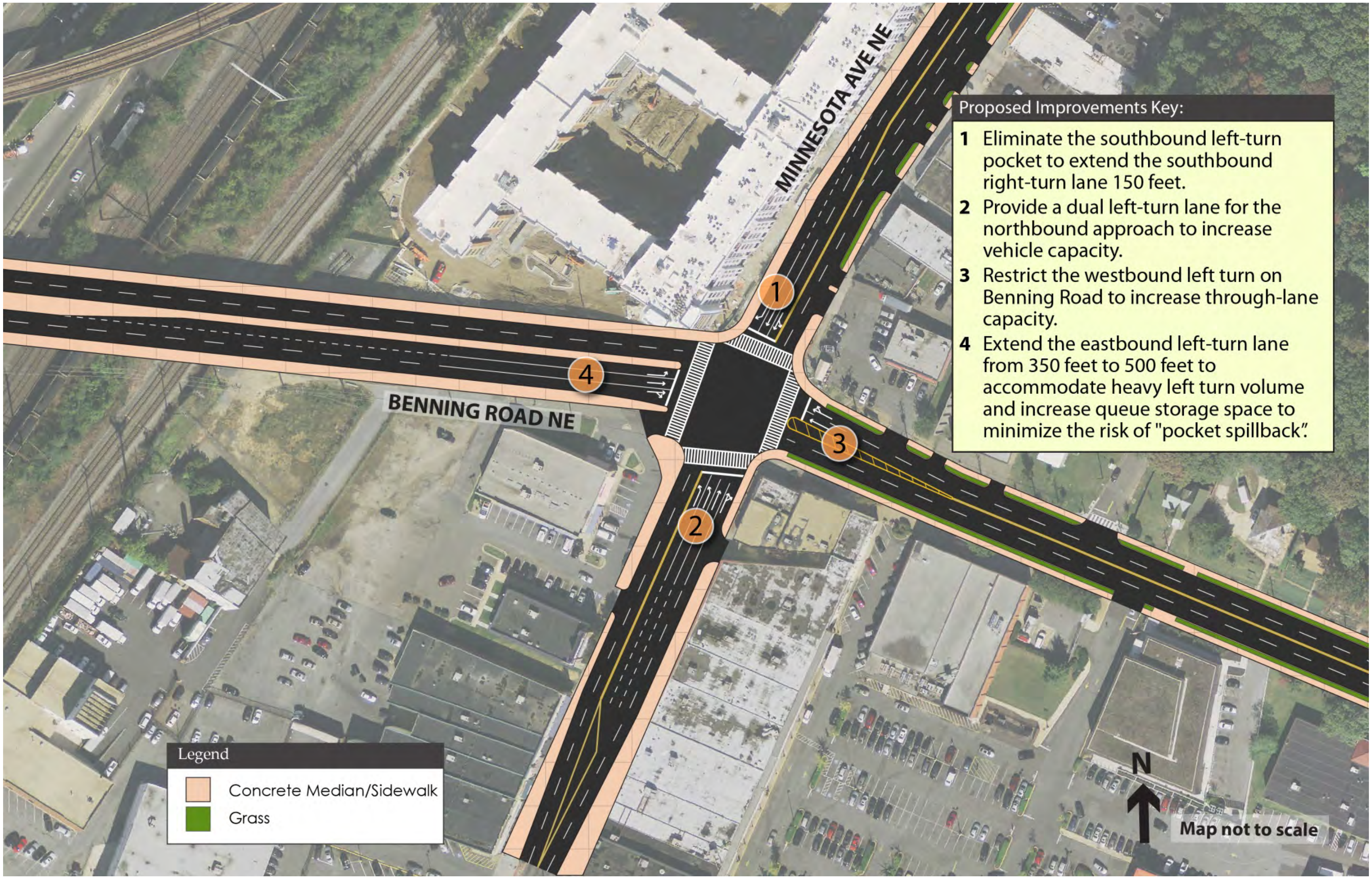
The Viaduct Bridges over DC-295 and the CSX railroad tracks comprise of an eastbound and a westbound structure as shown in **Figure 2-9**. Neither of these structures meets the minimum CSX vertical clearance requirements of 23 feet nor do they meet current design standards to provide safe passage for pedestrians and bicyclists. Inspection reports for the Viaduct Bridges prepared by DDOT in 2012 found the substructures of the Viaduct Bridges to be in fair to poor condition. The evaluation of the condition of the existing structures and the changes needed to provide for an extended left-turn lane and widened pedestrian and bicycle path resulted in a recommendation to completely reconstruct the two aging structures with a modern single structure as part of the Build Alternative.

The new structure (Viaduct Bridge) would replace the existing piers, superstructure, and deck as shown in **Figure 2-10**. Additionally, to accommodate the bridge improvements, the west abutment would be rebuilt and the east abutment would be relocated and rebuilt approximately 45 feet east of its existing location. The Viaduct Bridge would have longer spans than the current structures and can be constructed with two less piers as shown in **Figure 2-11**, thereby requiring less right-of-way from the CSX railroad tracks.

Figure 2-7: Existing Lane Configuration of Benning Road at Minnesota Avenue Intersection

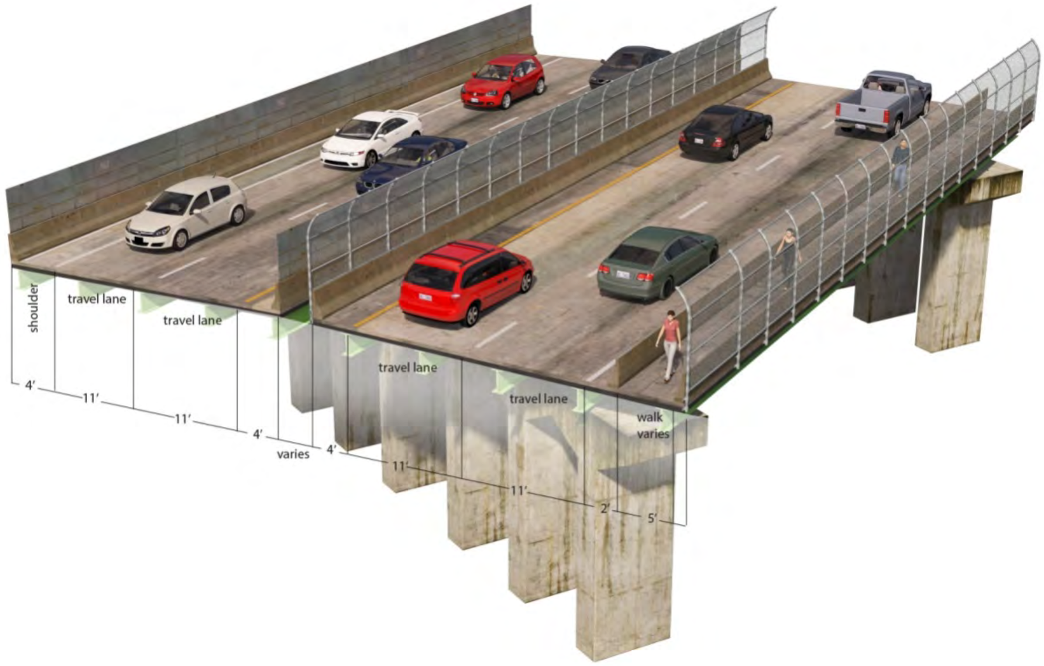
Source: Google Maps, May 2014

Figure 2-8: Proposed Lane Configuration of Benning Road at Minnesota Avenue Intersection



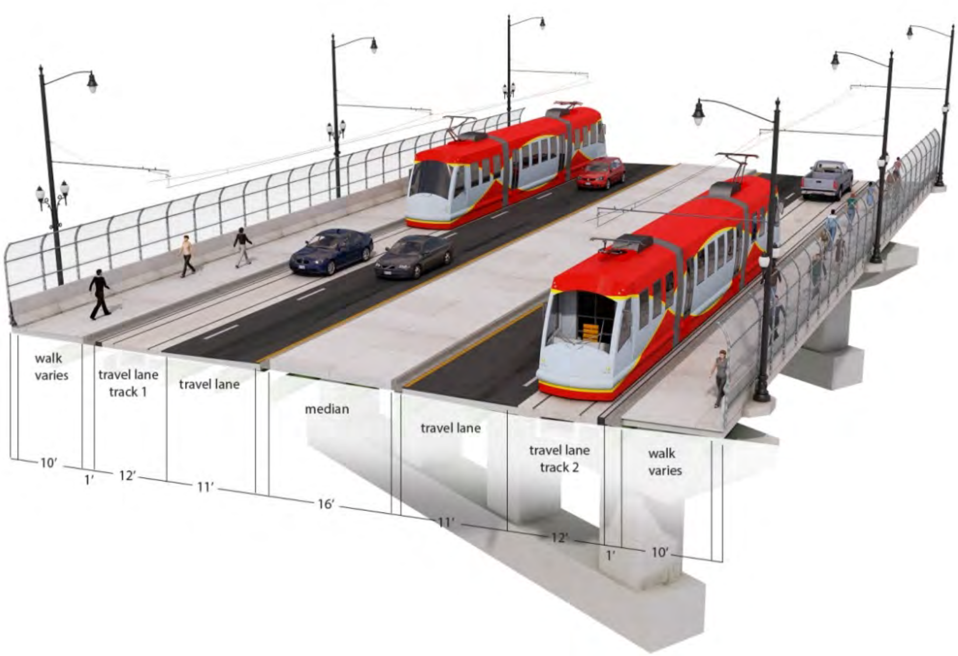
Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-9: Existing Viaduct Bridges (looking east)



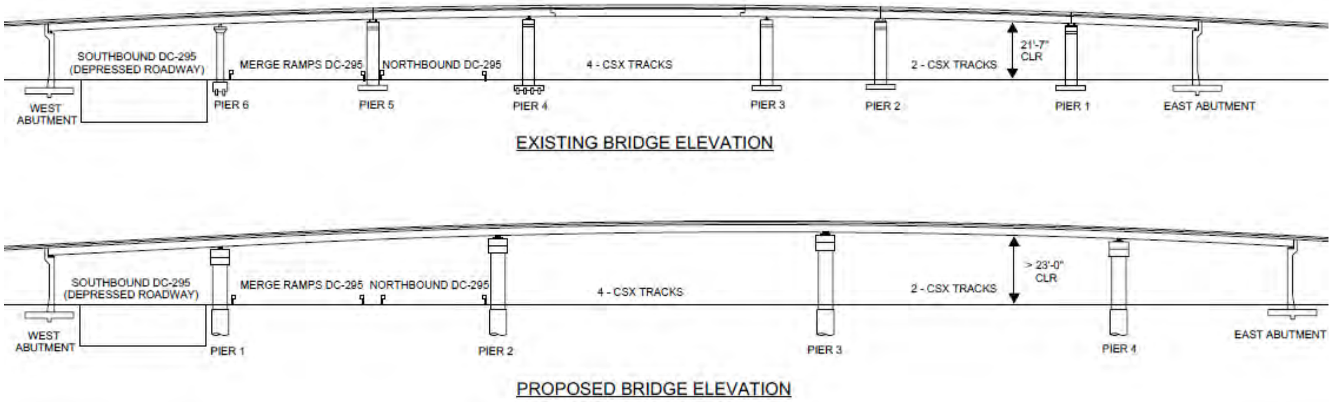
Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-10: Proposed Viaduct Bridge with Improvements (looking east)



**Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.*
Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-11: Profile View of Existing and Proposed Viaduct Bridge



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-12: Artist's Rendering of Proposed Bridge

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.6.3 PEDESTRIAN IMPROVEMENTS AT BENNING ROAD AND 36TH STREET

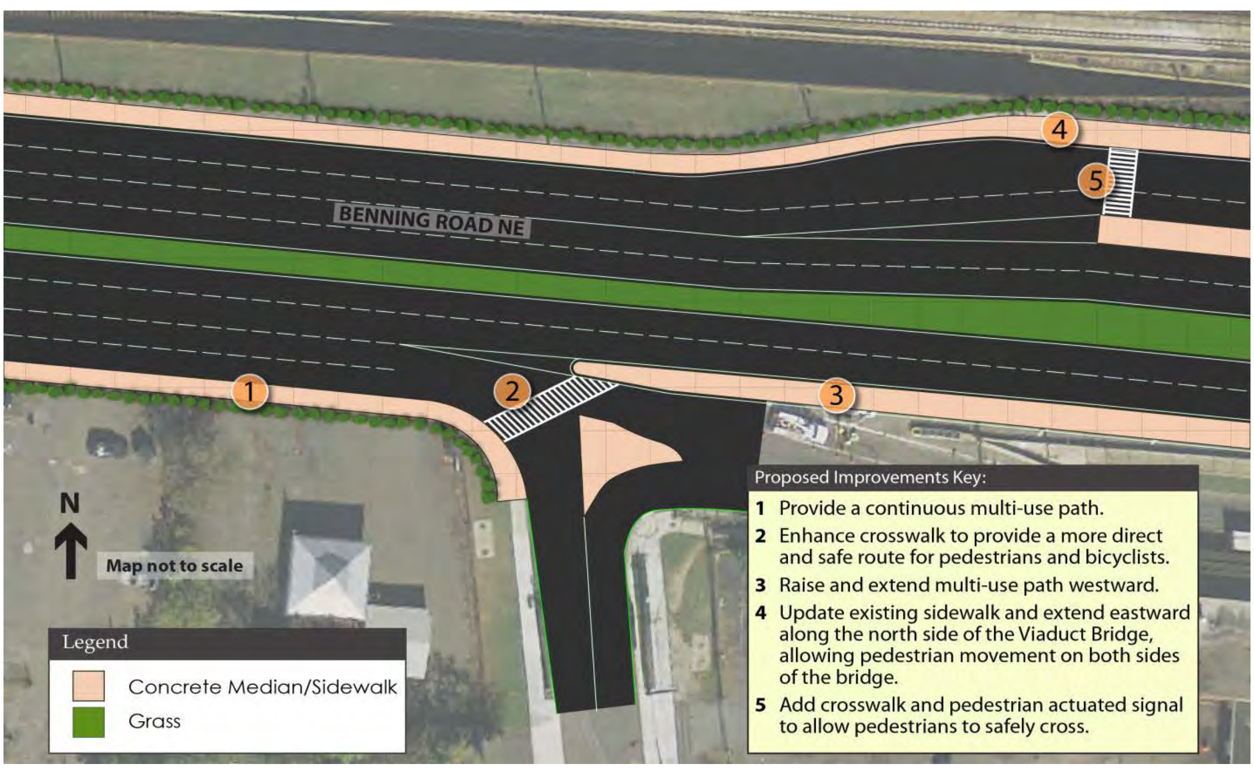
Benning Road near the 36th Street intersection currently has multiple traffic operations including a right turn onto 36th Street, an off-ramp to DC-295, and pedestrian movements, all occurring in a short space as illustrated in **Figure 2-13**. Currently, in the vicinity of 36th Street, Benning Road transitions from four-lanes to two-lanes in the eastbound direction. The two outside lanes of eastbound Benning Road become the access ramps to northbound and southbound DC-295. The two interior lanes remain as Benning Road and begin the approach slope to the Viaduct Bridges over DC-295 and the CSX railroad tracks. In the westbound direction, two lanes from the DC-295 access road meet the two westbound lanes from the Viaduct Bridges at 36th Street.

The pedestrian pathway to and from the Viaduct Bridge requires pedestrians to cross 36th Street, and continue along the south side of the access ramp to a pedestrian crossing signal. Pedestrians are then directed to cross the two lane access road to the eastbound Viaduct Bridge. To enhance pedestrian safety at the Benning Road and 36th Street intersection, the multi-use path along the south side of the eastbound bridge would be raised and extended westward toward 36th Street as illustrated in **Figure 2-14**. The pedestrian crossing signal and crosswalk would also be moved west, closer to the 36th Street intersection to provide a more direct route for pedestrians and bicyclists accessing the Viaduct Bridge. Additionally, a sidewalk would be added to the north side of the Viaduct Bridge, allowing pedestrian movement on both sides of the bridge. A crosswalk would be added where the off-ramp of DC-295 meets Benning Road, as seen in **Figure 2-14**. This crosswalk would use a pedestrian-actuated signal in order to allow pedestrians to safely cross.

Figure 2-13: Existing Benning Road at 36th Street Intersection

Source: Google Maps, May 2014

Figure 2-14: Proposed Pedestrian Improvements at Benning Road and 36th Street



Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.7 BUILD ALTERNATIVE 1 – CURBSIDE RUNNING STREETCAR

Build Alternative 1 would provide a 12-foot, curbside running streetcar lane for the length of the Benning Road corridor and new pedestrian, bicycle, and safety improvements. The shared streetcar lane would be constructed in the outside lane adjacent to the curb and pedestrian facilities. Typical sections are shown in **Figure 2-15** (wired propulsion system) and **Figure 2-16** (wireless propulsion system). General Plans for Build Alternative 1 are provided in **Appendix B**. **Table 2-5** provides a summary of physical improvements proposed under the No Build Alternative, Build Alternative 1 and Build Alternative 2.

Platforms would be located approximately a quarter-mile apart as shown in **Figure 2-17**. Platforms would be constructed along the eastbound and westbound directions of Benning Road at six locations:

- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metrorail Station (eastern terminus).

Table 2-5: Physical Improvements Summary

Component	No-Build Alternative	Build Alternative 1	Build Alternative 2
General Purpose Lanes			
Oklahoma Avenue to Kingman Island	6	4	4
Kingman Island to 36th Street	8	6	6
36th Street to Minnesota Avenue	4 with 1 left turn lane at Minnesota Ave	2 through lanes with 1 left turn lane at Minnesota Ave	2 through lanes with 1 left turn lane at Minnesota Ave
Minnesota Avenue to 45th Street	4	2	2
Lane Width (feet)	10′	10′-11′	10′-11′
Shared Streetcar Lanes			
Oklahoma Avenue to Kingman Island	0	2	2
Kingman Island to 36th Street	0	2	2
36th Street to Minnesota Avenue	0	2	2
Minnesota Avenue to 45th Street	0	2	2
Lane Width (feet)	N/A	12′	12′
Number of Streetcar Stops			
Oklahoma Avenue to Kingman Island	0	2	2
Kingman Island to 36th Street	0	1	1
36th Street to Minnesota Avenue	0	0	0
Minnesota Avenue to 45th Street	0	3	3
Width	N/A	10′	12′
Sidewalks			
Oklahoma Avenue to Kingman Island	Eastbound: 10′ Westbound: 4-5′	Eastbound: 10′ Shared-Use Path Westbound: 6′ Sidewalk	Eastbound: 10′ Shared-Use Path Westbound: 6′ Sidewalk
Kingman Island to 36th Street	Eastbound: 4-10′ Westbound: 4-10′	Eastbound: 6-10′ Shared-Use Path Westbound: 6′ Sidewalk	Eastbound: 6-10′ Shared-Use Path Westbound: 6′ Sidewalk
36th Street to Minnesota Avenue	Eastbound: 6′	Eastbound: 10′ Shared-Use Path Westbound: 6.3′ Sidewalk	Eastbound: 10′ Shared-Use Path Westbound: 6′ Sidewalk
Minnesota Avenue to 45th Street	4-6′ Eastbound 4-6′ Westbound	Eastbound: 6′ Sidewalk Westbound: 6′ Sidewalk	Eastbound: 6′ Sidewalk Westbound: 6′ Sidewalk
Bicycle Facilities			
Oklahoma Avenue to Kingman Island	None	Eastbound: 10′ Shared-Use Path	Eastbound: 10′ Shared-Use Path
Kingman Island to 36th Street	None	Eastbound: 6-10′ Shared-Use Path	Eastbound: 6-10′ Shared-Use Path
36th Street to Minnesota Avenue	None	Eastbound: 10′ Shared-Use Path	Eastbound: 10′ Shared-Use Path
Minnesota Avenue to 45th Street	None	None	None
On-Street Parking			
Oklahoma Avenue to Kingman Island	Yes (with some restrictions)	No	Yes (with some restrictions)

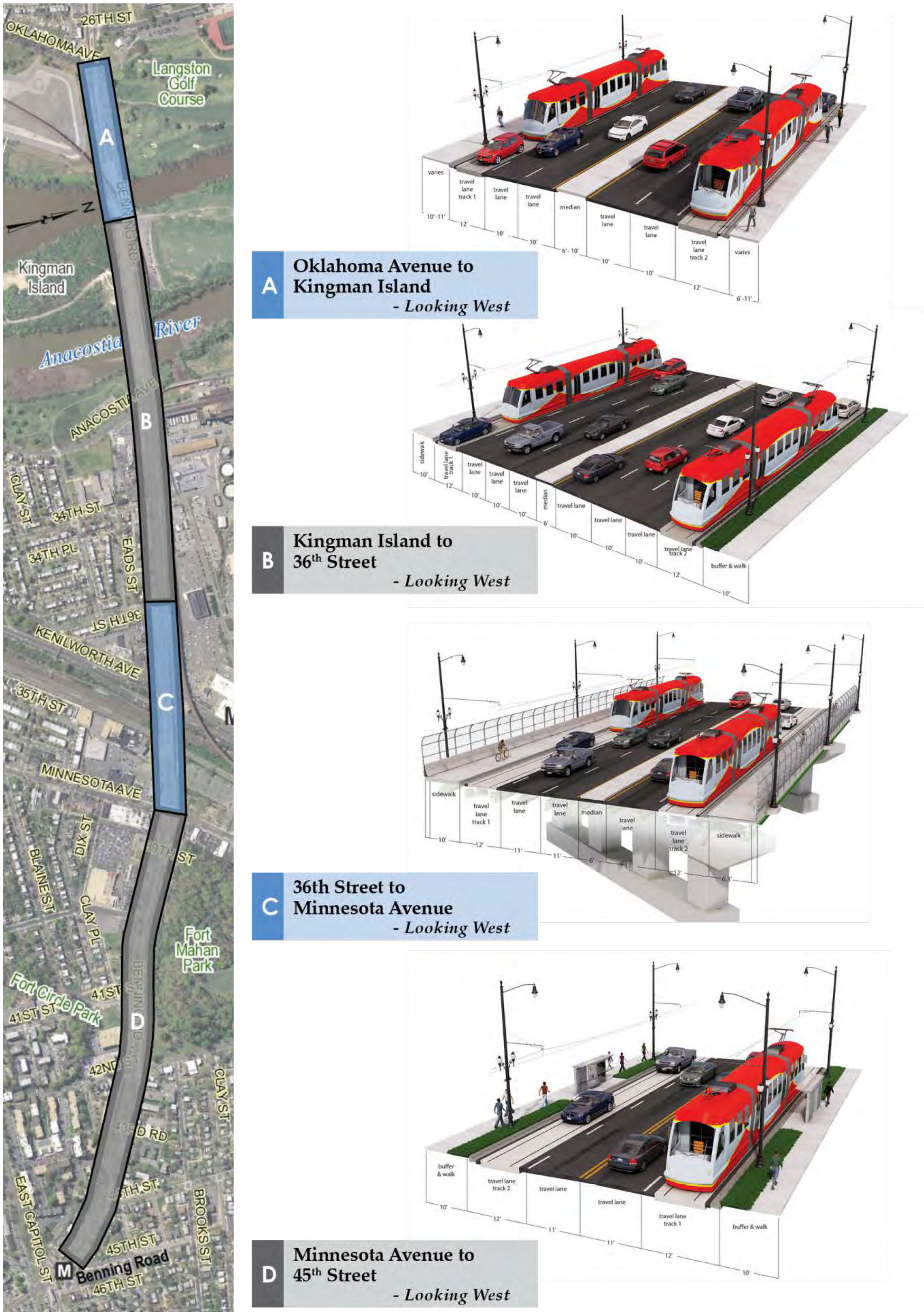
Component	No-Build Alternative	Build Alternative 1	Build Alternative 2
Kingman Island to 36th Street	Yes (with some restrictions)	No	Yes (with some restrictions)
36th Street to Minnesota Avenue	No	No	No
Minnesota Avenue to 45th Street	Yes (with some restrictions)	No	Yes (with some restrictions)

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The following sections describe the proposed typical section for each typical segment of Build Alternative 1. For ease of discussion, the Benning Road corridor is divided into four typical segments from west to east. Segments are based on transitions in the lane configuration and width of the right-of-way:

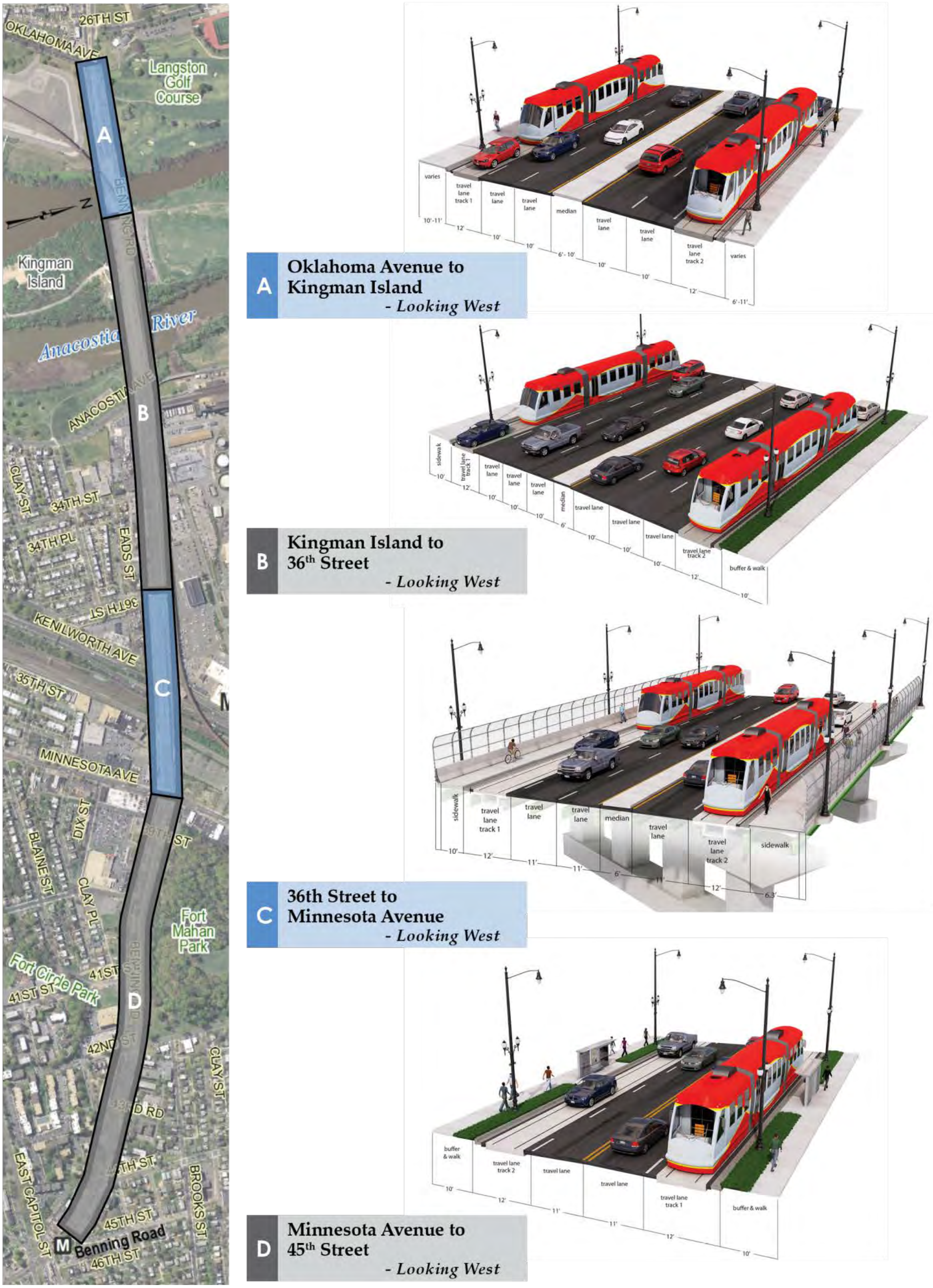
- Oklahoma Avenue to Kingman Island;
- Kingman Island to 36th Street;
- 36th Street to Minnesota Avenue; and
- Minnesota Avenue to 45th Street.

Figure 2-15: Build Alternative 1 Typical Sections *(Wired Propulsion System)*



**Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.*
Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-16: Build Alternative 1 Typical Section *(Wireless Propulsion System)*



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-17: Platform Locations

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.7.1 OKLAHOMA AVENUE TO KINGMAN ISLAND

This typical section would begin at the intersection of Benning Road and Oklahoma Avenue just west of Kingman Lake. The platforms at the intersection of Benning Road and Oklahoma Avenue would serve as the western terminus for the project where the streetcar tracks tie into the H/Benning Streetcar Line. In this typical section, the streetcar tracks would transition from the median H/ Benning Streetcar Line running to the curb at Oklahoma Avenue.

Benning Road is currently six lanes in this portion of the study area and transitions to eight lanes beneath the Metrorail Bridge near the Benning Road Bridge over Kingman Lake. A pier for the Metrorail Bridge and the width of the Benning Road Bridge over Kingman Lake create constraints that require the transition from six to eight lanes be east of Kingman Lake. The transition to eight lanes would occur with the development of a left-turn lane into the Langston Golf Course driving range.

The Benning Road Bridge over Kingman Lake would require modification of the deck locally in the vicinity of the embedded streetcar tracks. The Benning Road Bridge over the Anacostia River would require modification of the deck and girders to accommodate the embedded streetcar tracks. For both bridges, the local portion would likely include one or two bays between girders depending on the precise track location.

2.7.2 KINGMAN ISLAND TO 36TH STREET

The typical section from Kingman Island to Anacostia Avenue would provide a wide right-of- way consisting of six 10-foot general purpose lanes and two 12-foot shared streetcar lanes, as shown in **Figures 2-15** and **2-16** above. A 10-foot shared use path would run behind the curb on the south side of Benning Road from Kingman Island to Anacostia Avenue, while a 6-foot sidewalk and 4-foot buffer would run along the northern part from Kingman Island to Anacostia Avenue. The typical section is 112 feet in width along this segment. In addition to the Oklahoma Avenue termini stations, eastbound and westbound stations would be constructed at one other location along this typical section at Kingman Island. A new pedestrian signal and crosswalk would be provided in this area.

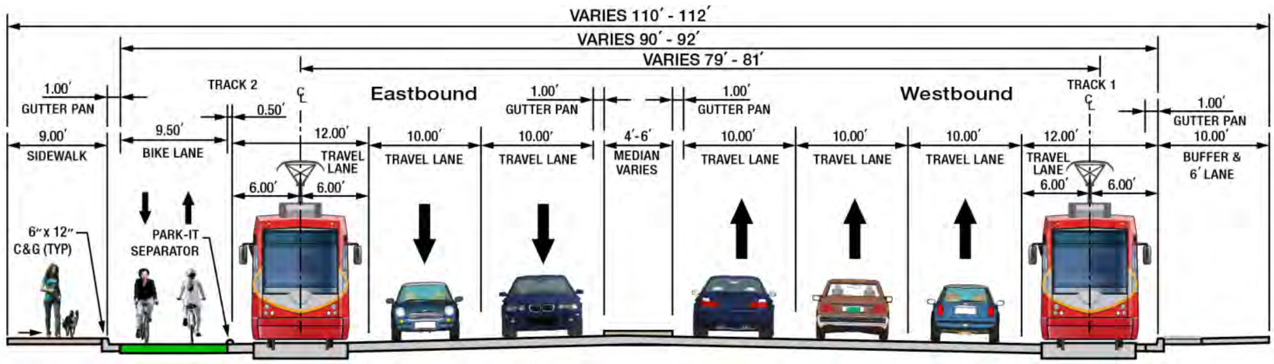
The typical section from Anacostia Avenue to 36th Street would provide the widest right-of-way section where six 10-foot general purpose lanes and two 12-foot shared streetcar lanes would be constructed as shown in **Figures 2-15** and **2-16**. A 6 to 10-foot shared use path would run behind the curb on the south side of Benning Road from Anacostia Avenue to 36th Street, while a 6 to 8-foot sidewalk would run along the northern edge of roadway from Anacostia Avenue to 36th Street. As a whole, the typical section would vary from 108 to 116 feet. The streetcar track would continue along the curb from Kingman Island to the next station location proposed at 34th Street. Two platforms (one in the eastbound direction and one in the westbound direction) at the intersection of Benning Road and 34th Street are proposed for this typical section. In order for the streetcar to be aligned with the curb of the Viaduct Bridge, the streetcar rails would transition from the curb at 34th Street to the second interior lane of Benning Road immediately east of the intersection of Benning Road and 34th Street. The traffic signal at 34th Street would be retimed to provide for this transition.

2.7.2.1 Kingman Island to 36th Street Two-Way Bike lane Option

Under this option, the westbound lane configuration of Benning Road would remain as it is depicted in **Figures 2-15** and **2-16** above. However, in the eastbound direction, Benning Road would retain three lanes from the western terminus at Oklahoma Avenue to 36th Street as depicted in **Figure 2-18**. The two interior lanes, closest to the median, would be 10 feet wide, general purpose travel lanes. The third lane, furthest from the median, would consist of a 12-foot shared streetcar car lane. The fourth travel lane that exists today between the Metrorail Bridge overpass pier and 36th Street would be converted to a two-way bicycle lane. The two-way bicycle lane would be at the same elevation as the shared streetcar lane and would be separated from the shared streetcar lane with a six-inch wide parking stop barrier.

In the vicinity of the proposed 34th Street streetcar platform (shown in **Figure 2-17)**, the bike lane could either be narrowed or placed adjacent to the buildings while the platform and sidewalk are combined as shown in **Figure 2-19**.

Figure 2-18: Kingman Island to 36th Street Two-Way Bike Lane Option, Build Alternative 1



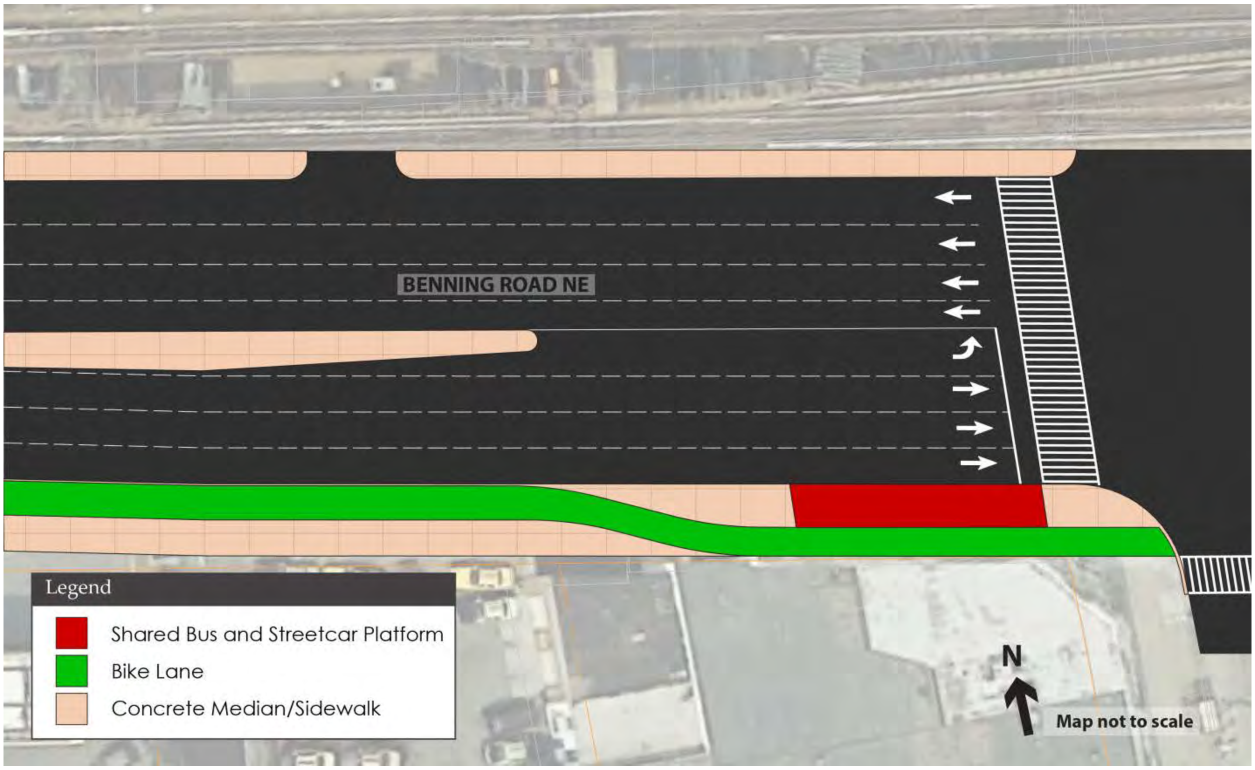
Source: Benning Road and Bridges Transportation Improvements EA Project Team

The two-way bike lane option between Kingman Island and 36th Street would provide more room for pedestrians and cyclists between the Anacostia Riverwalk Trail and pedestrian walkway on the south side of the Viaduct Bridge over DC-295/CSX railroad tracks. This option would also allow the proposed 34th Street platform and bus stop to be physically located in closer proximity to the intersection of 34th Street and Benning Road.

2.7.3 36TH STREET TO MINNESOTA AVENUE

This typical section would begin at 36th Street and would include the Viaduct Bridge over DC-295/CSX railroad tracks and end at the intersection of Benning Road and Minnesota Avenue. The ROW along this typical section comprises two 11-foot general purpose lanes and two 12-foot shared streetcar lanes as shown in **Figures 2-15** and **2-16**. A 10-foot shared use path would be constructed behind the curb in the eastbound direction and a 6.3-foot sidewalk in the westbound direction. The Viaduct Bridge would be widened as described in **Section 2.6.2**. The intersection of Benning Road and Minnesota Avenue would be reconfigured as described in **Section 2.6.1** and pedestrian safety improvements would be constructed at the intersection of 36th Street and Benning Road as well as at the DC-295 off-ramp and Benning Road as described in **Section 2.6.3**. No platforms are proposed for this segment.

Figure 2-19: Two-Way Bike Lane Option at Benning Road and 34th Street, Build Alternative 1



Source: Benning Road and Bridges Transportation Improvements EA Project Team

As part of Build Alternative 1, the traffic signal at the transition of the access ramp would be modified to allow the streetcar to transition from the curbside of the Viaduct Bridge to the curbside of the outside lane in the westbound direction of Benning Road. A pedestrian actuated signal would also be added with a crosswalk across the DC-295 off-ramp to allow pedestrians to safely cross from the Viaduct Bridge and continue westbound on Benning Road.

At 36th Street, Build Alternative 1 would extend the raised multi-use path from the intersection directly to the Viaduct Bridge. This extension would replace the current pedestrian travel pattern of crossing 36th Street to a sidewalk on the south side of the access road and using a pedestrian signal to cross the access road to the bridge as described in **Section 2.6.3** and shown **Figure 2-13**.

The Viaduct Bridge would comprise four lanes with a 16-foot wide raised median. As eastbound Benning Road approaches the Minnesota Avenue intersection, a portion of the raised median would be converted to a single 500-foot long left-turn lane for eastbound Benning Road to northbound Minnesota Avenue. A 10-foot wide shared use path would be provided on the south side of the bridge. On the north side of the bridge, a 6.3-foot wide sidewalk would be provided.

The east approach to the intersection of Benning Road with Minnesota Avenue would include a median island separating the eastbound and westbound lanes.

2.7.4 MINNESOTA AVENUE TO 45th STREET

This typical section would begin east of the intersection of Benning Road at Minnesota Avenue, where two 11-foot general purpose lanes and two 12-foot shared streetcar lanes would be constructed as shown in **Figures 2-15** and **2-16** above. Six-foot sidewalks and buffers would also be provided in both directions. The typical section would be 66 feet in width along this portion of Benning Road. Platforms would be provided at the intersections of Benning Road with 39th Street and 42nd Street, and at the eastern terminus of the project, the Benning Road Metrorail Station.

Build Alternative 1 would maintain the streetcar tracks adjacent to the curb to 45th Street. A new traffic signal would be installed at 45th Street to allow the streetcar to cross from the south side of Benning Road and join the rail on the north side of Benning Road ending at a platform at the Benning Road Metrorail Station. The platform would occupy the sidewalk area. The track on the south side of Benning Road would transition to and merge with the track on the north side at 45th Street; this single track would end just north of Central Avenue at the Benning Road terminus.

2.8 BUILD ALTERNATIVE 2 - MEDIAN RUNNING STREETCAR

Build Alternative 2 would provide a 12-foot, median running streetcar lane for the length of the Benning Road corridor and new pedestrian, bicycle, and safety improvements. The shared streetcar lane would be constructed as the inside lane adjacent to the median. Typical sections are shown in **Figure 2-20** (wired propulsion system) and **Figure 2-21** (wireless propulsion system). General Plans for Build Alternative 2 are provided in **Appendix A**. **Table 2-5** provides a summary of physical improvements proposed under the No Build Alternative, Build Alternative 1 and Build Alternative 2.

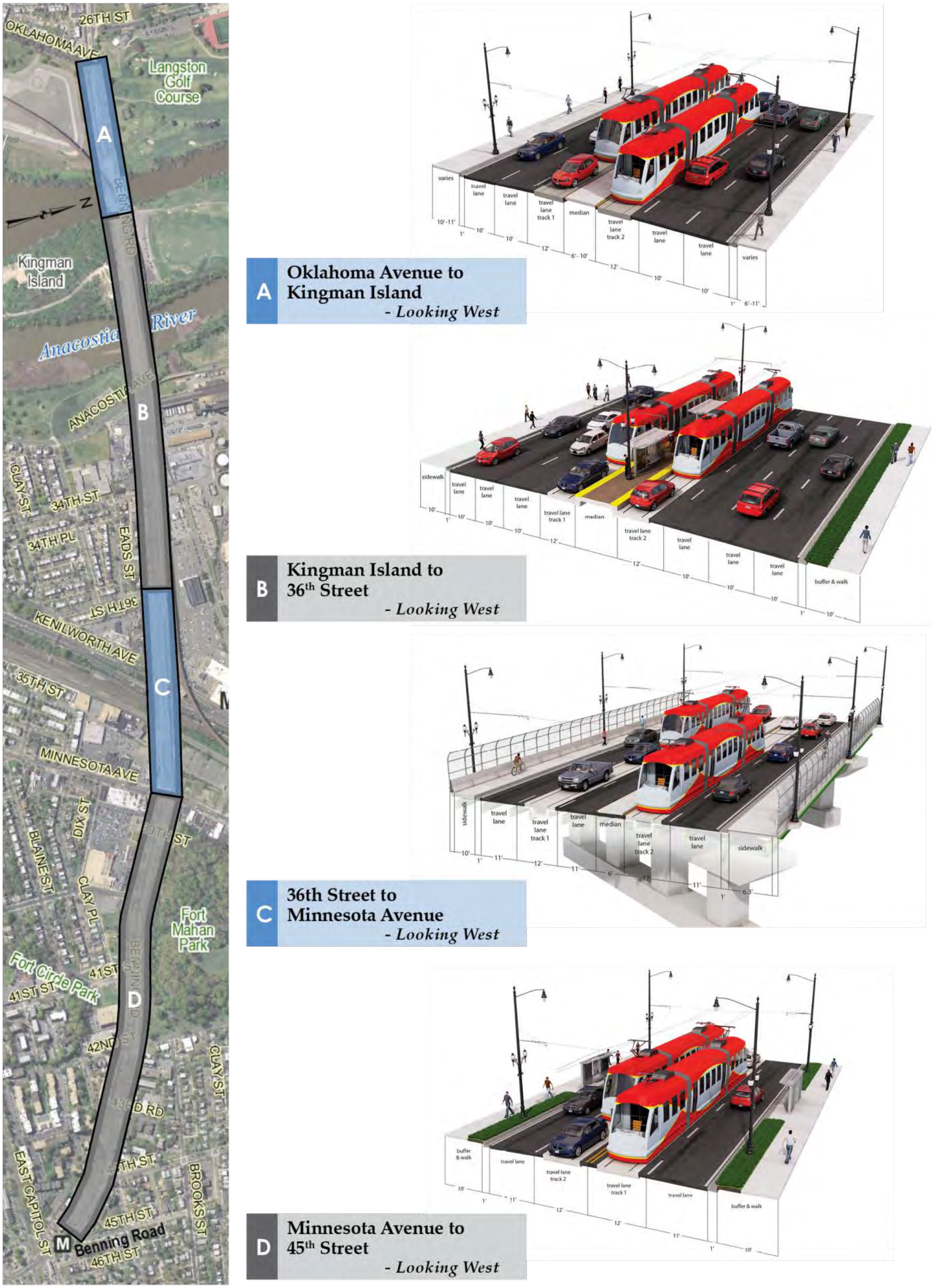
Platforms would be located approximately a quarter-mile apart. Platforms would be constructed within the median to serve both eastbound and westbound directions of Benning Road at six locations as shown in **Figure 2-17**:

- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metrorail Station (eastern terminus).

The following sections describe the proposed typical section for each segment of Build Alternative 2. For ease of discussion, the Benning Road corridor is divided into four typical sections from west to east where there are transitions in the lane configuration and width of the right-of-way:

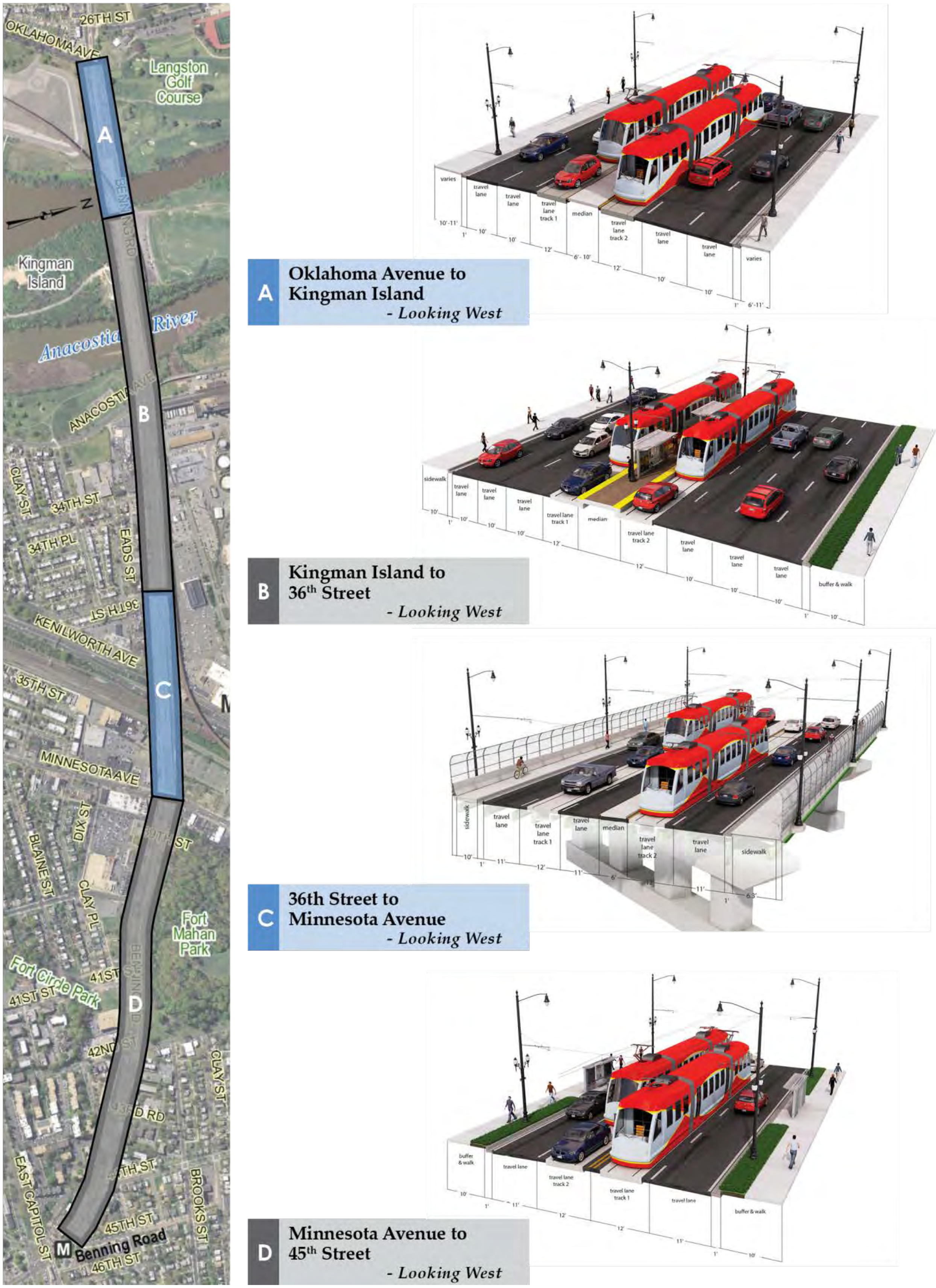
- Oklahoma Avenue to Kingman Island;
- Kingman Island to 36th Street;
- 36th Street to Minnesota Avenue; and
- Minnesota Avenue to 45th Street.

Figure 2-20: Build Alternative 2 Typical Sections *(Wired Propulsion System)*



**Details of the overhead propulsion system would be determined during final design. Renderings show only one possible treatment for overhead wiring.*
Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-21: Build Alternative 2 Typical Sections *(Wireless Propulsion System)*



Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.8.1 OKLAHOMA AVENUE TO KINGMAN ISLAND

This typical section would begin at the intersection of Benning Road and Oklahoma Avenue just west of Kingman Lake. The platform at the intersection would be the western terminus for the project near the point where the streetcar tracks would tie into the existing H/Benning Streetcar Line. The streetcar track would remain in the median alignment from its current terminus at Oklahoma Avenue.

The section from Oklahoma Avenue to Anacostia Avenue accommodates six 10-foot general purpose lanes and two 12-foot shared streetcar lanes as shown in **Figure 2-20** and **2-21**. A new platform would be constructed in the median between Kingman Lake and the Anacostia River. A 6-foot sidewalk and a 4-foot buffer would be constructed in the westbound direction, and a 10-foot shared use path in the eastbound direction. The typical section is varies from 104 to 108 feet in width.

The Benning Road Bridge over Kingman Lake would require modification of the deck locally in the vicinity of the embedded streetcar tracks. The Benning Road Bridge over the Anacostia River would require modification of the deck and girders locally to accommodate the embedded streetcar tracks. For both bridges, the local portion would likely include one or two bays between girders depending on the precise track location.

2.8.2 KINGMAN ISLAND TO 36th STREET

The typical section from Anacostia Avenue to 36th Street would provide the widest right-of-way section where six 10-foot general purpose lanes and two 12-foot shared streetcar lanes would be constructed as shown in **Figure 2-20** and **2-21**. The typical section would vary from 108 to 118 feet. A new pedestrian crosswalk and pedestrian signal would be provided in this area. The streetcar rail would continue along the median until the next platform location proposed at 34th Street.

As with Build Alternative 1, Build Alternative 2 would extend the multi-use path from 36th Street directly to the Viaduct Bridge. This extension would replace the current pedestrian travel pattern of crossing 36th Street to a sidewalk on the south side of the access road and using a pedestrian signal to cross the access road to the bridge as described in **Section 2.6.3** and shown **Figure 2-13**. Build Alternative 2 would also include the pedestrian actuated signal and crosswalk across the DC-295 off-ramp, connecting the Viaduct Bridge with westbound Benning Road.

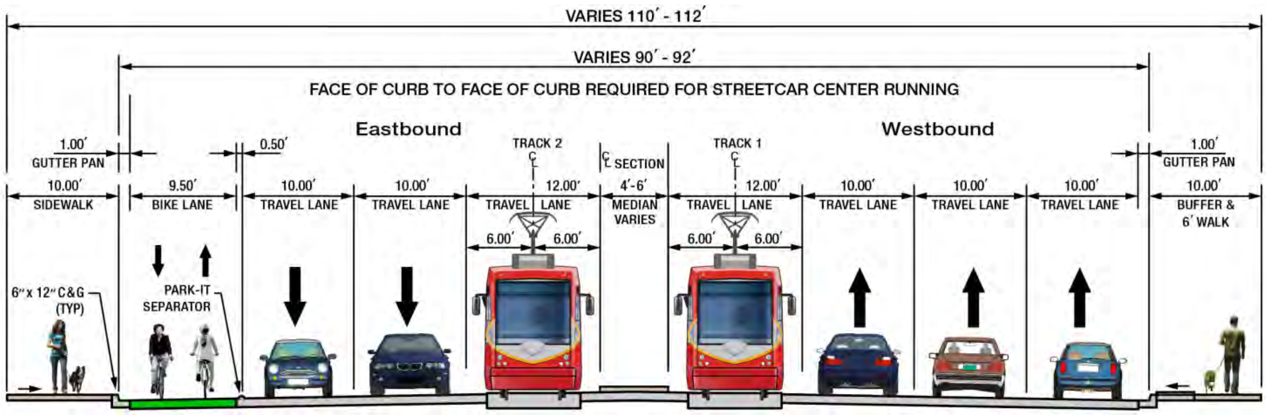
2.8.2.1 Kingman Island to 36th Street Two-Way Bike Lane Option

Under this option, the westbound lane configuration of Benning Road would remain as it is depicted in **Figure 2-20** and **2-21**. However, in the eastbound direction, Benning Road would retain three lanes from the western terminus at Oklahoma Avenue to 36th Street as depicted in **Figure 2-22**. The lane closest to the median would be a 12-foot wide shared streetcar lane. The center lane and lane furthest from the median would be 10-foot general use travel lanes. The fourth travel lane between the Metrorail Bridge overpass pier and 36th Street would be converted to a two-way bicycle lane. The two-way bicycle lane would be at the same elevation as the shared streetcar lane and would be separated from the shared streetcar lane with a six-inch wide parking stop barrier.

In the vicinity of the proposed 34th Street streetcar platform (shown in **Figure 2-17**), the bike lane could either be narrowed or placed adjacent to the buildings while a bus platform and sidewalk are combined as shown in **Figure 2-23**.

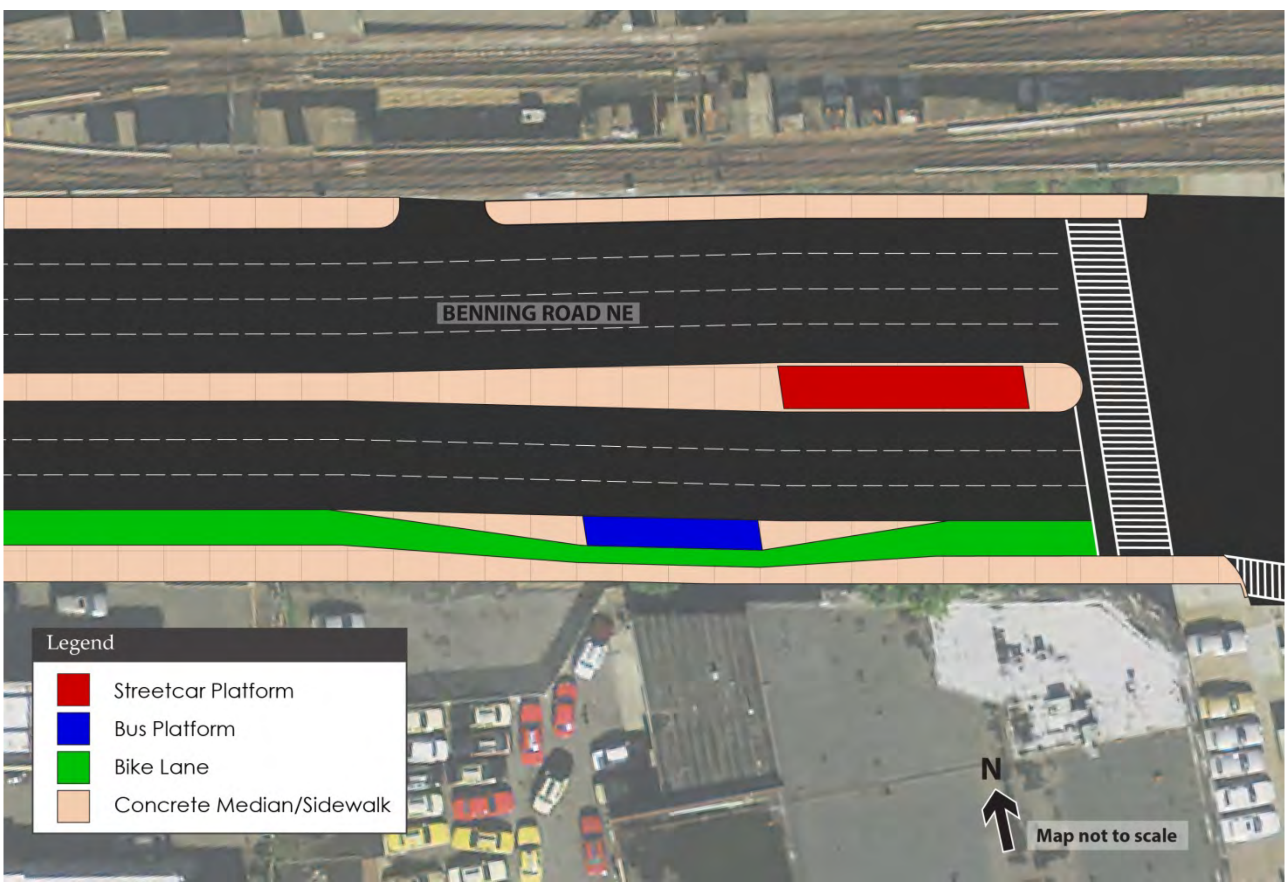
The two-way bike lane option between Kingman Island and 36th Street would provide more room for pedestrians and cyclists between the Anacostia Riverwalk Trail and pedestrian walkway on the south side of the Viaduct Bridge over DC-295/CSX railroad tracks.

Figure 2-22: Kingman Island to 36th Street Two-Way Bike Lane Option, Build Alternative 2



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 2-23: Two-Way Bike Lane Option at Benning Road and 34th Street, Build Alternative 2



Source: Benning Road and Bridges Transportation Improvements EA Project Team

2.8.3 36th STREET TO MINNESOTA AVENUE

This typical section would begin at 36th Street and would include the Viaduct Bridge over DC-295/CSX railroad tracks and end at the intersection Benning Road at the Minnesota Avenue. Along this typical section the ROW comprises two 11-foot general purpose lanes and two 12-foot shared streetcar lanes. A 10-foot shared use path would be constructed in the eastbound direction as well as a 6.3-foot sidewalk in the westbound direction as shown in **Figure 2-19** and **2-20**. The Viaduct Bridge would be widened as described in **Section 2.6.2**. The intersection would be reconfigured as described in **Section 2.6.1** and pedestrian safety improvements would be constructed at the intersection of 36th Street and Benning Road as well as the DC-295 off-ramp to Benning Road, as described in **Section 2.6.3**. No platforms are proposed for this segment.

Under Build Alternative 2, the streetcar would remain in the median across the reconstructed Viaduct Bridge. The Viaduct Bridge would comprise of four lanes with a 16-foot raised median. A 10-foot shared use path would be provided on the south side of the bridge with a 6.3-foot sidewalk on the north side. As eastbound Benning Road approaches the Minnesota Avenue intersection, a portion of the raised median would be converted to a single 500 foot left-turn lane for eastbound Benning Road to northbound Minnesota Avenue.

2.8.4 MINNESOTA AVENUE TO 45th STREET

This typical section would begin east of the intersection of Benning Road and Minnesota Avenue, where two 11-foot general purpose lanes and two 12-foot shared streetcar lanes would be constructed as shown in **Figure 2-20** and **2-21**. Six-foot sidewalks and 4-foot buffers would also be provided in both directions. The typical section would be 66 feet in width along this segment. Platforms would be provided at the intersections of Benning Road with 39th Street and 42nd Street, and at the eastern terminus of the project, the Benning Road Metrorail Station.

East of the intersection of Benning Road and Minnesota Avenue, Build Alternative 2 would include a median island extending from the intersection eastward to 39th Street where a platform would be constructed in the median. A new median platform would also be constructed at 42nd Street.

A new traffic signal would be installed at 45th Street to allow the streetcar to cross from the south side of Benning Road and join the track on the north side of Benning Road. The single-track terminus would end at a platform adjacent to the Benning Road Metrorail Station. The track on the south side of Benning Road would transition to and merge with the track on the north side at 45th Street; this single track would end just north of Central Avenue at the Benning Road terminus. The streetcar platform is adjacent to the track.

2.9 STREETCAR PROPULSION

Both "wired" and "wireless" propulsion systems are being evaluated by DDOT for the streetcar system. This EA addresses potential impacts for extension of the OCS of the H Street/Benning Line and for implementation of a wireless system. Background documentation for wireless technologies includes two reports, the *Union Station to Georgetown Alternatives Analysis for Premium Transit Service Propulsion Study* (DDOT, 2013) and *Comprehensive Assessment on Streetcar Propulsion Technology* (DDOT, 2014). These documents were further supplemented by transit industry information available from the American Public Transportation Association (APTA) and from operators.

2.9.1 OVERVIEW OF PROPULSION TECHNOLOGIES

OCS or "Wired" is the most common streetcar propulsion technology. APTA defines OCS as: "A traction electrification system comprising the overhead conductors (or single contact wire), aerial feeders, overhead contact system supports, foundations, balance weights and other equipment and assemblies, which delivers electrical power to non-self-powered electric vehicles." TPSS must be implemented along streetcar routes to supply electricity. The potential locations and impacts of TPSS are discussed in more detail in **Chapter 4**.

"Wireless" propulsion technology options are being evaluated by DDOT as part of a broader analysis of options potentially available to operate in areas of the District of Columbia where overhead wires are prohibited. Wireless systems can be grouped into two broad categories: Energy Storage Systems (ESS) and Ground Level Continuous Power Supply Systems (GLCPSS).

2.9.1.1 Energy Storage Systems

ESS use power sources installed on the vehicle to allow for wirefree operation. Vehicles using this technology can be powered by batteries, super capacitors, flywheels, fuel cells, diesel and/or alternative fuel sources or a combination of these power storage devices. Batteries and super capacitors are the two primary technologies in the ESS group. These can be charged during operation by capturing the energy generated during the vehicle braking cycle and while the vehicle is operating under wire. Supercapacitors discharge more quickly than batteries and require charging at more frequent intervals, typically at passenger stops.

- **Batteries** – Batteries are the most diverse type of on-board energy storage. Battery types include lead-acid, nickel-metal hydride, and lithium-ion (Li) batteries. Battery charge and discharge time can be long, typically measured in hours; however, batteries can store more energy per unit weight than other on-board storage devices such as super capacitors or flywheels. Propulsion with batteries alone, however, is characterized by lower vehicle acceleration and overall performance. The Benning Road corridor includes higher speed segments, grades and, potentially, streetcar operation in a shared lane. Optimal performance is therefore desirable in a mixed flow traffic situation to ensure both safety and operating efficiency.
- **Supercapacitors** – Supercapacitors store energy electrically in an electrostatic field and are used to increase regeneration and lower energy consumption as well as for off-wire operation. Supercapacitors have been installed on streetcar vehicles in revenue service by almost all major streetcar manufacturers. The technology has a fast charge/discharge rate, typically measured in seconds, which is compatible with the need to charge quickly at transit stops. Repeated

charge/discharge cycling can occur without significant degradation to capacitors. Supercapacitors are used for wireless streetcar operation in specific sections of existing systems; the majority of these systems, however, operate under wire. Supercapacitors charge at station stops from either a rigid overhead connection or surface level power rail. The surface level power rail is activated only when the streetcare is above it. While supercapacitors allow vehicles to operate with performance comparable to that with wired systems; vehicles also include batteries as a complementary and emergency energy source.

- **Flywheels** – Flywheels store kinetic energy in a high speed rotating drum which forms the rotor of a motor generator. When electrical energy is required, the drum gives up some of its kinetic energy by driving the generator. The amount of energy that can be stored in flywheels is comparable to a supercapacitor. Application of the technology in transit vehicles continues to be developed. No proven long-term operating history for this technology for transit revenue service can be cited.
- **Fuel Cells** – Fuel cells directly convert fuel to electrical power without the need for an engine or turbine. While several demonstration projects with electric buses have been implemented, there are no known applications for streetcar service. Buses use the hydrogen or methanol powered fuel cells to drive electric motors as well as to charge batteries, which then can assist the electric drives. Fuel cells would replace conventional diesel powered electric generators of hybrid vehicles.
- **Diesel Power** – Diesel fuel used to power an engine or turbine is common for buses, but its application for streetcar operation is limited. Streetcars can be acquired with a diesel fueled engine that powers an electric generator; this may result in longer vehicle or less interior space. Existing operations are typically suburban or urban/suburban lines and include systems that operate solely with diesel propulsion or can switch between diesel and electric propulsion.

2.9.1.2 Ground Level Continuous Power Supply Systems (GLCPSS)

GLCPSS are external to the vehicle and require specialized infrastructure and vehicle equipment. These systems use a ground level power rail or induction coil, instead of an overhead contact system. As with OCS, ground level systems require traction power substations and power distribution conduits. Ground level power systems currently in operations are proprietary

Vehicles for a GLCPSS system with a power rail must be equipped with power pickup shoes that convey electricity to the vehicle. For systems currently in operation, the power rail is divided into insulated segments which are energized only when the rail vehicle is above; a special trackway design is required to accommodate the power rail, power boxes, conduits and access boxes.

A contactless GLCPSS based on induction requires both a special trackway and vehicles. Buried cables along the trackway are connected to a power source that when energized creates a magnetic field. Correspondingly, vehicles must be equipped with coils that change this magnetic field into electric power for the vehicle.

2.9.2 EVALUATION OF PROPULSION TECHNOLOGIES FOR BENNING ROAD STREETCAR EXTENSION

Current applications of wirefree technologies are typically for limited distances in areas where OCS is deemed unacceptable from the visual perspective or the OCS elements would physically interfere with other activities; the remaining segments of these systems would operate under wire. Completely wirefree systems have recently opened, are under construction, or in final design. However, no existing wired systems have been converted to wirefree.

Considerations for implementation of wirefree technologies for the H/Benning Streetcar Line extension are described below.

- **Implication of proprietary systems and subsystems**. Key considerations are warranty, operations and long-term maintenance of the new system and vehicles. As ground level power supply systems are usually proprietary, the operator may be faced with significantly higher maintenance costs over the life of the asset. Proprietary systems may pose an issue for or complicate the procurement processes and may pose a longer term concern for maintenance, spare parts and compatibility.
- **Technical Specifications and Procurement.** Specifications for wirefree operations must be clearly defined in consideration compatibility with the existing H Street/Benning Line, implications for the broader streetcar network, and flexibility to address ongoing innovation.
- **Utility Relocation**. Wirefree ESS technologies may reduce the need for utility relocations as the potential for stray-current leakage is minimal; this could translate into infrastructure cost savings. For ground level power supply systems, however, utility relocation may be required to implement the power rail and related elements; any utility relocation cost savings must be weighed against capital infrastructure and long-term maintenance costs.
- **Wayside Infrastructure Requirements**. Traction power substations would be required for the ground level power supply systems and energy storage systems that require vehicle charging at stops. The power distribution and charging infrastructure requirements must be defined along with capital and maintenance costs. Ground-level power systems require a greater degree of engineering for design and implementation of the power rail and related elements.
- **Compatibility with H/Benning Streetcar Line**. A wirefree extension would require that passengers transfer and infrastructure modifications be implemented at the Oklahoma Avenue stop, or that current vehicles be retrofitted with equipment to operate on the wirefree segment, or that vehicles be replaced. Passenger transfer is an unreasonable scenario and does not conform to sound planning for seamless and convenient transit. Retrofitting current vehicles for operation with GLPSS or ESS technologies is unlikely due to the proprietary aspects of the respective ground level power supply systems, service interruption, and potential cost. New vehicles could be acquired that can operate under wire along the existing H/Benning Streetcar Line and wirefree on the extension.
- **Modification of H/Benning Streetcar Line for wirefree operation**. A GLPSS technology would require that the current trackway be reconstructed to include the power rail and its associated elements or inductance loops. Current vehicles would be replaced and service suspended during construction. Implementation of an ESS technology with supercapacitors would require implementation of overhead or ground level charging at stops; ground level charging would require a limited reconstruction in the trackway for the charging rail and power distribution.

Battery, Diesel or Diesel/hybrid operation would not require new infrastructure along the H/Benning Streetcar Line, but would require new vehicles compatible with existing stop infrastructure.

- **Maintenance**. Supercapacitor and battery life are affected by the number of charging cycles, the frequency and degree of high performance operation, vehicle passenger loading, ancillary power consumption, and grades. Induction power -based contactless systems are described as not being affected by weather. However, due to limited application of this technology, neither comprehensive nor exhaustive historical performance data exits for review. A comprehensive evaluation of long-term maintenance needs, procedures and costs for wirefree propulsion system must be conducted based on geometric, mixed-flow operation, and loading characteristics of the H Street/Benning Line extension.
- **Maintenance Facility**. The current maintenance facility for the H Street/Benning Line would have to be modified to accommodate a ground level power supply system, or all GLPSS or ESS vehicles would have to be equipped to operate under wire.
- **Vehicle operations and performance**. Ground level power supply systems provide operation comparable to that of wired systems. Operating experience with ESS indicates that supercapacitor-based systems provide performance comparable to wired systems; however, battery powered systems may be subject to lower acceleration rates and maximum speed as compared to wired systems, particularly in instances of high energy demand. The majority of existing ground level power systems operate in moderate climates and in dedicated rights-of-way. Reliability of contact based systems can be affected by ponding and un-cleared snow and ice. The H Street/Benning Line extension is characterized by mixed-flow operation, longer grades for the DC-295 Viaducts, and areas where higher maximum speeds can be achieved. It is imperative that a wirefree propulsion system perform efficiently for alignment and climatic operating conditions.
- **Maximum Length of Wirefree Segment**. The range for wirefree operation of ESS technologies varies between 0.25 and 2.5 miles and is dependent on the on-board energy source and available capacity, based on research of existing systems. Supercapacitor and battery life are affected by the number of charging cycles, the frequency and degree of high performance operation, vehicle passenger loading, ancillary power consumption, and grades. Ground level power supply systems are continuous; therefore, there is not a maximum distance for wirefree operation. Station stop spacing for the H/Benning Streetcar Line extension fits the noted range for wirefree operation.
- **Vehicle Design**. For the H Street/Benning Line, alternative propulsion wirefree systems will likely require new vehicles. Widths of vehicles in operation with ground level power supply systems vary between 2.4 and 2.65 m; streetcars for the H Street/Benning Line are 2.44 m wide and fit the noted range. To accommodate on-board elements for battery or diesel-based propulsion systems and maintain the dimensions of the H Street/Benning Line, more significant vehicle design modification is likely and a decrease in vehicle passenger capacity may result.

2.10 COST AND DURATION

Budget-level cost estimates were prepared for Build Alternative 1 and 2. These estimates include capital costs of roadway, bridge and streetcar elements/infrastructure, as well as operations and maintenance (O&M) costs of streetcar, and contingencies for design and construction management and inspection. Costs were based on available DDOT construction pricing, similar construction projects, and engineering judgment. To ensure accuracy, quantities were derived directly from the conceptual designs for each Build Alternative. Costs associated with utility impacts and relocation, and for right-of-way acquisition were not included. A budget-level cost estimate summary is presented in **Table 2-6**. Detailed cost estimates for the Build Alternatives are presented in **Appendix C**.

Capital costs of roadway, bridge and streetcar elements/infrastructure for Build Alternative 1 is estimated at approximately $172.6 million, while that of Build Alternative 2 is estimated at approximately $174.5 million. The duration of construction for either Build Alternative is anticipated to take approximately 36 months (see **Appendix D** for a Maintenance of Traffic Concept Plan).

Streetcar O&M costs for both Build Alternative 1 and 2 is approximately $4.4 million.

Table 2-6: Budget-Level Cost Estimate for Build Alternative 1 and 2

Item	Build Alternative 1	Build Alternative 2
Roadway and Bridge Capital Costs	$115,947,498	$118,275,137
Streetcar Capital Costs	$56,652,305	$56,234,123
Total Capital Costs	**$172,599,803**	**$174,509,260**
Operations and Maintenance	$4,389,270	$4,389,270

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The subcategories used to calculate the cost estimate are described below:

2.10.1 ROADWAY AND BRIDGE/STRUCTURAL IMPROVEMENTS

Items associated with roadway improvements include pavement removal, roadway, sidewalk, streetscape, and traffic signals. Appropriate percentage factors were used to account for drainage, signing and striping, and non-streetcar related electrical and lighting. These improvements also include replacement of all bus stops, ADA improvements and a pedestrian crossing at Kingman Island. Full depth pavement is assumed for entire project area. Roadside planting strip assumes one tree every fifty feet and the median landscape assumes use of perennials as opposed to woody/shrub treatment.

To facilitate streetcar infrastructure and improve pedestrian facilities, the bridges and structures within the project corridor require repair and/or replacement. Costs include retaining wall work, modifications to Bridge No. 52 (over Anacostia River) and Bridge No. 77 (over Kingman Island), and full replacement of the Viaduct over CSX railroad tracks and DC-295 (Bridge No. 503). The cost for full replacement includes demolition and new substructure and superstructure.

These estimates include factors for engineering and construction management/construction inspection (CMI).

To account for construction contingencies and maintenance of traffic, appropriate percentage factors were used based on the project subtotal for roadway and bridge construction. These costs were applied to compute mobilization. Mobilization is calculated only for the roadway and bridge construction items using the DDOT formula for a project greater than one million dollars. Costs for design fee and construction management and inspection are computed using the construction subtotal inclusive of mobilization.

2.10.2 STREETCAR CAPITAL COSTS

Capital cost estimates for the streetcar were determined based on quantities associated with each Build Alternative and are presented using FTA's standard cost categories (SCC) Format. These costs are summarized below in **Table 2-7**.

The estimate assumed the purchase of three new streetcar vehicles to account for the service extension to the Benning Road Metrorail Station associated with this project. Other items associated with streetcar costs are platforms (including fare collection), trackwork for both normal and special segments, propulsion system allowance, and miscellaneous infrastructure.

2.10.3 OPERATIONS AND MAINTENANCE

Operations and Maintenance (O&M) costs were computed based on annual revenue vehicle miles and hours, and unit costs per mile and hour, respectively. As provided by DDOT, the 2009 cost per mile was $5.23 and the 2010 cost per hour was $216.81; both were escalated at 3% to 2014 values of $6.06 and $244.02, respectively. Total revenue miles due to the streetcar extension is based on the number of streetcar trips per period and the round trip distance, annualized. Revenue hours based on the number of streetcars (cycle time divided by headway) required by period, multiplied by the hours per period and then annualized. Annual mile and hour-based costs were added to determine total annualized O&M cost.

The following were used as inputs in determining operating costs for Build Alternatives 1 and 2:

- Headway:
  - Service at 10 minute headways during all hours of streetcar operation.
- Hours of Operation:
  - Monday-Thursday 6 AM to 12 AM
  - Friday 6 AM to 2 AM
  - Saturday 6 AM to 2 AM
  - Sunday 8 AM to 10 PM
- Modified Annualization (operating days):
  - 204 weekdays
  - 52 Fridays
  - 52 Saturdays
  - 58 Sundays

Annual operations costs for each of the two Build Alternatives are summarized in **Table 2-8.**

Table 2-7: Budget-level Cost Estimate for Build Alternative 1 and 2

FTA Standard Cost Categories (SCC)	Build Alternative 1	Build Alternative 2
10 GUIDEWAY & TRACK ELEMENTS	**$10,550,500**	**$10,567,000**
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	$8,310,000	$0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	$377,500	$8,684,000
10.04 Guideway: Aerial structure	$835,500	$835,500
10.01 Guideway: At-grade exclusive right-of-way	$302,500	$302,500
10.12 Track: Special (switches, turnouts)	$0.00	$170,000.00
10.12 Track: Special (switches, turnouts)	$600,000.00	$450,000.00
10.12 Track: Special (switches, turnouts)	$125,000.00	$125,000.00
20 STATIONS, STOPS, TERMINALS, INTERMODAL	**$2,010,000**	**$1,720,000**
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	**$0**	**$0**
40 SITEWORK & SPECIAL CONDITIONS (MOT and Mobilization)*	**$10,000,000**	**$10,000,000**
40.08 Temporary Facilities and other indirect costs during construction	$10,000,000	$10,000,000
50 SYSTEMS	**$3,700,000**	**$3,700,000**
Construction Subtotal (10-50)**	$26,260,500	$25,987,000
60 ROW, LAND, EXISTING IMPROVEMENTS	**$0 (Not included)**	**$0 (Not included)**
70 VEHICLES (3)	**$15,000,000**	**$15,000,000**
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	**$10,241,595**	**$10,134,930**
80.01 Project Development	$1,838,235	$1,819,090
80.02 Engineering	$2,100,840	$2,078,960
80.03 Project Management for Design and Construction	$1,050,420	$1,039,480
80.04 Construction Administration & Management	$3,939,075	$3,898,050
80.05 - 80.08 Other Soft Costs	$1,313,025	$1,299,350
Subtotal (10-80)	**$51,502,095**	**$51,121,930**
90 UNALLOCATED CONTINGENCY	**$5,150,210**	**$5,112,193**
TOTAL PROJECT COST (10-90)	**$56,652,305**	**$56,234,123**

Notes:

** Costs shown for Category 40 are only for MOT and mobilization related to streetcar costs. Please refer to separate Roadway and Bridge cost estimates for these sitework associated costs.*

*** Utility relocation costs are NOT included in estimate.*

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 2-8: Annual Operations Cost Estimate

	Build Alternative 1	Build Alternative 2
Annual Revenue Miles	180,600	180,600
Unit Cost per Revenue Mile	$6.06	$6.06
Mileage Based Annual Cost	$1,094,978	$1,094,978
Annual Revenue Hours	13,500	13,500
Unit Cost per Revenue Hour	$244.02	$244.02
Hourly Based Annual Cost	$3,294,291	$3,294,291
Total Annual O&M Costs 2014 dollars	$4,389,270	$4,389,270

Source: Benning Road and Bridges Transportation Improvements EA Project Team

3 AFFECTED ENVIRONMENT

This chapter is a compilation and summarization of information collected to reflect the existing social, economic and natural resources within the project study area that could be affected by the project alternatives. Unless otherwise specified, a quarter-mile radius, the typical walking distance to high-quality, high-frequency transit, around the Benning Road corridor was determined to be the appropriate study area boundary for the Benning Road and Bridges Transportation Improvements Environmental Analysis (EA). Where noted, the "Benning Road and Bridges Transportation Improvements EA Project Team" as listed includes the technical team members also listed in **Chapter 6**, List of Preparers.

This chapter evaluates existing conditions for the following resources:

- Zoning and Land Use;
- Neighborhoods, Demographics, and Community Facilities;
- Environmental Justice;
- Development and Joint Development;
- Transportation and Traffic Operations including the roadway network, mass transit, pedestrian and bicycle facilities and freight rail service;
- Section 4(f);
- Parklands;
- Cultural Resources;
- Aesthetics and Visual Quality;
- Natural Resources including surface waters, wetlands, regulated floodplains, soils, topography, habitat, threatened and endangered species;
- Utilities;
- Hazardous Materials;
- Noise and Vibration;
- Air Quality; and
- Energy Use and Climate Change.

Each section provides an introduction and regulatory setting of the environmental resource, and the methodology for documenting existing conditions including data sources and findings within the study area. Each section follows a standard organization:

- Introduction
- Methodology
- Existing Conditions

3.1 SOCIOECONOMIC RESOURCES

3.1.1 ZONING AND LAND USE

3.1.1.1 Introduction

This section describes the existing zoning, existing land use, and planned future land use.

3.1.1.2 Methodology

Existing conditions information is based on site visits, aerial photographs, studies by the District of Columbia's Office of Planning, and GIS data obtained from the District of Columbia Office of the Chief Technology Officer (OCTO).

Zoning Information

Zoning information is based on GIS data obtained from OCTO.

Land Use Information

Existing land use information is derived from GIS data obtained from OCTO showing an approximate rendering of land use as it existed in 2005. This has been updated to show land uses as they currently exist based on site observations. The Comprehensive Plan Future Land Use Map shows land use as envisioned in the District's 2006 revised Comprehensive Plan. The future land use information uses GIS data updated in January 2013. The categories used in the existing and future land use maps are similar, but not identical.

3.1.1.3 Existing Conditions

Zoning

Zoning of parcels in the study area is regulated by the District of Columbia's Office of Zoning. The zoning categories in the study area include residential, commercial, industrial, mixed-use, and parks and open space. Public roadways are not covered by local zoning. The proposed future land use generally corresponds to the local zoning categories; for example, where mixed uses are proposed along Minnesota Avenue, the underlying zone allows office and residential uses in addition to retail uses.

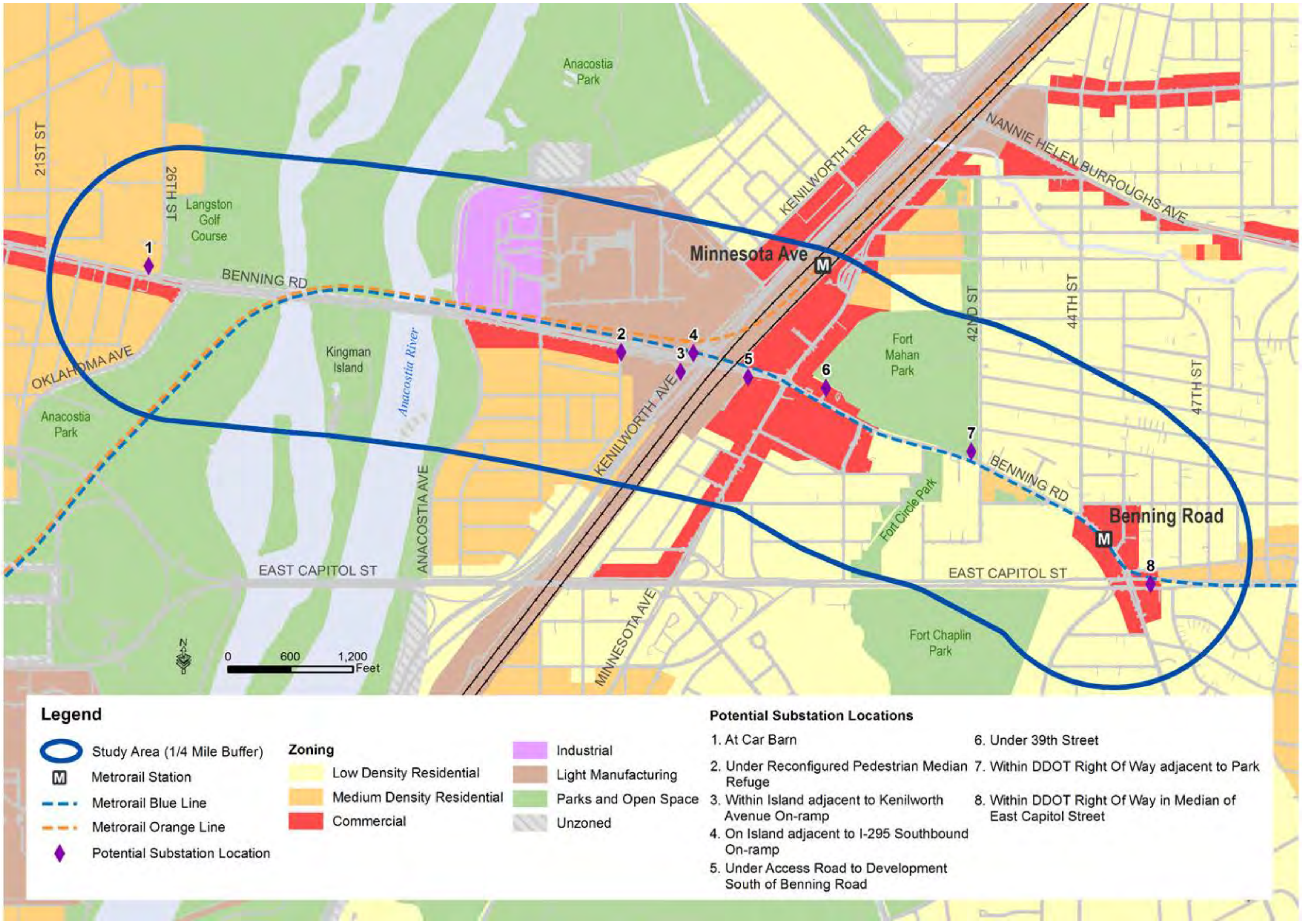
Figure 3-1 shows the general zoning categories in the study area. Specific zones and their brief descriptions are listed in **Table 3-1**. Refer to Title 11 of the *District of Columbia Municipal Regulations* for a detailed description of zoning districts.

Table 3-1: Zoning in the Study Area

General Zoning Category	Zone	Description of Permissible Uses
Low Density Residential	R-2	Permits matter-of-right development of single-family residential uses for detached and semi-detached structures, churches, and public recreation and community centers, and schools; maximum height of 40 feet, or 60 feet for churches and schools, and 45 feet for public recreation and community centers.
	R-5-A	Permits matter-of-right development of single-family residential uses for detached and semi-detached dwellings and, with the approval of the Board of Zoning Adjustment, new residential development of low density residential uses including row houses, flats, and apartments, and public recreation and community centers; maximum floor area ratio (FAR) of 0.9; maximum height of 40 feet, or 90 feet for schools, 60 feet for churches, and 45 feet for public recreation and community centers.
Medium Density Residential	R-3	Permits matter-of-right development of single-family residential uses (including detached, semi-detached, and row dwellings), churches and public schools, and public recreation and community centers; maximum height of 40 feet, or 60 feet for churches and schools and 45 feet for public recreation and community centers.
	R-4	Permits matter-of-right development of single-family residential uses (including detached, semi-detached, row dwellings, and flats), churches and public schools, and public recreation and community centers; maximum height of 40 feet, 60 feet for churches and schools and 45 feet for public recreation and community centers. Conversions of existing buildings to apartments are permitted.
Commercial	C-1	Permits matter-of-right neighborhood retail and personal service establishments and certain youth residential care homes and community residence facilities; maximum FAR of 1.0; maximum height of 40 feet.
	C-2-A	Permits matter-of-right low density development, including office employment centers, shopping centers, medium-bulk mixed use centers, and housing; maximum FAR of 2.5 for residential use and 1.5 FAR for other permitted uses; maximum height of 50 feet.
	C-2-B	Permits matter-of-right medium density development, including office, retail, housing, and mixed uses; maximum FAR of 3.5 for residential use and 1.5 FAR for other permitted uses; maximum height of 65 feet.
	C-3-A	Permits matter-of-right medium density development, with a density incentive for residential development within a general pattern of mixed- use development; maximum FAR of 4.0 for residential and 2.5 FAR for other permitted uses; maximum height of 65 feet.
Industrial	M	Permits general industrial uses to a maximum FAR of 6.0, and a maximum height of 90 feet with standards of external effects and new residential prohibited.
Light Manufacturing	C-M-1	Permits development of low bulk commercial and light manufacturing uses to a maximum FAR of 3.0, and a maximum height 40 feet with standards of external effects and new residential prohibited.
Parks and Open Space	W-0	Permits open space, park and low-density and low-height waterfront- oriented retail and arts uses with a maximum height of 40 feet and a maximum FAR of 0.5 (.75 for a lot that is used exclusively for recreational use, marina, yacht club, or boathouse building or structure).

Source: District of Columbia Office of Zoning. http://dcoz.dc.gov/info/districts.shtm, accessed February 17, 2014

Figure 3-1: Study Area Zoning



Source: DC OCTO and Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Existing Land Use

As shown in **Figure 3-2**, existing land use includes residential, commercial, utilities, industrial, local public uses, and parks and open spaces. Land uses are described from west to east below.

Between 21st Street and Oklahoma Avenue, land uses are primarily a mix of low-medium density residential, medium density residential and local public use (currently the site of the vacant Spingarn Senior High School). In addition, industrial and commercial uses exist along the southern side of Benning Road.

Between Oklahoma and Anacostia Avenues, the only land use within the study area is parks and open space, and includes the Langston Golf Course, Kingman Island, and the Anacostia Park.

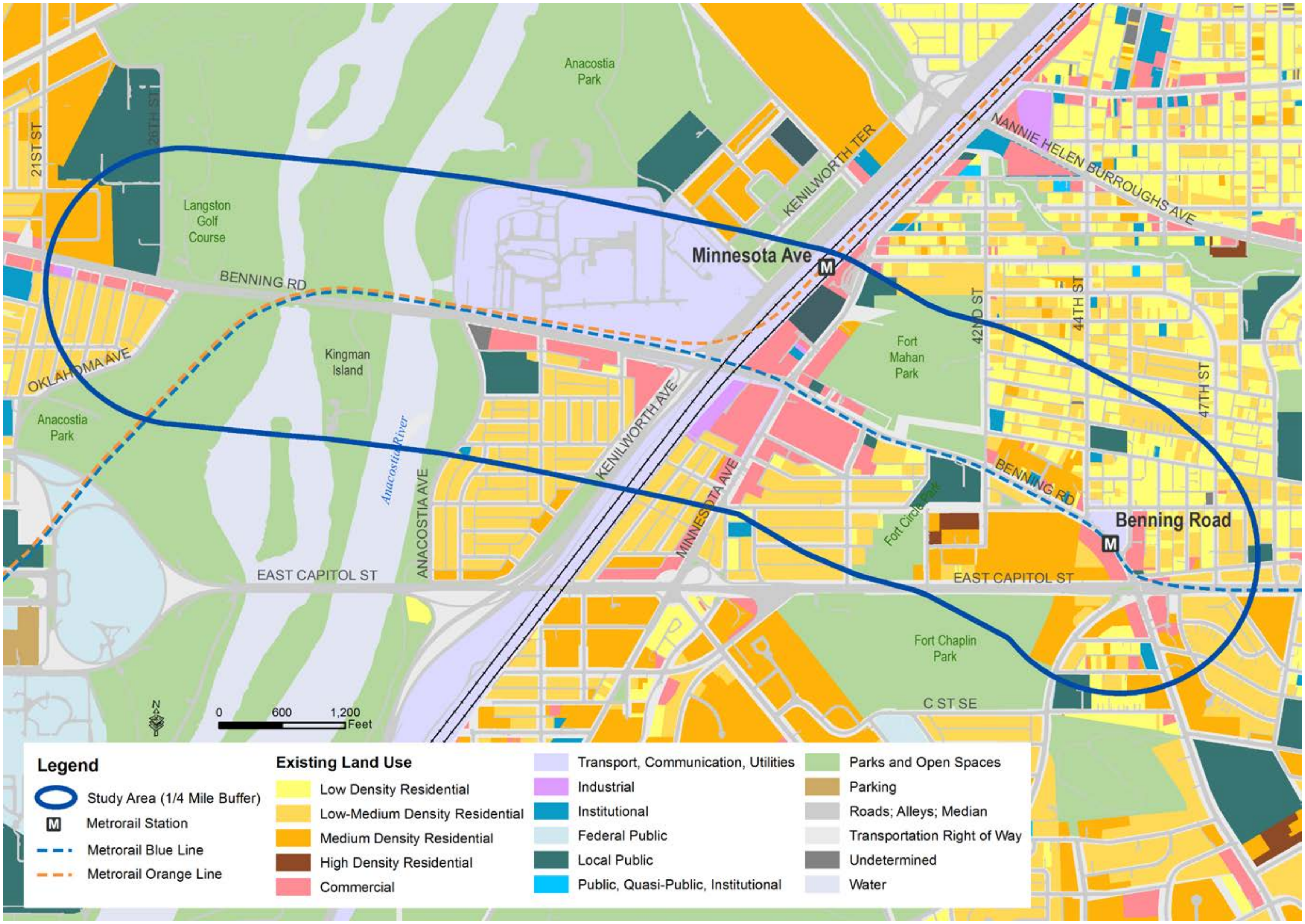
East of Anacostia Avenue to Minnesota Avenue, the predominant land use to the north of Benning Road is transportation with CSX Railroad and Metrorail, communications and utilities, and includes the decommissioned Pepco Power Plant. Open space currently exists between the moderate density new Parkside residential development and Minnesota Avenue.

South of Benning Road, between Anacostia Avenue and Minnesota Avenue, the low-medium density residential neighborhood of River Terrace is the primary land use. Other existing land uses include local public use (currently the site of the River Terrace Education Campus) and commercial uses along Benning Road.

Between Kenilworth and Minnesota Avenues, the land use is primarily commercial, in addition to the Minnesota Avenue Metrorail Station, a local public use -- the District's Department of Employment Services (DOES) offices, and some low-medium density residential south of Benning Road. The intersection of Benning Road and Minnesota Avenue, also referred to as "Downtown Ward 7", is where the largest concentration of commercial use currently exists in the study area.

Land use between Minnesota Avenue and the Benning Road Metrorail Station is primarily a mix of low, low-medium, and medium density residential, interspersed by three large parks of the National Park Service (NPS) Fort Circle Parks system and occasional commercial and public uses along Benning Road.

Figure 3-2: Existing Land Use



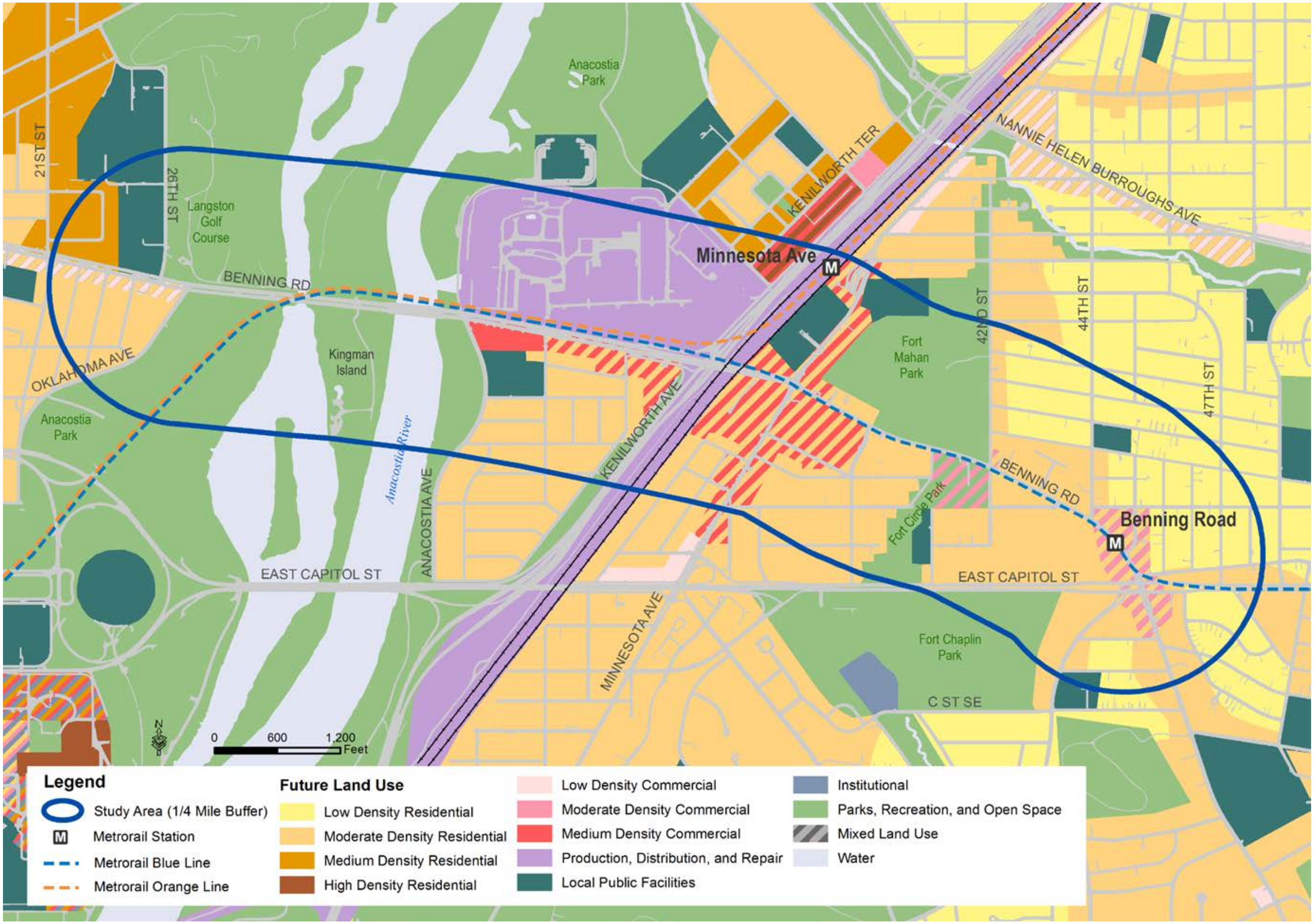
Source: DC OCTO and Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Future Land Use

Planning in the study area anticipates some new uses, increasing density and a greater mix of uses at certain locations. **Figure 3-3** shows the future land use within the study area. Key land use changes anticipated are listed from west to east below:

- Spingarn Senior High School closed in 2013 and is the future site of DDOT's Spingarn Car Barn and Training Facility. The new Car Barn will serve as the maintenance facility for the DC streetcar system.
- The open space that currently exists between Minnesota Avenue and the moderate density new Parkside residential development is slated for a mix of high density residential and medium density commercial uses.
- Medium density commercial and a mix of moderate density residential and medium density commercial are proposed east of Anacostia Avenue (south of Benning Road) and between Anacostia Freeway and 40th Street on both sides of Benning Road.
- A mix of moderate density residential and recreational use is proposed south of Benning Road between 41st and 42nd Streets.
- A mix of moderate density residential and moderate density commercial is proposed for the area around the Benning Road Metrorail Station.

Figure 3-3: Future Land Use



Source: DC OCTO and Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

3.1.2 NEIGHBORHOODS, COMMUNITY RESOURCES AND DEMOGRAPHICS

3.1.2.1 Introduction

This section identifies existing and projected neighborhoods, community resources, and demographics.

3.1.2.2 Methodology

Existing information on neighborhoods and community resources was gathered through site visits, examination of recent aerial photographs, other studies undertaken by DDOT, including the *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013), and GIS data layers obtained from OCTO.

Current and projected demographic information through the year 2040 is based on 2012 American Community Survey 5-Year Estimates and Metropolitan Washington Council of Governments (MWCOG) population and employment Round 8.2 Forecasts, published in July 2013. Projected population and employment growth are analyzed by Transportation Analysis Zone (TAZ) using GIS. TAZs are geographic units that are commonly used in transportation models and regional forecasts to analyze demographic data and trip generation. The 2012 American Community Survey 5-Year Estimates are used to identify the existing minority, low-income, and transit-dependent populations within the study area.

3.1.2.3 Existing Conditions

Neighborhoods

The study area is primarily comprised of neighborhoods in Ward 7. The neighborhoods within the study area are described in **Table 3-2** and identified in **Figure 3-4**.

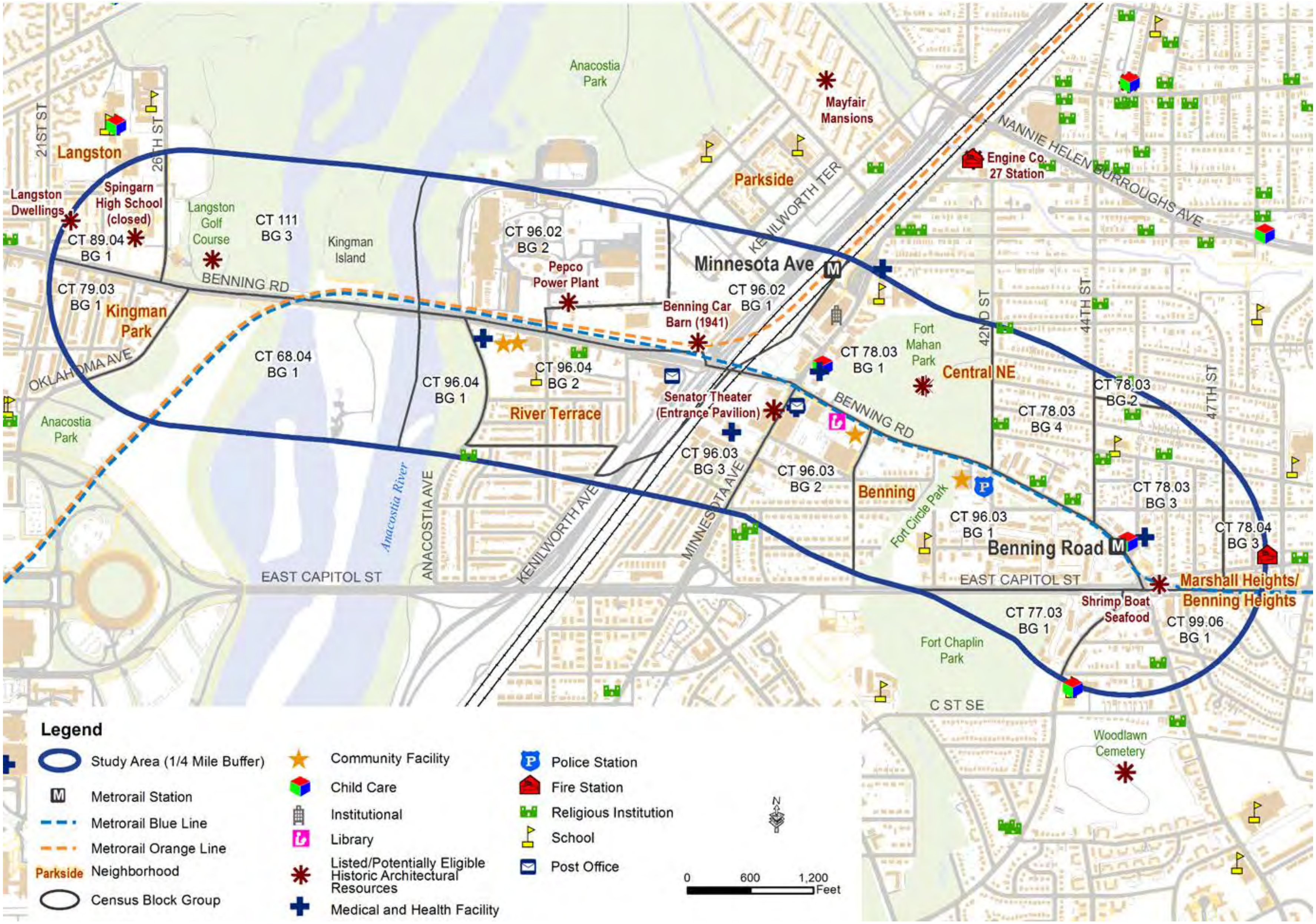
Table 3-2: Neighborhoods

Location	Development Characteristics	Population Characteristics
Langston		
Census Tract 89.04 Block Group 1	Medium Density Residential. Listed on the National Register of Historic Places (NRHP), Langston Terrace was the first federally funded housing project in DC and the second in the nation. Directly east of the neighborhood is the Langston Golf Course, which is also listed on the NRHP as the first golf facility to serve African Americans.	Approximately 670 residents within the study area. Nearly 99 percent of the population is minority and 25 percent are low-income. This area has the lowest percentage of home- ownership in the District. The DC Housing Authority website lists that 44 percent of residents are disabled and 47 percent are single person households.
Kingman Park		
Census Tract 79.03 Block Group 1	Mostly low-density residential with some commercial storefronts along Benning Road. The neighborhood is characterized by brick façade row houses and mature tree lined streets in neighborhoods along 21st Street and eastward including Oklahoma Avenue.	Approximately 580 residents within the study area. Nearly 96 percent of the population is minority and 22 percent are low-income.

Location	Development Characteristics	Population Characteristics
Parkside		
Census Tract 96.02 Block Group 1	A portion of the study area is within the Parkside neighborhood, which is currently being redeveloped. Parkside offers a variety of housing options, with more than 1,500 new residential units. Housing includes affordable elderly apartments, for-sale market-rate and for-sale affordable townhomes, and apartments for households of all income levels.	Approximately 650 residents within the study area. 100 percent of the population is minority and roughly 45 percent are low-income. Nearly 90 percent of the housing units are renter occupied.
River Terrace		
Census Tract 96.04 Block Group 1 Census Tract 96.04 Block Group 2	Mostly low-density residential with some commercial storefronts along Benning Road. Adjacent to the neighborhood is River Terrace Park, a national park made up of a section of the eastern bank of the Anacostia River. The Pepco Power Plant and a trash transfer station are two major industrial uses located directly north of the neighborhood.	Approximately 1200 residents within the study area. Nearly 99 percent of the population is minority and 10 percent are low-income.
Central Northeast (also known as Mahaning Heights)		
Census Tract 78.03 Block Group 1 Census Tract 78.03 Block Group 4	Mixed use. Fort Mahan Park is located at the center of the neighborhood, with low-density residential to the north and west of the park. Commercial, office and institutional uses are clustered along Minnesota Avenue, including the DC DOES and Friendship Collegiate Academy.	Approximately 920 residents within the study area. Nearly 99 percent of the population is minority and 27 percent are low-income.
Benning		
Census Tract 96.03 Block Group 1 Census Tract 96.03 Block Group 2 Census Tract 96.03 Block Group 3	Mixed use. Commercial use clustered around Benning Road and Minnesota Avenue intersection and the Benning Road Metrorail Station. Mixture of low-density residential and medium density residential, with parkland in the center of the neighborhood.	Approximately 2200 residents within the study area. Nearly 99 percent of the population is minority and 20 percent are low-income.
Marshall Heights/Benning Heights		
Census Tract 77.03 Block Group 1 Census Tract 78.03 Block Group 2 Census Tract 78.03 Block Group 3 Census Tract 78.04 Block Group 3 Census Tract 99.06 Block Group 1	Mixed use. Majority low-density residential but some medium-density residential developments are present. Commercial use clustered along Benning Road. Parts of Fort Chaplin Park are also within the study area.	Approximately 1650 residents within the study area. Nearly 98 percent of the population is minority and 18 percent are low-income.

Sources: U.S. Census Bureau, American Community Survey 5-Year Estimates (2008-2012); DC Data Catalog (http://data.dc.gov/)

Figure 3-4: Neighborhoods and Community Facilities



Sources: US Census Bureau, DC OCTO, and Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Community Facilities

Community facilities within the study area include schools, churches, public library, post offices, police and fire stations, and medical facilities. **Table 3-3** lists community facilities and **Figure 3-4** shows their locations. A number of parks and recreation areas also exist within the study area; these facilities are described in **Section 3.3**.

Table 3-3: Community Facilities in Study Area

Facility	Location	Ownership
Schools		
Friendship Public Charter Schools – Collegiate Academy	4095 Minnesota Avenue	District of Columbia
DC Prep Public Charter Schools – Benning Elementary and Middle Schools	100 41st Street	District of Columbia
Smothers Elementary School	4400 Brooks Street	District of Columbia
River Terrace Education Campus	420 34th Street	District of Columbia
Spingarn High School (closed)	2500 Benning Road	District of Columbia
Places of Worship		
Varick Memorial AME Zion	255 Anacostia Ave	Private
Beyond the Veil Worship Center, Inc.	3433 Benning Road	Private
Crusaders Baptist*	4203 Edson Place	Private
Upper Room Baptist Church*	60 Burns Street	Private
Ward Memorial AME	241 42nd Street	Private
New Grove Baptist Church	4242 Benning Road	Private
New Mount Calvary Baptist	4720 Benning Road	Private
East Friendship Baptist	4401 Brooks Street	Private
Morningstar Pentecostal*	4409 Eads Street	Private
Grace Apostolic Church	4417 Dix Street	Private
Glorious Church of God	4510 Brooks Street	Private
Gospel Ark Temple Bible	4551 Benning Road	Private
Public Facilities		
Dorothy I Height/Benning Neighborhood Library	3935 Benning Road	District of Columbia
DOES/ American Job Center	4058 Minnesota Avenue	District of Columbia
Metropolitan Police Department Sixth District Station	100 42nd Street	District of Columbia
DC Fire Department Engine 30 Station	50 49th Street	District of Columbia
Community Facilities		
Northeast Performing Arts Group, Inc./ Northeast ‘Outreach’ Youth Center, Inc.	3431 Benning Road	Private
NOW (Neighborhood, Organized, Workforce), Inc.	3435 Benning Road	Private
Marshall Heights Community Development Organization, Inc.	3939 Benning Road	Private
Boys and Girls Club Headquarters/ Richard England Clubhouse #14	4103 Benning Road	Private
Childcare Facilities		
Community Child Development Center	4021 Minnesota Avenue	Private
Kids Universe Child Development Center	4430 Benning Road	Private
DPR Plummer Before and After School*	4601 Texas Avenue	Private
Hospital, Medical and Health Facilities		
Family Preservation Services of DC	3341 Benning Road	Private

Facility	Location	Ownership
Unity - Minnesota Ave Health Center	3924 Minnesota Avenue	Private
Planned Parenthood - Ophelia Egypt Health Center	3937 Minnesota Avenue	Private
MBI Health Services	4017 Minnesota Avenue	Private
Northside Medical Services Corporation*	4121 Minnesota Avenue	Private
Unity - East of the River Health Center	123 45th Street	Private
Post Offices		
River Terrace Location	3621 Benning Road	U.S. Postal Service
Benning Location	3937 1/2 Minnesota Avenue	U.S. Postal Service

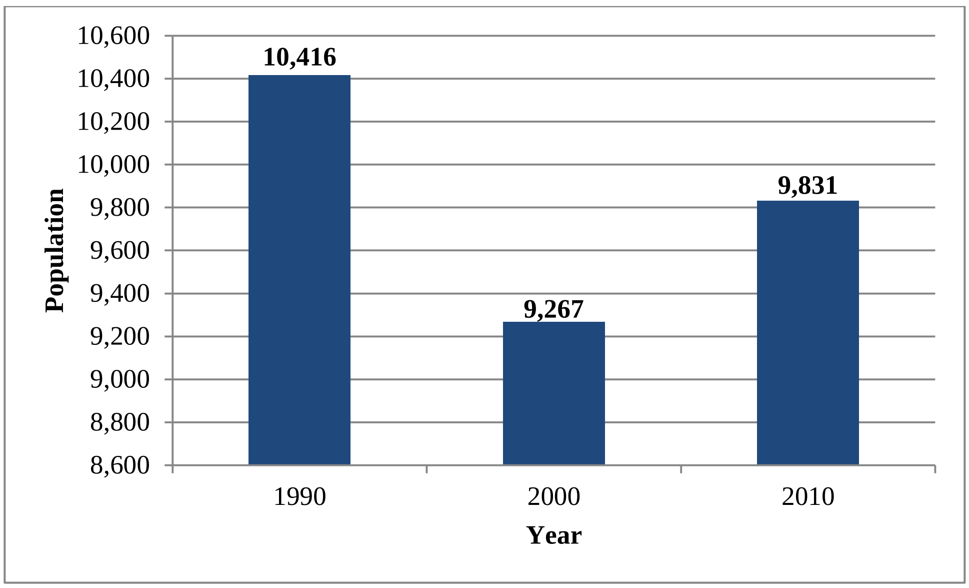
**Facility located immediately outside of ¼-mile study area.*

Sources: DC Data Catalog (http://data.dc.gov/); Benning Road and Bridges Transportation Improvements EA Project Team

Demographics

As shown in **Figure 3-5**, the study area underwent population decreases through the 1990s and early 2000s; however by 2010 the study area had grown by 6 percent.

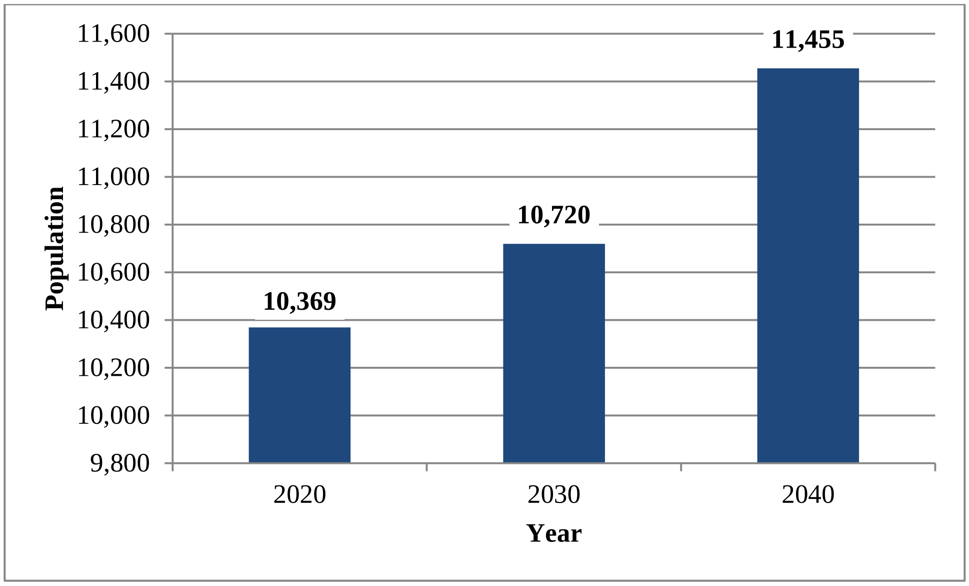
Figure 3-5: Recent Population Growth in Study Area



Source: U.S. Census Bureau

MWCOG forecasts that population in the study area is projected to continue to grow by 2040, with most of that growth occurring between 2030 and 2040. As **Figure 3-6** shows, population is projected to grow by 10 percent between 2020 and 2040 to approximately 11,455 people.

Figure 3-6: Projected Population Growth in Study Area



Source: MWCOG Round 8.2 Estimates and Projections (July 2013)

Figure 3-7 shows population densities within the study area by TAZ for 2010. The highest densities in 2010 are located east of Minnesota Avenue between Benning Road and East Capitol Street and the areas surrounding the Benning Road Metrorail Station. Population growth is projected to remain focused in the study area over the next two decades.

Populations

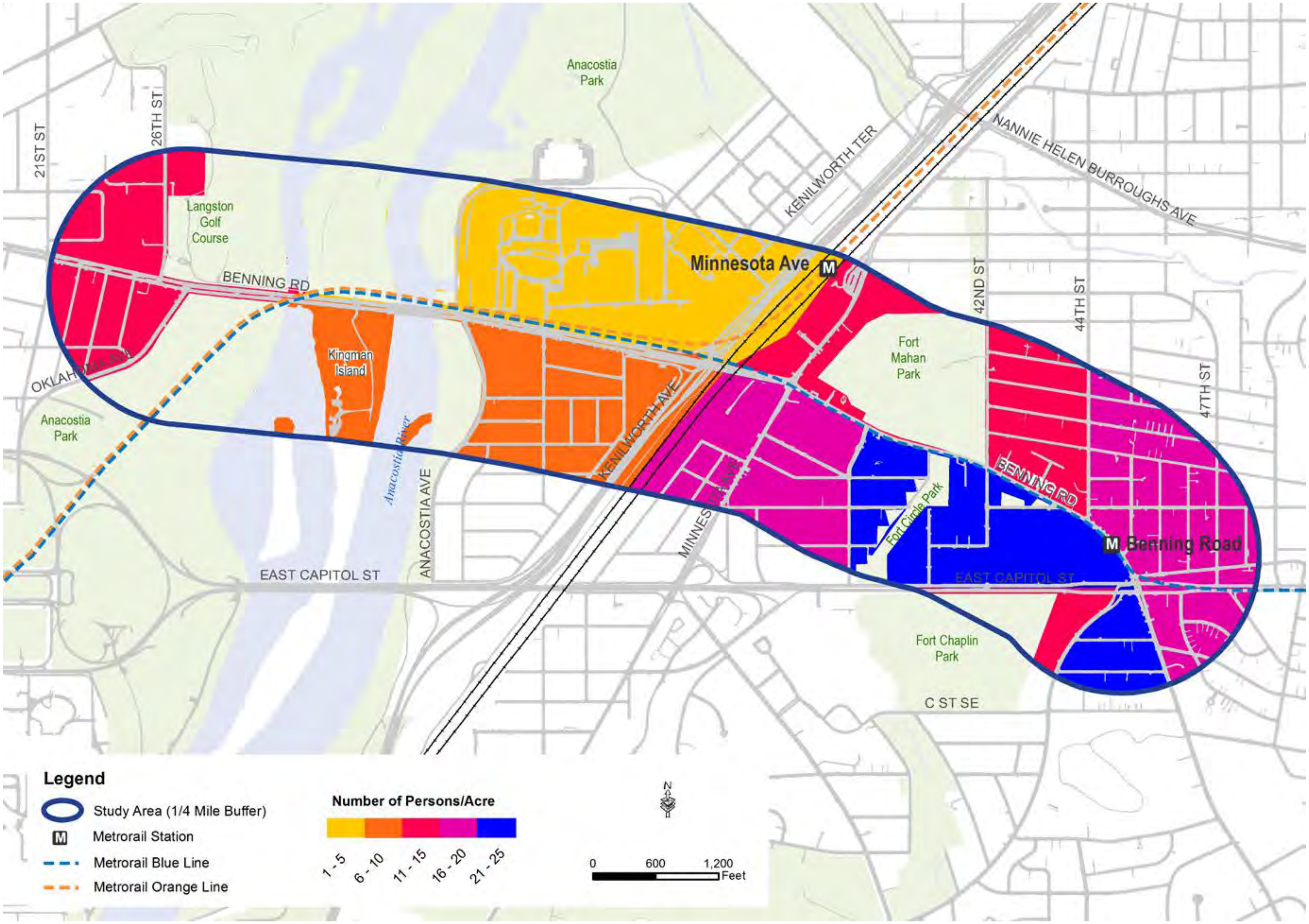
Table 3-4 shows the population composition in the study area. Black individuals make up the largest share of the population with 95.9 percent of the total study area population. White and Hispanic individuals make up the second largest share with 1.3 percent each respectively, followed by individuals who identify with two or more races at 0.9 percent.

Table 3-4: Study Area Populations

Race/Ethnicity	Study Area Population	District of Columbia
Black	8,401 (95.9%)	305,141 (50.4%)
White	117 (1.3%)	209,183 (34.5%)
Hispanic	116 (1.3%)	56,259 (9.3%)
Two or More Races	82 (0.9%)	10,759 (1.8%)
American Indian and Alaskan Native	22 (0.3%)	1,518 (0.3%)
Asian	19 (0.2%)	21,273 (3.5%)
Other	6 (0.1%)	1,314 (0.2%)
Native Hawaiian or Other Pacific Islander	0 (0%)	312 (<1%)

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2008-2012

Figure 3-7: 2010 Population Density



Source: MWCOG Round 8.2 Estimates and Projections, July 2013

Transit-Dependent Populations

A "transit-dependent" person is someone who does not have access to a personal automobile and relies on public transit. For this analysis, transit-dependent population percentages were identified using 2008-2012 American Community Survey 5-Year Estimates for: (1) populations without private transportation (zero-car households), (2) populations under age 18 or over age 65, and (3) low-income populations (population below the federally designated poverty level by family size).

The study area has several concentrations of transit-dependent populations, clustered around both Benning Road and Minnesota Avenue Metrorail Stations. **Table 3-5** illustrates transit dependency using 2008-2012 American Community Survey 5-Year Estimate data within the study area, and compares these percentages with total transit-dependent percentages in the District of Columbia. The study area has higher rates of zero-car households, population below the poverty level, and population under 18 or over 65 than the District of Columbia.

Table 3-5: Transit Dependent Populations in Study Area

Transit Dependency Indicator	Study Area Population	District of Columbia
Zero-Car Households	1,767 (45.7%)	95,206 (36.5%)
Population Under 18 or Over 65	3,006 (34.3%)	173,031 (28.6%)
Population Below Poverty Level	1,922 (23.2%)	105,606 (18.5%)

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2008-2012

Employment

As seen in **Table 3-6**, MWCOG Forecasts project employment in the study area to double between 2010 and 2040. Employment is projected to grow at a rapid rate (53 percent) between 2010 and 2020 and continue at a slower rate between 2020 and 2030 (13 percent) and between 2030 and 2040 (17 percent).

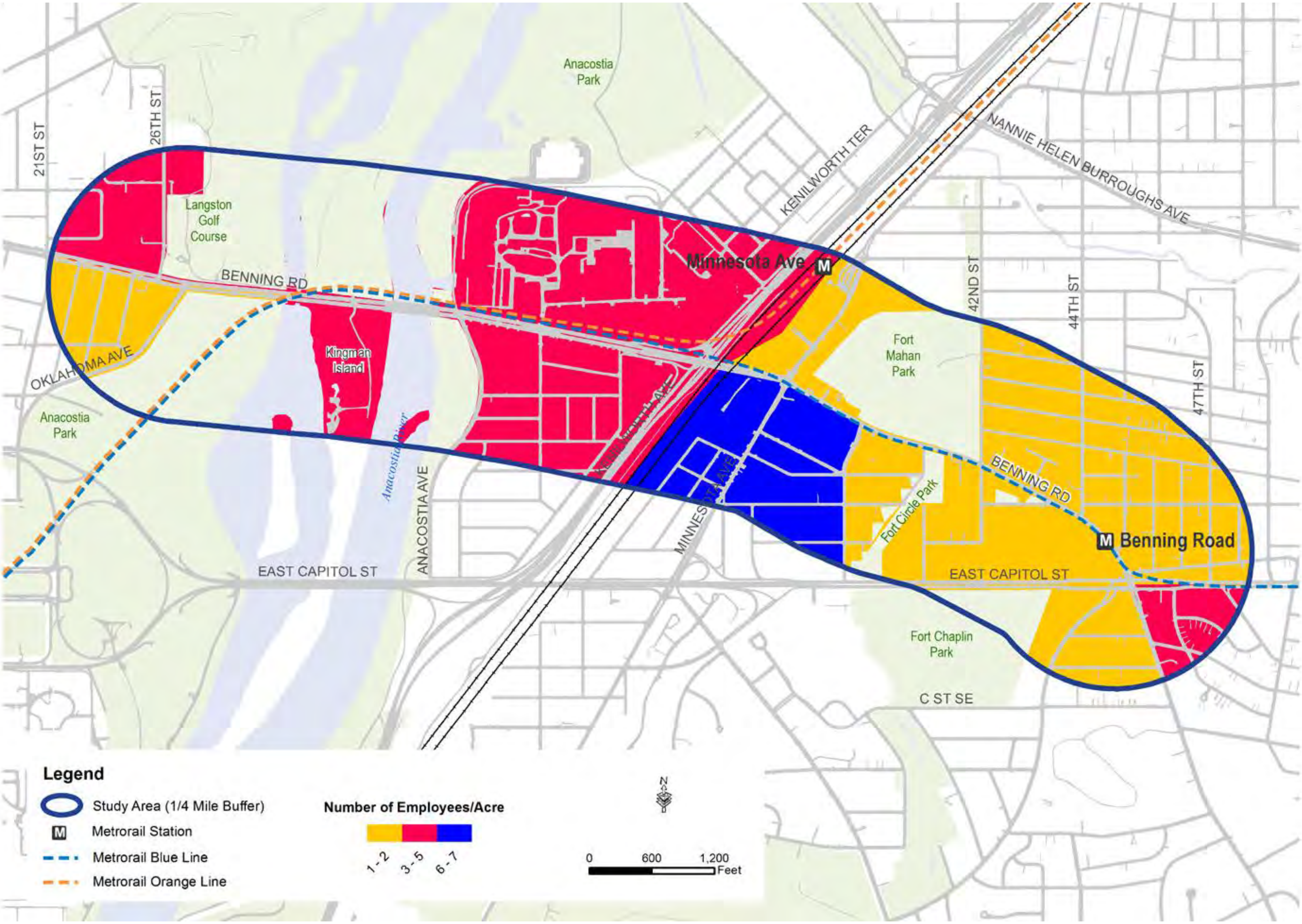
Table 3-6: Employment Growth in Study Area

	2010	2020	2030	2040
Number of Employees	2,084	3,179	3,600	4,205
Percentage Change	n/a	53%	13%	17%

Source: MWCOG Round 8.2 Estimates, July 2013

Figure 3-8 shows the 2010 employment density within the study area by TAZ. The highest concentration of employment exists south of the Minnesota Avenue/Benning Road intersection where a commercial and light manufacturing cluster is located.

Figure 3-8: 2010 Employment Density



Source: MWCOG Round 8.2 Estimates, July 2013

3.1.3 ENVIRONMENTAL JUSTICE

3.1.3.1 Introduction

As part of the environmental justice (EJ) analysis for this project, this section identifies minority and low-income populations (collectively "EJ populations") in the study area. Environmental Justice is defined by Executive Order 12898 (EO 12898), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. EO 12898 requires that federal agencies identify and address disproportionately high and adverse impacts on minority and low-income populations. The U.S. Department of Transportation (USDOT) is committed to the principles of EJ, which include:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations;
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process; and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

The EJ analysis was prepared in accordance with the following federal guidance documents.

- USDOT Order 5610.2(a), Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, May 10, 2012;
- Federal Transit Administration Circular 4703.1, Environmental Justice Policy Guidance for Federal Transit Administration Recipients, August 15, 2012; and
- Council on Environmental Quality (CEQ), Environmental Justice – Guidance under the National Environmental Policy Act (NEPA) of 1969, December 10, 1997.

The USDOT Order on Environmental Justice (5610.2a) and Federal Transit Administration (FTA) Circular 4703.1 define minority and low-income populations as follows:

- **Minority Populations**: Minority populations include persons who are American Indian or Alaskan Native, Asian American, Native Hawaiian or Other Pacific Islander, Black (not of Hispanic Origin), and Hispanic or Latino.
- **Low-Income Populations**: Any readily identifiable group of low-income persons whose household income is at or below the U.S. Department of Health and Human Services poverty guidelines. For low-income populations, FTA encourages the use of a locally developed threshold, such as that used for FTA's grant program (Public Law 112-141), which defines "low-income individual" to mean "an individual whose family income is at or below 150 percent of the poverty line."

3.1.3.2 Methodology

Minority and low-income statistics were analyzed at the Census block group level using the 2008-2012 American Community Survey 5-Year Estimate population and income data. The study area intersects 18 Census Block Groups. All Census block groups within the study area were reviewed to identify potentially affected EJ populations.

The identification of environmental justice populations primarily relied on the use of thresholds based on CEQ guidance provided in *Environmental Justice Guidance under NEPA* (CEQ, 1997). An EJ population was defined to include any Census block group in which the minority or low-income population meets or exceeds the following thresholds:

- Minority or low-income population in the Census block group exceeds 50 percent; or
- Percentage of a minority or low-income population in the affected area is meaningfully greater than the lowest percentage in either the county (for this project, the District of Columbia was used for comparison purposes since there is not a county for DC) or study area.

The CEQ guidance does not define the specific percentage that should be used for determining if the minority or low-income population is "meaningfully greater" than the average in the surrounding jurisdiction. However, it is consistent with the CEQ guidance to set a threshold that is higher than (not the same as) the average of the low-income or minority population in the surrounding jurisdictions. For this EA, the minority or low- income population was considered "meaningfully greater" than the average in the surrounding jurisdictions if it was 10 percent higher than the average for the District of Columbia.

Other data sources used to confirm the location of minority and low-income populations included information from the District of Columbia, field visits, and public meetings.

3.1.3.3 Existing Conditions

Overall Study Area

Table 3-7 lists the percentages of minority and low-income residents in the study area and within the entire jurisdiction of the District of Columbia to use as a comparison for identifying minority and low-income populations. Approximately 99 percent of the study area population belongs to a minority group. In comparison to the District of Columbia, whose minority population comprises 65 percent of the total population, the study area has a higher percentage of minorities. Additionally, 33 percent of the study area population is low-income, which is also a higher percentage than the District of Columbia.

Table 3-7: Minority and Low-Income Populations

Population Type	Study Area Population	District of Columbia
Total Population	8,763	605,759
Minority	8,646 (98.7%)	396,576 (65.5%)
Population for whom poverty status is determined*	8,299	572,108
Low-Income	2,700 (32.5%)	147,965 (25.9%)

**The population for whom poverty is determined is determined by the U.S. Census Bureau. For the ACS 5-Year Estimates (2008-2012), poverty status was determined for all people except for unrelated individuals under 15 years old, and people in institutional group quarters, college dormitories, military barracks, and living situations without conventional housing.*

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2008-2012

Neighborhoods with Environmental Justice Populations

A number of EJ populations exist within the study area. By following the methodology outlined above, 18 block groups were found to meet the thresholds for high concentration of minority populations and 7 block groups met the thresholds for high concentration of low-income populations. Neighborhoods with EJ populations are identified in **Table 3-8** and shown in **Figure 3-9**.

Approximately 99 percent of the total study area population belongs to a minority group. All 18 block groups along the corridor have high concentrations of minority population (>50 percent). These areas include parts of residential neighborhoods such as Carver and Langston Terrace, River Terrace, Parkside, Upper Central Northeast, Lower Central Northeast, Marshall Heights and Benning Heights.

A majority of block groups within the study area exceed the percentage of low-income populations within the District of Columbia (>25.9%); however 7 block groups exceed the District's percentage by 10 percent or more. Three of the 7 block groups (Census Tract 68.04 Block Group 1, Census Tract 96.02 Block Group 2, and Census Tract 111 Block Group 3) that exceed the District's percentage by 10 percent contain neighborhoods outside of the study area; therefore these block groups were not included in the low-income analysis. The three block groups include Kingman Island and the former Pepco Power Plant property, in which no residential populations exist. The area comprising the Parkside neighborhood to the west of Minnesota Avenue and the Lower Central Northeast neighborhood contain the highest percentage of low-income individuals in the study area.

Table 3-8: Neighborhoods with Environmental Justice Populations

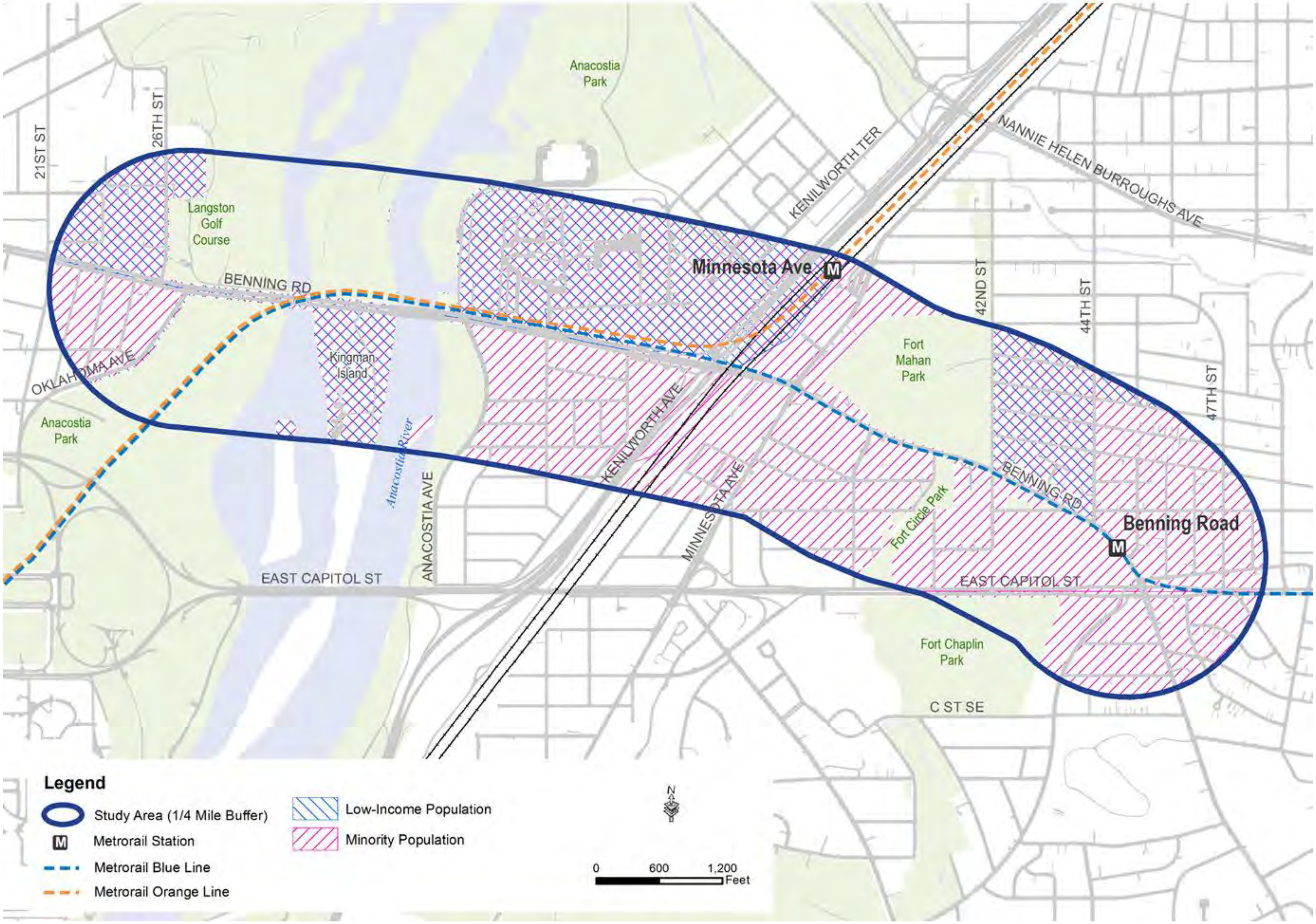
			Minority			Low-Income			Environmental Justice Population*	
Tract	Block Group	Neighborhood	Total Population	Minority Population	Percent	Total Population**	Low-Income Population	Percent	Minority	Low-Income
68.04	1	Kingman Island	435	424	97.5%	15	15	100.0%	X	X
77.03	1	Marshall Heights/ Benning Heights	180	180	100.0%	180	18	10.0%	X	
78.03	1	Central Northeast	268	268	100.0%	268	52	19.4%	X	
78.03	2	Marshall Heights/ Benning Heights	51	51	100.0%	51	28	54.9%	X	X
78.03	3	Marshall Heights/ Benning Heights	491	474	96.5%	491	132	26.9%	X	
78.03	4	Central Northeast	649	641	98.8%	649	364	56.1%	X	X
78.04	3	Marshall Heights/ Benning Heights	210	210	100.0%	210	44	21.0%	X	
79.03	1	Kingman Park	579	553	95.5%	573	167	29.1%	X	
89.04	1	Langston	672	666	99.1%	672	261	38.8%	X	X
96.02	1	Parkside	655	655	100.0%	655	375	57.3%	X	X
96.02	2	Pepco Power Plant	377	377	100.0%	377	267	70.8%	X	X
96.03	1	Benning	1299	1287	99.1%	1288	306	23.8%	X	
96.03	2	Benning	257	257	100.0%	257	50	19.5%	X	
96.03	3	Benning	633	629	99.4%	633	191	30.2%	X	
96.04	1	River Terrace	454	454	100.0%	447	105	23.5%	X	
96.04	2	River Terrace	726	716	98.6%	726	83	11.4%	X	
99.06	1	Marshall Heights/ Benning Heights	718	704	98.1%	718	208	29.0%	X	
111	3	Kingman Island	109	101	92.7%	88	34	38.6%	X	X

**Minority population exceeds 50%, or low-income population exceeds 35.9% (10 percent greater than city-average).*

***The population for whom poverty is determined is determined by the U.S. Census Bureau. For the ACS 5-Year Estimates (2008-2012), poverty status was determined for all people except for unrelated individuals under 15 years old, and people in institutional group quarters, college dormitories, military barracks, and living situations without conventional housing.*

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2008-2012

Figure 3-9: Environmental Justice Populations



Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2008-2012

3.1.4 DEVELOPMENT AND JOINT DEVELOPMENT

3.1.4.1 Introduction

This section identifies recent development and proposed plans for redevelopment or joint development within the study area.

3.1.4.2 Methodology

Sites under construction or with redevelopment plans in the near term, medium term, and long term were identified from information obtained from the DC Office of Planning and the Washington, DC Economic Partnership.

3.1.4.3 Existing Conditions

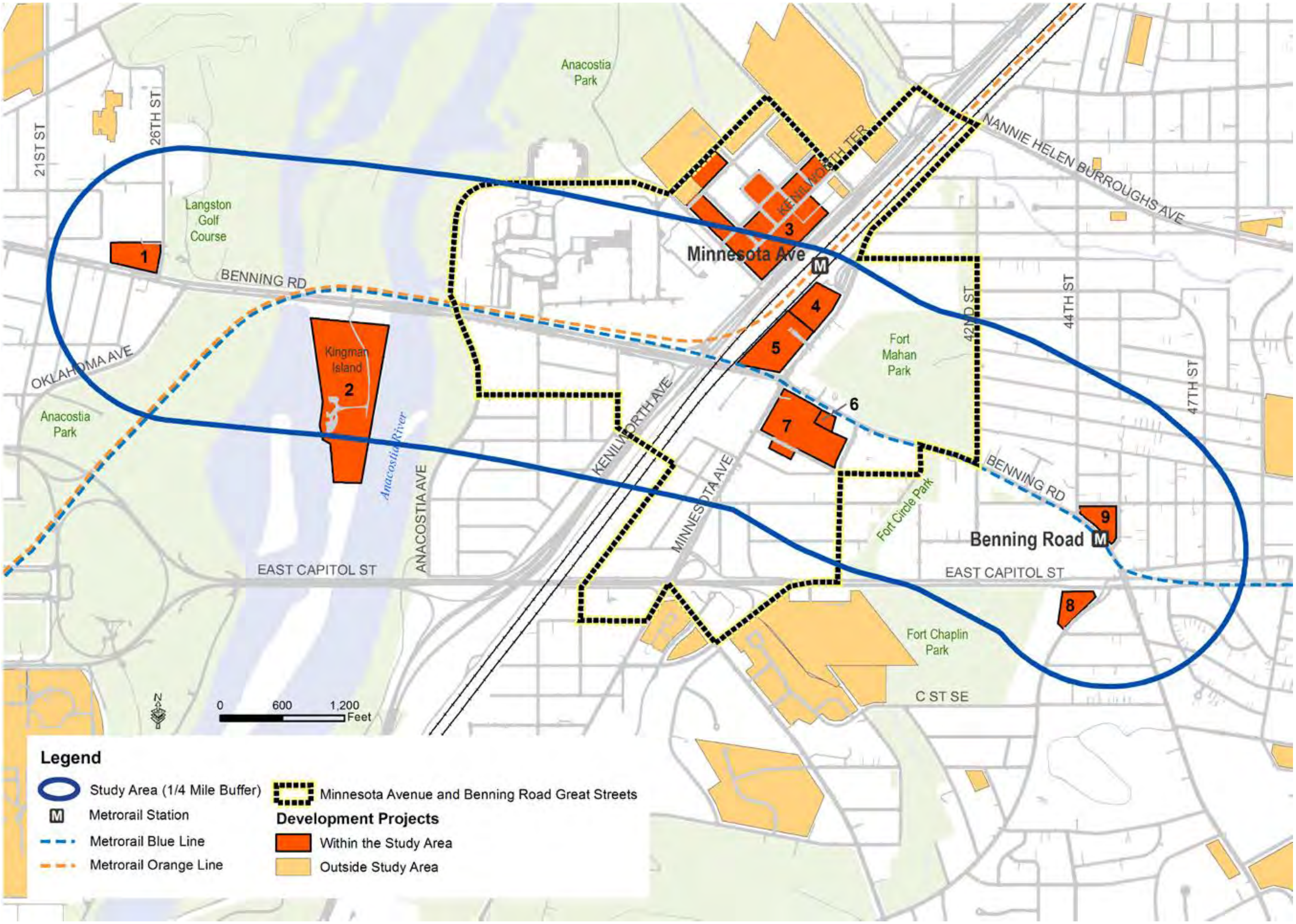
Benning Road and Minnesota Avenue are designated as Great Streets by the District government, and as funds become available, existing small businesses and new businesses will have the opportunity to apply for up to $85,000 in reimbursable grants for capital expenditures. In addition, **Figure 3-10** shows sites recently developed in the study area as well as sites currently under construction or have proposals for redevelopment. Key projects and sites are numbered from west to east and described in **Table 3-9**.

Table 3-9: Development Projects in Study Area

No.	Name	Description	Status
1	Spingarn Streetcar Facility	The Spingarn Car Barn at the site of Spingarn Senior High School will serve as an operations and maintenance (O&M) facility for the H/Benning Streetcar Line. The associated Car Barn Training Center (CBTC), currently under construction and expected to be open in 2016, will provide career and technical education preparing students from across the District for careers in high-demand industries including transportation. The facility will also include a 1,500 sq. ft. conference room for community use. The contracts for the completion of needed construction along the H/Benning Streetcar Line including the CBTC and the O&M include a First Source clause, requires that 51 percent new hires need to be District residents. The O&M team will need over 35 people for permanent jobs including supervisor, maintenance staff, and operator positions.	Under Construction
2	Kingman Island Nature Center	A renovated pedestrian bridge provides access to these islands, and over 40 acres of tidal marsh in Kingman Lake are currently being restored. The renovated islands will include a new Environmental Education Center and a memorial tree grove dedicated to the District of Columbia schoolchildren who were victims of the September 11 terrorist attack.	Proposed
3	Kenilworth-Parkside Neighborhood	City Interests is the master developer for a 2.8 million square foot mixed-use development in the 26-acre site is located off of Kenilworth Avenue across from the Minnesota Avenue Metrorail Station. Plans call for 1,500–2,000 residential units, 30,000–50,000 square feet of retail space and 500,000–750,000 square feet of office space and a one-acre park. An $8 million pedestrian bridge crossing DC-295 is also planned linking the neighborhood with the Minnesota Avenue Metrorail Station.	Under Construction
4	DOES Headquarters	The 450-employee DOES headquarters are located at the Minnesota Avenue Metrorail Station in a new building which also includes a community meeting facility.	Construction completed in 2010
5	Park 7	Donatelli Development and Blue Skye Development delivered their Park 7 project in 2014 which offers 22,000 square feet of retail space and 376 apartments adjacent to the Minnesota Avenue Metrorail Station.	Construction completed in 2014
6	Benning Library	The 13,000 square feet DC public library was completed in 2009.	Construction completed in 2009
7	East River Park Shopping Center	Katz Properties purchased the East River Park Shopping Center in 2012 for $33.6 million; the developer plans to upgrade the property and add new restaurants and neighborhood-serving stores around the existing anchors, Safeway and CVS.	Proposed
8	Chaplin Woods	A 22 townhome affordable homeownership community, Chaplin Woods is the result of a joint venture between the Marshall Heights Community Development Organization and Manna, Inc.	Construction completed in 2001
9	Benning and East Capitol Gateway	So Others Might Eat (SOME) proposes to develop 202 units of affordable, workforce and senior housing (all drug and alcohol free), a sit-down deli, a seven classroom expansion of SOME's Center for Employment Training, a 36,000-square-foot medical and dental clinic, and administrative offices on the three properties adjacent to the Benning Road Metrorail Station.	Under Construction

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 3-10: Development Projects in the Study Area



Source: DC Office of Planning and DC Economic Partnership, February 2014

3.2 TRANSPORTATION AND TRAFFIC OPERATIONS

3.2.1 INTRODUCTION

This section describes the existing transportation network in the study area including the roadway network, mass transit, pedestrian and bicycle facilities, and freight rail service.

3.2.2 METHODOLOGY

Information on the existing transportation network was provided by multiple sources including the Washington Metropolitan Area Transit Authority (WMATA), DDOT, field observations, and previous transportation studies completed in the study area.

A traffic operations analysis was performed for the study intersections using Synchro, a tool based on the methodology outlined in the 2010 edition of the Highway Capacity Manual, and VISSIM, a microscopic simulation software. See **Appendix E** for more detail on the methodology of the traffic operations analysis.

3.2.3 EXISTING CONDITIONS

3.2.3.1 Roadway Network

The study area is in the northeast section of the District and encompasses Benning Road from 26th Street in the west to East Capitol Street in the east. The Viaduct Bridges cross over CSX railroad tracks and Kenilworth Avenue (DC-295) east of the Anacostia River. **Figure 3-11** illustrates the roadway network, lane configurations, and study intersections. **Table 3-10** summarizes selected characteristics for the major roadways. Local collector streets in the study area generally run north-south intersecting with Benning Road. Major roadways in the study area include:

- Benning Road;
- Minnesota Avenue;
- Kenilworth Avenue (DC-295); and
- East Capitol Street.

Table 3-10: Major Roadways

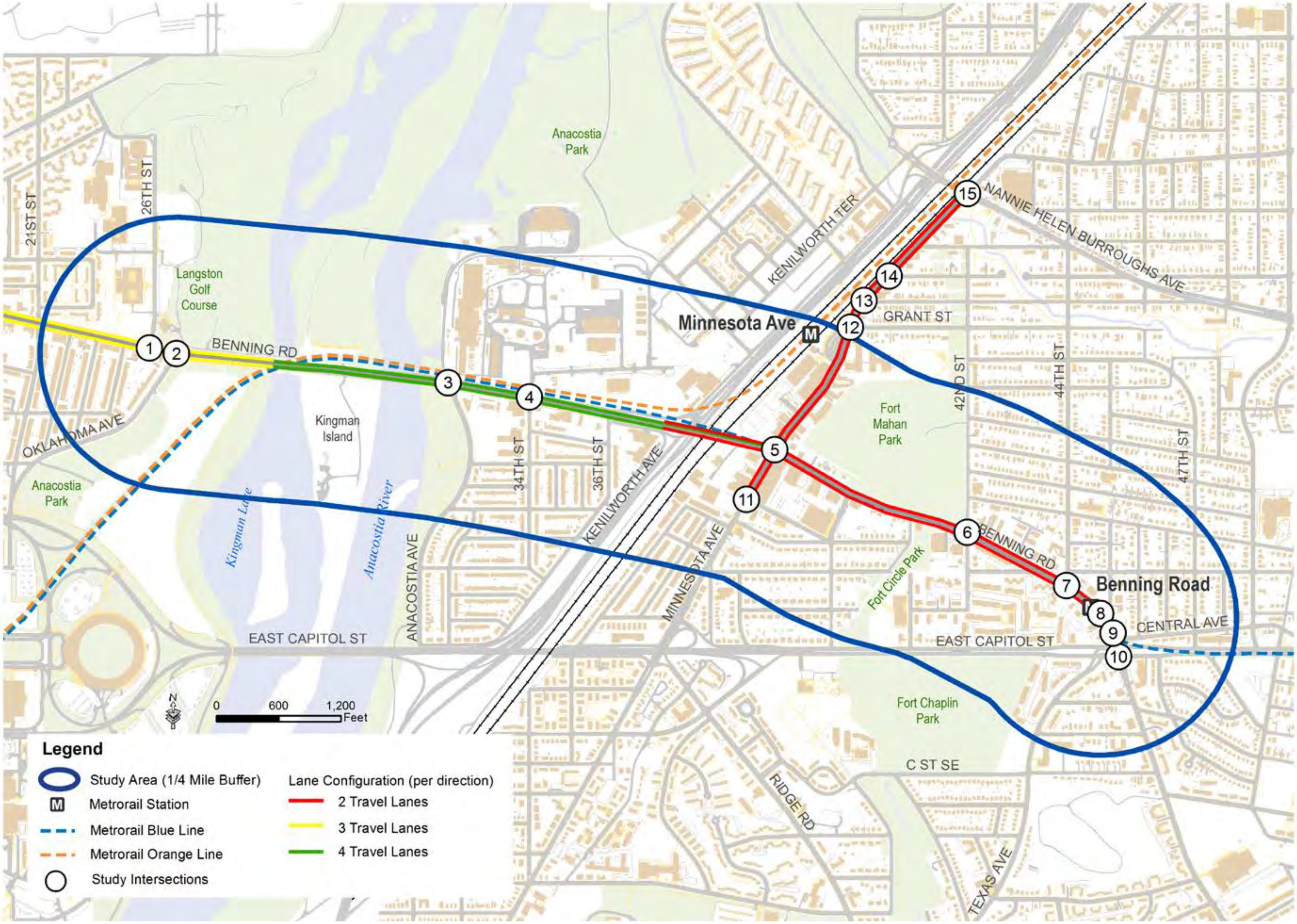
Road Name	Functional Classification	Annual Average Daily Volume	Posted Speed Limit (mph)	Major Interchanges Or Intersections
Benning Road**	Principal Arterial	44,400 (West of Minnesota Avenue) 18,300 (East of Minnesota Avenue)	30	• Northbound Kenilworth • Avenue (DC-295) • Southbound Kenilworth • Avenue (DC-295) • Minnesota Avenue • East Capitol Street
Minnesota Avenue	Minor Arterial	17,200	30	• East Capitol Street • Benning Road • Nannie Helen Burroughs • Avenue

Road Name	Functional Classification	Annual Average Daily Volume	Posted Speed Limit (mph)	Major Interchanges Or Intersections
Kenilworth Avenue (DC-295)	Other Freeway and Expressway	100,000	45	• Pennsylvania Avenue • East Capitol Street • Westbound Benning Road • Nannie Helen Burroughs Avenue • Eastern Avenue
East Capitol Street	Principal Arterial	29,500	30	• Benning Road

***Benning Road is also a FHWA-designated truck route*

Source: DDOT Traffic Volume Map 2010, Benning Road and Bridges Transportation Improvements EA Project Team

Figure 3-11: Existing Roadway and Lane Configuration



Source: DDOT and Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Benning Road: Benning Road is a principal arterial that runs east-west and links downtown District of Columbia to suburban neighborhoods in the District and Prince George's County, Maryland. Roadway geometry varies along Benning Road depending on the corridor segment.

From the western terminus, Benning Road transitions from a divided roadway with three lanes in each direction to four lanes in each direction as the road crosses over Kingman Lake and the Anacostia River and approaches the Kenilworth Avenue (DC-295) interchange. At the Viaduct Bridges crossing over DC-295 and the CSX railroad tracks, Benning Road reduces to two lanes in each direction.

East of the Minnesota Avenue intersection, Benning Road continues as an undivided street, with two lanes in each travel direction and on-street parking during non-peak periods until the East Capitol Street intersection.

Minnesota Avenue: Minnesota Avenue is a minor arterial that runs northeast-southwest through the study area parallel to Kenilworth Avenue (DC-295). Minnesota Avenue is generally a four-lane undivided street with two travel lanes in each direction.

Kenilworth Ave (DC-295): Kenilworth Avenue is a limited access freeway/expressway providing a link between I-395, DC-295, and the Baltimore-Washington Parkway. Within the study area, Kenilworth Avenue consists of six lanes with three lanes in each direction.

East Capitol Street: East Capitol Street is a major east-west principal arterial that links downtown District of Columbia to neighborhoods to the east and to Maryland. East Capitol Street is a six lane, divided roadway with three lanes traveling in each direction.

Intersections and Interchanges

Within the study area, there are eleven signalized and four unsignalized intersections which are listed in **Table 3-11.** Existing morning and evening peak hour intersection traffic volumes are shown in **Figure 3-12**. Existing intersection level of service (LOS) at study intersections based on VISSIM simulations are shown in **Figure 3-13.**

Parking and Access

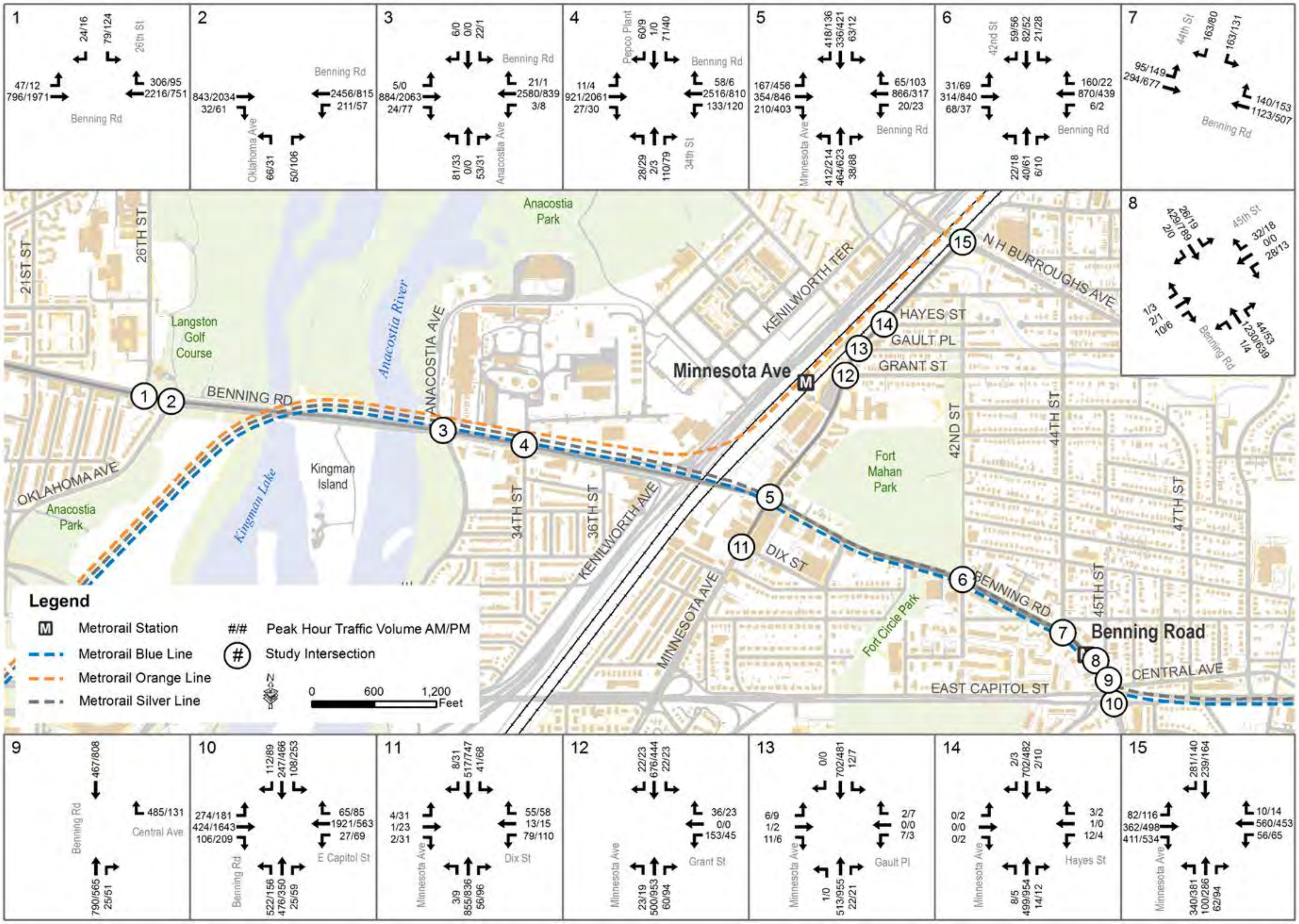
On-street parking is generally restricted to off-peak travel periods as Benning Road is an arterial and commuter route into and out of downtown DC. Off-street parking is generally accommodated at the major activity centers along Benning Road and Minnesota Avenue. At the Minnesota Avenue Metrorail Station and DOES building, there is a large pay parking garage. Other retail centers have smaller surface parking lots.

Table 3-11: Signalized and Unsignalized Intersection

Signalized Intersections	Unsignalized Intersections
Benning Road and 26th Street	Benning Road and 45th Street
Benning Road and Oklahoma Avenue	Benning Road and Central Avenue
Benning Road and Anacostia Avenue	Minnesota Avenue and Gault Place
Benning Road and 34th Street	Minnesota Avenue and Hayes Street
Benning Road and Minnesota Avenue	
Benning Road and 42nd Street	
Benning Road and 44th Street	
Benning Road and East Capitol Street	
Minnesota Avenue and Dix Street	
Minnesota Avenue and Grant Street	
Minnesota Avenue and Nannie Helen Burroughs Avenue	

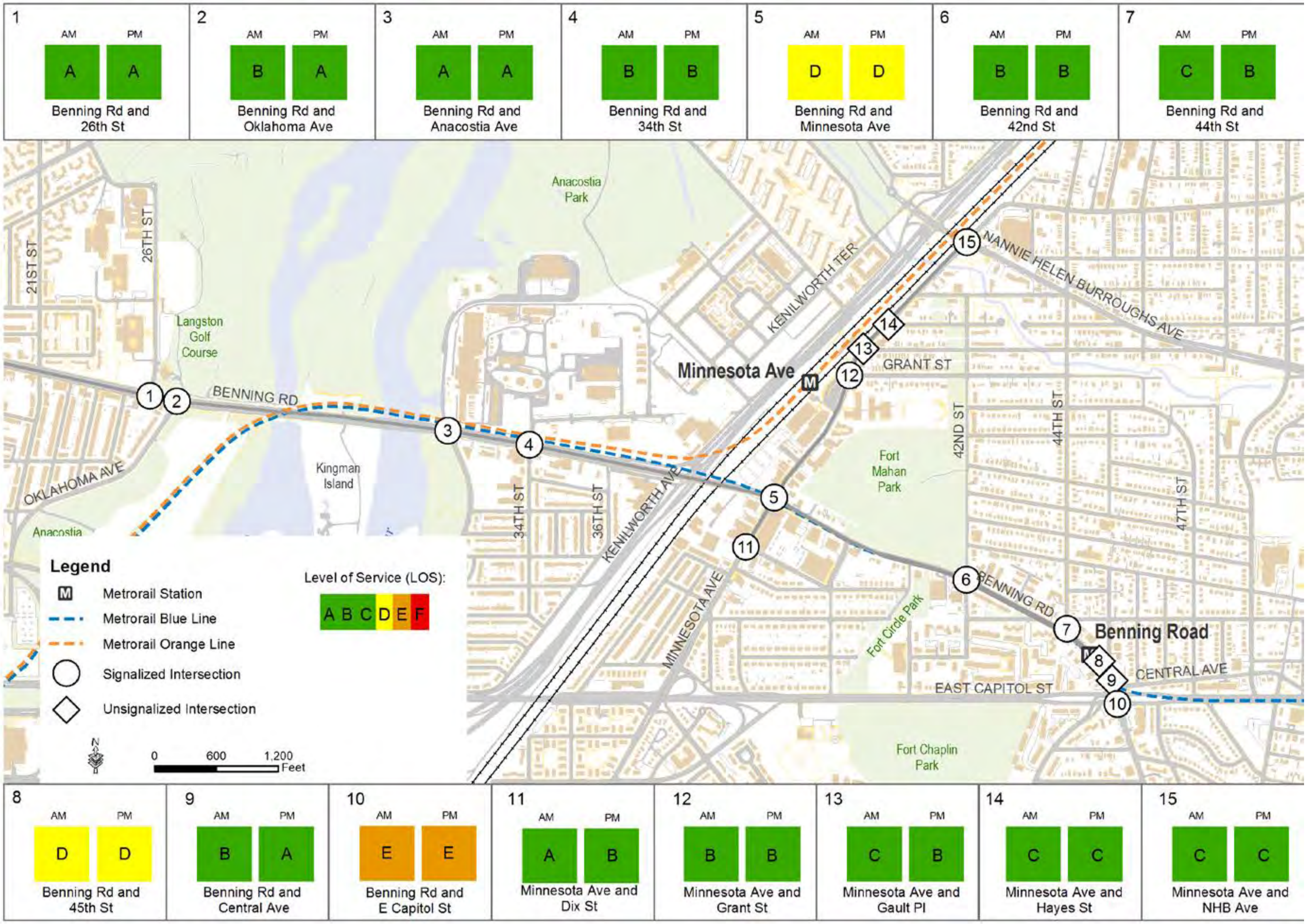
Source: Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Figure 3-12: Existing (2014) Morning and Evening Peak Hour Intersection Traffic Volumes



Source: DCGIS, Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

Figure 3-13: Existing Level of Service at Study Intersections



Source: Benning Road and Bridges Transportation Improvements EA Project Team, February 2014

3.2.3.2 Mass Transit

WMATA provides mass transit service to the study area. Two Metrorail stations provide access to the Blue, Orange, and Silver Metrorail lines and are complimented by the Metrobus network. These transit services provide connections to regional activity centers such as downtown DC, the H Street corridor, historic Anacostia, and the greater metropolitan DC area via Metrorail. **Figure 3-14** shows the existing transit service within the study area.

Metrorail

The Orange, Blue, and Silver Metrorail lines operate within the study area serving the Minnesota Avenue and Benning Road Metrorail Stations. The Orange and Silver Metrorail lines provide six-minute peak and twelve-minute off-peak service frequency. The Blue Metrorail Line provides twelve-minute frequency for both peak and off-peak service. These stations are served directly by the network of Metrobus routes operating within the study area.

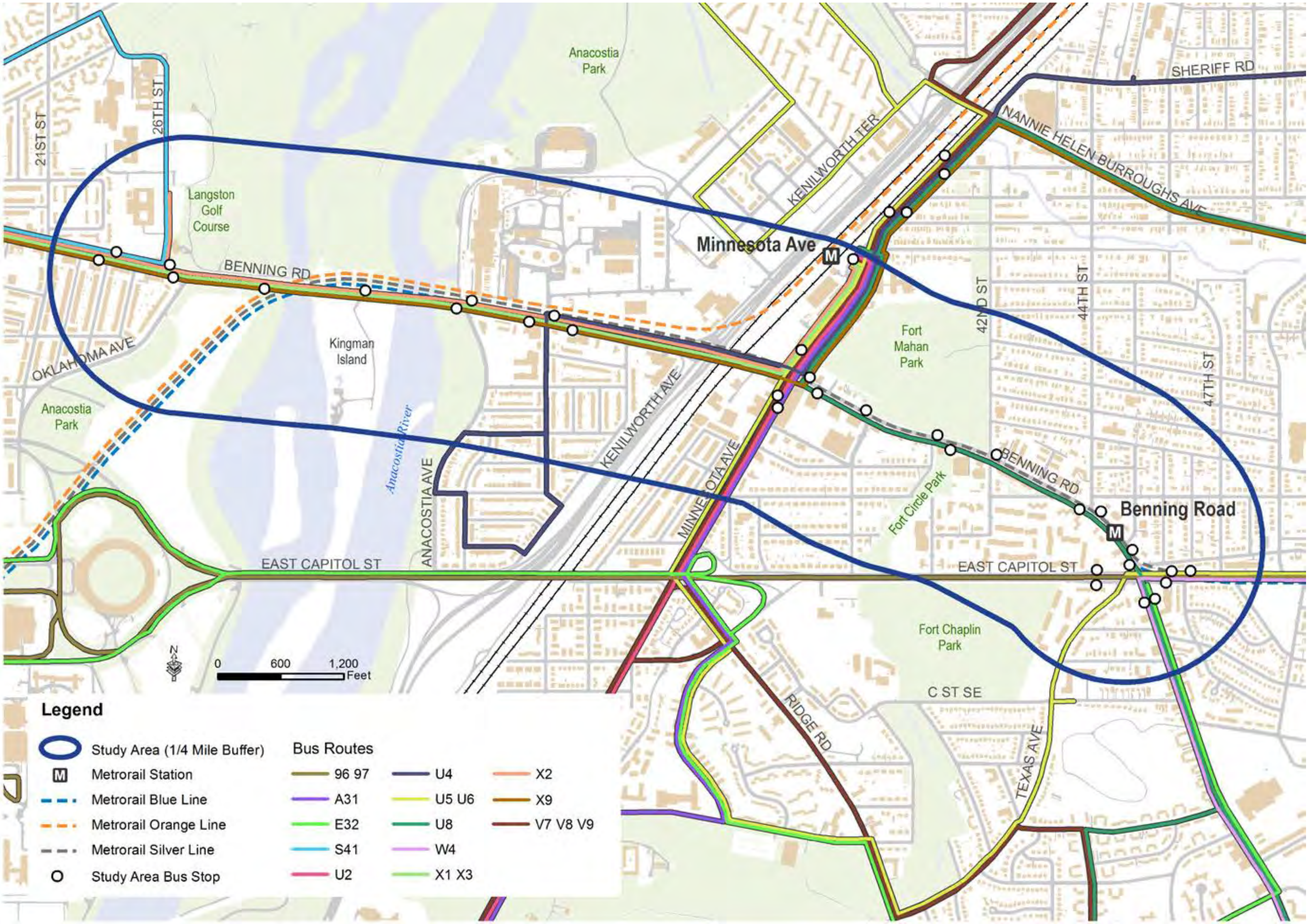
The Minnesota Avenue Metrorail Station is located approximately one-quarter mile north of the Minnesota Avenue and Benning Road intersection, adjacent to the CSX Railroad corridor between Minnesota Avenue and Kenilworth Avenue. The Orange Line provides service from Vienna/Fairfax-GMU in Fairfax County, Virginia to New Carrollton in Prince George’s County, Maryland. Approximately 20 metered daily and short-term parking spaces are available at the station. Bus connections are accommodated with an off-street bus bay facility. Metrobus routes U2, U4, U5, U6, U8, V7, V8, X1, X2, X3, and X9 directly serve the station.

The Benning Road Metrorail Station is located north of the Benning Road and East Capitol Street intersection. The Blue and Silver Lines serve the Benning Road Metrorail Station and runs a combined four-minute peak and six-minute off-peak frequency. The Blue Line provides service from Franconia/Springfield in Fairfax County, Virginia to the Largo Town Center in Prince George’s County, Maryland. The Silver Line opened in summer 2014 and currently provides service from the Wiehle-Reston East Station in Reston, Virginia to the Largo Town Center. Phase II of the Silver Line will extend west connecting to Dulles Airport and into Loudoun County, Virginia. Metrobus routes 96, 97, U5, U6, U8, W4, and E32 serve the bus stops located adjacent to the Metrorail Station entrance. Only a few short-term Kiss & Ride parking spaces are available at the station.

Metrobus

WMATA operates seventeen Metrobus routes within the study area, two of which only operate during public school arrivals and departures. These seventeen Metrobus routes provide neighborhood access to the Metrorail system as well as downtown and cross-town connections. **Table 3-12** provides route and service characteristics information on the existing bus routes in the study area, including service span, peak and off-peak frequency, and average daily ridership.

Figure 3-14: Existing Transit Services



Source: WMATA, February 2014

Table 3-12: Existing Bus Routes and Service Characteristics

Route	Terminals	Hours of Service	Peak Frequency	Off-Peak Frequency	December 2013 Average Daily Ridership
X1, X3	Minnesota Ave Station – Foggy Bottom-GWU Station (X1); Tenleytown-AU Station (X3)	AM Service – WB Only 6:00 AM – 9:30 AM (M-F) PM Service – EB Only 3:30 – 7:00 PM (M-F)	X1: 15 X3: 20	N/A	1,501
X2	Minnesota Ave Station – Lafayette Square	4:15 AM – 3:20 AM	6	Off-Peak: 12 After Midnight: 30	15,683
X9	Capitol Heights Station – Metro Center	AM Service 6:15 – 9:00 AM PM Service 3:30 – 7:15 PM	15	N/A	1,901
U2	Minnesota Ave Station – Anacostia Station	6:00 AM – 10:00 PM	30	30	3,168
U4	Sheriff Road – River Terrace	4:45 AM – 1:30 AM	10	Off-Peak: 30 After Midnight: 30	1,542
U5, U6	Mayfair – Lincoln Heights	4:45 AM – 2:50 AM	20	Off-Peak: 20 After Midnight: 30	4,697
U8	Capitol Heights Station – Benning Heights	24 Hour	10	Off-Peak: 12 After Midnight: 20-40	7,044
96, 97	Capitol Heights Station – Tenleytown-AU Station	4:52 AM – 2:48 AM	10	Off-Peak: 20 After Midnight: 30-40	7,025
V7, V8, V9	Deanwood Station – Benning Heights –Bureau of Engraving	4:38 AM – 2:00 AM	20	Off-Peak: 30 After Midnight: 35	5,114
W4	Deanwood Station – Anacostia Station	5:00 AM – 2:54 AM	10	Off-Peak: 20 After Midnight: 30	7,614
A31	Minnesota Ave Station – Anacostia Hs	3:20 PM - Trip operates only when public school is open.	N/A	N/A	21
E32	Benning Road Station – Eastern Hs	AM - 8:05 PM – 3:25 Trip operates only when public school is open.	N/A	N/A	27

Source: WMATA, February 2014

3.2.3.3 Pedestrian and Bicycle Network

Bicycle and pedestrian facilities consist of sidewalks, marked crosswalks, and recreational shared-use paths or trails. **Figure 3-15** shows the existing pedestrian and bicycle network within the study area.

Pedestrian Facilities

Streets within the study area include continuous sidewalks along both sides of the streets, with the exception of the north side of the Viaduct Bridges where no north side sidewalk exists.

The existing sidewalks vary in width within the study area. Most of the existing facilities throughout the study area meet Americans with Disabilities Act (ADA) requirements or DDOT design standards. However, the physical conditions of the sidewalks are deficient with substantial cracking and deformation at various locations that create hazards for pedestrians.

Although ADA ramps at pedestrian crossing were observed at most intersections and mid-block crosswalks, some of the ramps did not appear to meet current standards for placement and slope.

Bicycle Facilities

Conditions in this section are based on the bicycle facilities in the study area as of June 2015. While the study area does not currently include any on-street bicycle facilities, Benning Road is signed as an on-street bicycle route. However, DDOT rates the traffic conditions for bicycling on this section of Benning Road as "poor." In addition, there are on-street bicycle lanes proposed for East Capitol Street, Grant Street, and Nannie Helen Burroughs Avenue.

The availability of bicycle parking varies in the study area. WMATA provides bicycle parking at both Minnesota Avenue and Benning Road Metrorail Stations with eight bike racks and four lockers at Minnesota Avenue and four bike racks at Benning Road. Additionally, bicycle parking is available at the Benning Neighborhood Library and other major public and retail buildings in the study area.

Capital Bikeshare operates the District's bicycle sharing program.As of June 26, 2015, Capital Bikeshare operated four bikeshare stations within the study area.

Figure 3-15: Existing Pedestrian and Bicycle Network

Source: DCGIS and DDOT, February 2014

Shared Use Paths (Multi-Use Trails)

Three shared use paths (trails) are located within the study area. These trails provide hiking and bicycle connections and recreational access to public parks. This section also considers properties protected under Section 4(f) of the U.S. Department of Transportation Act.

Kingman and Heritage Islands Park: Kingman and Heritage Islands Park contains over 1.5 miles of trails. Biking and hiking are permitted on the main trail and boardwalk trail.

Anacostia Riverwalk Trail: The Anacostia Riverwalk Trail is a planned 20-mile multi-use trail along the east and west banks of the Anacostia that will connect residents and visitors to the Anacostia River and provides recreational opportunities such as walking, running, and bicycling. The trail will also connect waterfront neighborhoods and attractions including the Tidal Basin and National Mall, the Fish Market, Nationals Park, Historic Anacostia, RFK Stadium, Benning Road, the Kenilworth Aquatic Gardens, and points into Prince George's County, Maryland. The planned trail will also connect to other local and regional hiking and biking trails. The project is scheduled for completion in 2016.

Fort Circle Trail: The Fort Circle Trail is a seven-mile, unpaved hiking and biking trail that links the District's historic Civil War era forts. The trail, owned by NPS, runs from Fort Stanton to Fort Mahan in the southeastern portion of DC. Two of the historic forts are located in the study area (Fort Mahan and Fort Chaplin) and are connected by the trail. Since the trail is unpaved, the facility may have more of an appeal as a recreation facility than as a transportation connection.

Proposed Multi-Use Trails: In addition, the 2005 DC Bicycle Master Plan calls for a series of multi-use trails along Minnesota Avenue, Benning Road, East Capitol Street, Texas Avenue and through the Kenilworth Terrace community, connecting to the regional recreational shared-use paths. Multi-use trails can be constructed within a roadway corridor right-of-way, in their own corridor, or be a combination of both. Wide sidewalk facilities can also be designated as multi-use trails.

3.2.3.4 Freight Rail Service

The CSX Railroad freight corridor operates north-south through the study area between Kenilworth Avenue (DC-295) and Minnesota Avenue. CSX operates this line as a freight bypass of Washington Union Station. The Benning Road Yard is located to the immediate south of the study area, north of Anacostia Park as the CSX Railroad crosses the Anacostia River. The Metrorail Orange Line shares the CSX railroad tracks north of Benning Road.

3.3 Section 4(f) Resources

3.3.1 Introduction

Section 4(f) of the U.S. Department of Transportation Act of 1966, 49 USC 303(c) is a federal law that protects publicly owned parks, recreation areas, wildlife and/or waterfowl refuges, as well as significant public or privately owned historic sites. Section 4(f) requirements apply to all transportation projects that require funding or other approvals by the USDOT. As a USDOT agency, FHWA must comply with Section 4(f).

FHWA cannot approve a transportation project that uses a Section 4(f) property, as defined in 23 CFR 774.17, unless FHWA determines that:

- There is no feasible and prudent avoidance alternative, as defined in 23 CFR 774.17, to the use of land from the Section 4(f) property, and the action includes all possible planning, as defined in 23 CFR 774.17, to minimize harm to the property resulting from such use (23 CFR 774.3(a)); or
- The use of the Section 4(f) property, including any measure(s) to minimize harm (such as any avoidance, minimization, mitigation or enhancement measures) committed to by the applicant would have a de minimis impact, as defined in 23 CFR 774.17, on the property (23 CFR 774.3(b)):
    - For parks, recreations areas, and wildlife and waterfowl refuges, a de minimis impact determination may be made if the FHWA concludes the transportation project will not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f) after mitigation. In addition, to make a de minimis impact determination there must be:
        - Public notice and opportunity for public review and comment.
        - Concurrence on the effect finding is received from the official(s) with jurisdiction over the property.
    - For historic sites, a de minimis impact determination may be made if, in accordance with 36 CFR 800 (the implementing regulations of Section 106 of the National Historic Preservation Act), FHWA determines that the transportation program or project will have no effect or no adverse effect on historic properties, FHWA has received written concurrence from the official(s) with jurisdiction over the property, (e.g. the State Historic Preservation Officer [SHPO]) and has taken into account the views of consulting parties to the Section 106 process as required by 36 CFR Part 800.

3.3.2 Methodology

The evaluation included the following steps:

- **Identify Section 4(f) Properties.** DDOT reviewed existing mapping, conducted field investigations/site reconnaissance, searched property records, and consulted with officials with jurisdiction to identify the properties other than historic sites that qualify for protection by Section 4(f).
- To identify historic sites, an Area of Potential Effect (APE) was defined in consultation with and approved by the DC SHPO. The DC SHPO is the official with jurisdiction over historic properties in this evaluation.

- **Assess Potential for Section 4(f) Uses.** FHWA and DDOT identified and quantified potential uses of Section 4(f) properties associated with the Build Alternative. This assessment considered the potential for permanent uses (23 CFR 774.17), constructive uses (23 CFR 774.15) and temporary uses (23 CFR 774.13(d)).
- **Determine Temporary Occupancy Exceptions.** In evaluating potential uses of Section 4(f) properties, FHWA and DDOT considered the exception for temporary occupancy in 23 CFR 774.13(d). If the criteria for a temporary occupancy exception are met, there is no use.
- **Identify *De Minimis* Impacts.** For Section 4(f) properties that would be used, FHWA and DDOT evaluated the uses to determine whether such uses would meet the requirements for a *de minimis* impact determination.

Definition of Section 4(f) Uses

A Section 4(f) use is defined and addressed in 23 CFR 774.17. Three types of Section 4(f) use can occur as described below: a permanent use, a temporary use, or a constructive use.

- **Permanent use** – When land from a Section 4(f) property is permanently incorporated into a transportation facility (23 CFR 774.17);
- **Temporary use** – When there is a temporary occupancy of Section 4(f) land that is adverse in terms of the statute's preservation purpose as determined by the criteria in §774.13(d); if the criteria in 23 CFR 774.13(d) are met, the "temporary use exception" applies in which there is no "use" of the Section 4(f) property. If the criteria in 23 CFR 774.13(d) are not met, the use is evaluated as permanent.
- **Constructive use** – When there is a constructive use of a Section 4(f) property as determined by the criteria in §774.15.

3.3.3 Existing Conditions

The complete list of Section 4(f) resources within the study area is described in **Sections 3.2 (Trails), 3.4 (Parklands), and 3.5 (Cultural Resources)** of this EA.

3.4 PARKLANDS

3.4.1 INTRODUCTION

This section identifies existing publicly-owned parks and recreation areas. It also covers the consideration of parklands and other resources protected under Section 4(f) of the U.S. Department of Transportation Act and Section 6(f) of the Land and Water Conservation Act.

3.4.2 METHODOLOGY

Existing information was gathered through site visits, recent aerial photographs, and GIS data provided by OCTO. Facilities and properties protected by Section 6(f) of the US Land and Water Conservation Fund Act (LWCF) in the study area were reviewed based on the Detailed Listing of Grants obtained from NPS.[1]

Potential use of publicly-owned park and recreational resources by the project is described in terms of acreage and how activities and facilities at these areas could be impacted.

3.4.3 EXISTING CONDITIONS

Figure 3-16 shows the existing parks and recreational resources in the study area that are protected under Section 4(f) of the U.S. Department of Transportation Act. The complete list of these publicly- owned parks and recreation areas within the study area is shown in **Table 3-13** below. There are no properties acquired or developed with LWCF grants in the study area that would be protected under Section 6(f) of the LWCF.

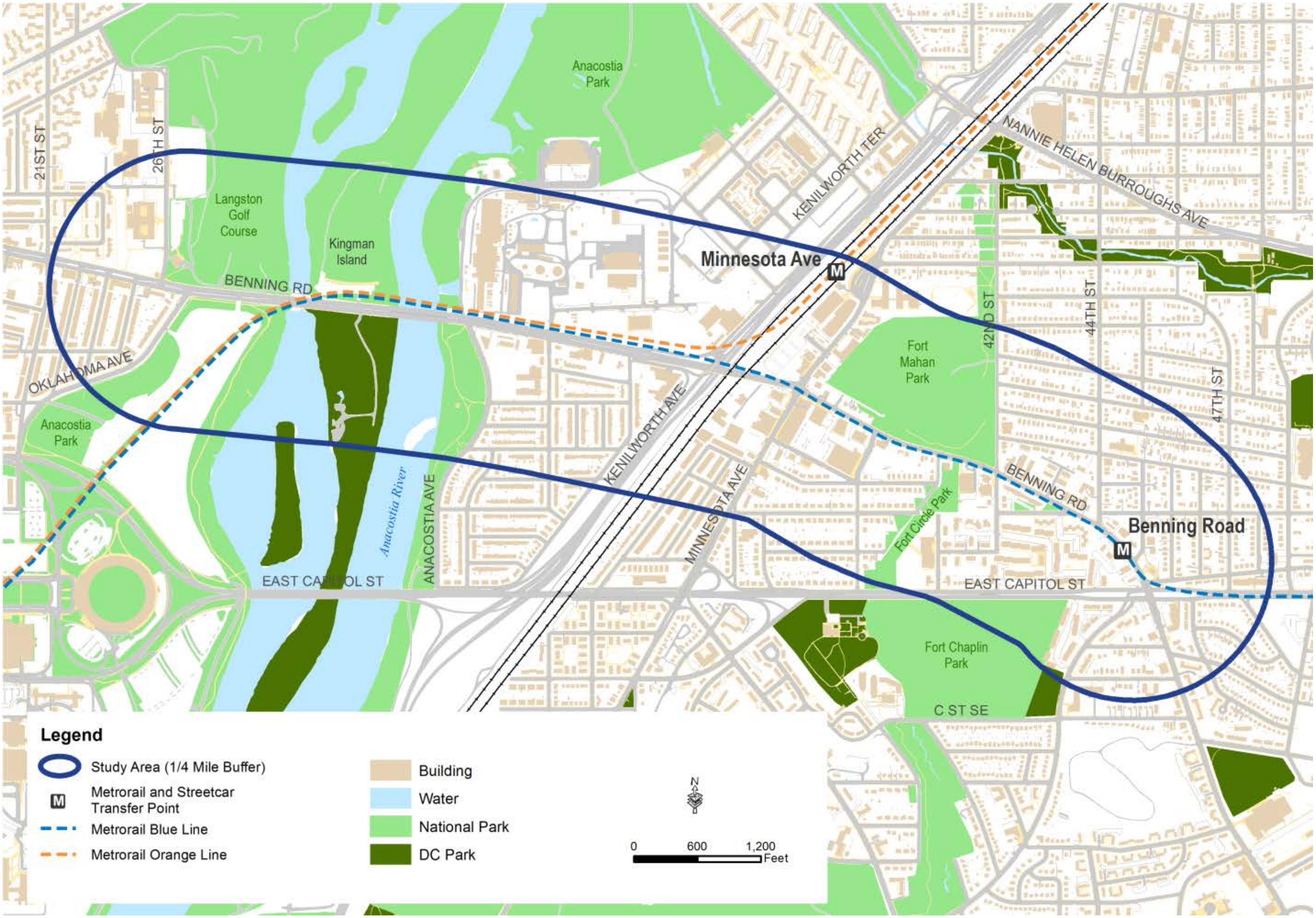
[1] *http://waso-lwcf.ncrc.nps.gov/public/index.cfm*

Table 3-13: Section 4(f) Parks and Recreational Resources in the Study Area

Resource	Location	Jurisdiction	Size	Description
Anacostia Park	Anacostia River (both banks) between DC Line and Railroad Bridges	National Park Service	105.0 acres out of 1062.1 total acres	Active and passive recreational uses. The park has shoreline access, a swimming pool, ball fields, trails, picnic facilities and the Anacostia Park Pavilion with public space for roller skating and special events. Langston Golf Course offers an 18-hole course as well as driving range.
Fort Circle Park	Anacostia Park to Fort Mahan Park; Fort Mahan Park to Fort Dupont Park	National Park Service	6.4 acres out of 454.6 total acres	Trail (and proposed greenway) network connecting the Civil War Defenses of Washington.
Fort Mahan Park	Benning Road between 42nd Street and Grant Street	National Park Service	36.8 acres out of 39.0 total acres	Open space and woodlands.
Kingman and Heritage Islands Park	Anacostia River between Benning Road and Kingman Lake Bridge	District of Columbia	19.7 acres out of 50.6 total acres	Active and passive recreational uses. Originally created by the Army Corps of Engineers in 1916, Kingman and Heritage Islands have now been transformed into a recreational area for people of all ages to learn about the natural environment in DC. Managed by Living Classrooms under contract of the Office of Deputy Mayor for Planning and Economic Development.
Fort Chaplin Park	South of East Capitol Street between Chaplin Street and T Street	National Park Service	8.3 acres out of 34.7 total acres	Mostly woodlands.
Fort Chaplin Park - Parksite	Texas Avenue and C Street	District of Columbia	0.3 acres out of 2.7 total acres	Open space and woodlands.

Source: DC Data Catalog (http://data.dc.gov/) and NPS

Figure 3-16: Section 4(f) Parks and Recreational Resources in the Study Area



Source: DC Data Catalog (http://data.dc.gov/) and NPS

3.5 CULTURAL RESOURCES

3.5.1 INTRODUCTION

This section provides an evaluation of historic architectural and archaeological (cultural) resources in the Area of Potential Effects (APE). Cultural resource investigations were completed for the project in accordance with federal and local laws and regulations, including Section 106 of the National Historic Preservation Act (54 U.S.C. 300101 et seq.). This section also covers the consideration of historic properties protected under Section 4(f) of the U.S. Department of Transportation Act

DDOT informally initiated Section 106 consultation with the District of Columbia State Historic Preservation Office (DCSHPO) in March 2014; formal Section 106 consultation was initiated by the Federal Highway Administration (FHWA) in March 2015. In subsequent consultation between FHWA, DDOT and DCSHPO, the APE was established and the properties that required evaluation for their eligibility for inclusion in the National Register of Historic Places (NRHP) were identified. The identification and communication with consulting parties is an on-going process and is detailed in Chapter 5 of this EA. During consultation it was agreed that 29 properties in the APE required a determination of NRHP eligibility (**Appendix F**). Additionally, it was acknowledged that six resources in the APE have previously been listed in or have been determined eligible for listing in the NRHP.

Since the project involves work in previously disturbed land within the DDOT right-of-way, any requirement to conduct an archaeological survey for the proposed action has been deferred until the proposed location and dimensions of project-related ground disturbances outside the existing streets are established. FHWA and DDOT will consult with DCSHPO on the need for an archeological survey as project design advances and all areas of potential ground disturbances are identified.

3.5.2 METHODOLOGY

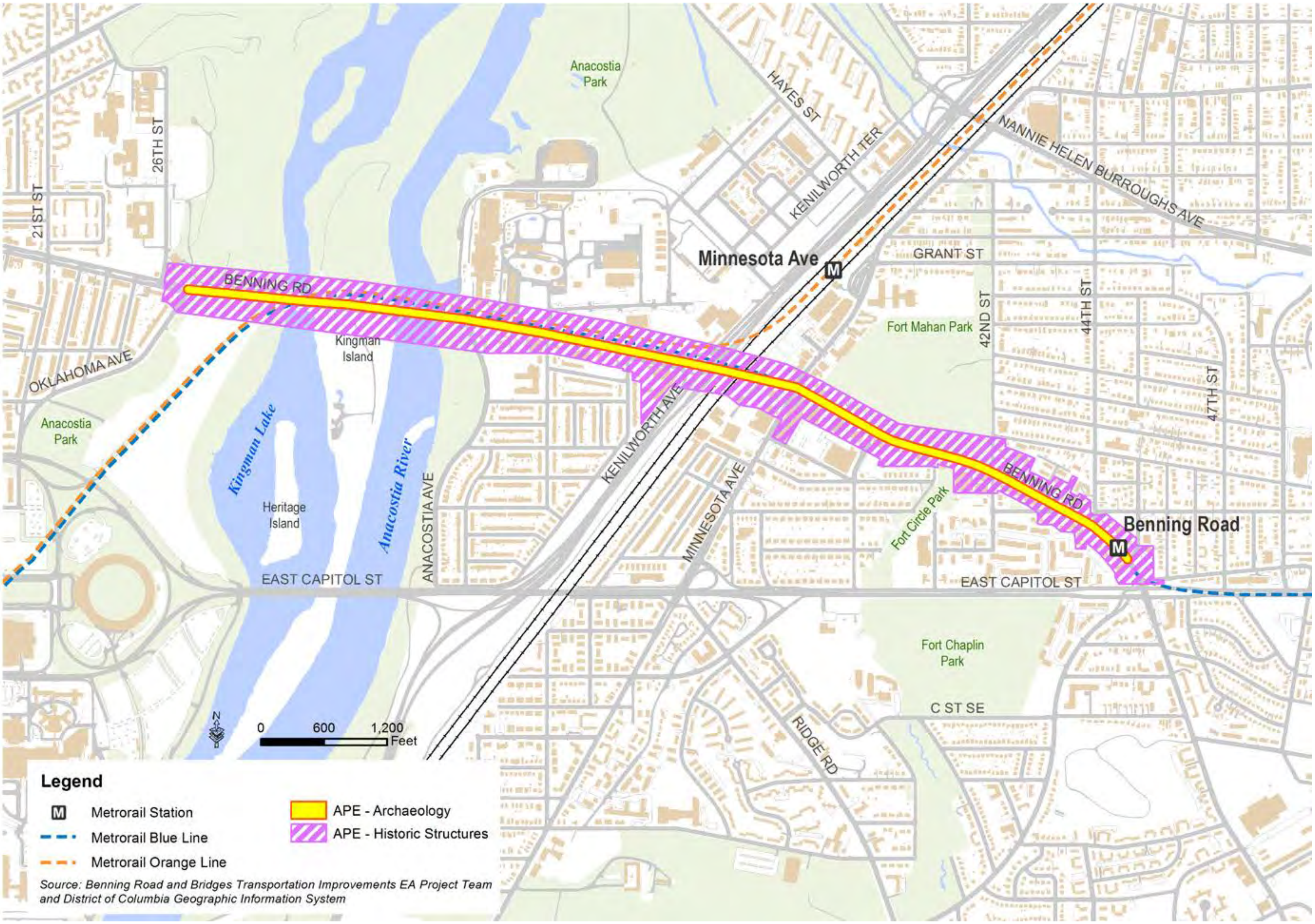
Preliminary data collection was initiated in January 2014. The purpose of this effort was to observe the character of the study area and identify known and potential historic properties in the vicinity of the study area, in order to recommend the limits of the APE for the undertaking. Historic properties include above- and below-ground resources eligible for listing or listed in the NRHP. Resources that meet the criteria for listing in the District of Columbia Inventory of Historic Sites (DCIHS) are considered to meet NRHP eligibility criteria and, thus, are historic properties.

Under 36 CFR 800.16(d), the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." The APE encompasses properties within the limits of disturbance, as well as properties that may be visually or otherwise indirectly affected by the project. Development of the APE took into consideration effects that could result from temporary or permanent construction and operational activities that include (but are not limited to): physical effects, visual effects, auditory effects, atmospheric effects, vibration effects, and changes in the character or use of historic properties (**Figure 3-17**). The APE was based upon an understanding of project design and a field view to determine the geographic area where historic resources could be affected by the undertaking. The APE for archaeological resources was defined as the project limits of disturbance (LOD) under current design plans; the APE for historic structures includes areas within visible and/or audible range of the LOD (**Figure 3-17**). In consultation with FHWA, DDOT and DCSHPO, the APE may be modified in the future to accommodate additional impact areas (such as construction lay-down areas) not defined in current design plans.

Additional background research and an architectural survey were conducted on the properties in the APE that required an architectural survey in order to evaluate their eligibility for listing in the NRHP. The background research effort consisted of internet research of local newspaper articles, library research at Kiplinger Research Library of the Historical Society of Washington, DC, and the Washingtonian collection at the Martin Luther King, Jr. Library, analysis of historic maps and aerial photographs, nominations for sites listed in the NRHP and DCIHS, the DC Office of Planning online mapping of historic sites, and previous studies in the project vicinity. A complete list of these sources is provided in **Chapter 8**.

The architectural survey was conducted between August and October 2014. The purpose of the survey was to collect sufficient data and photographs to evaluate the historical integrity of each of the 29 properties identified in order to determine their NRHP eligibility in consultation with the DCSHPO. Project effects on the eight recorded NRHP properties were also evaluated by the project architectural historians. Architectural historians that meet the Secretary of the Interior's Professional Qualifications Standards conducted the survey. Information gathered during the background research and field survey was used to prepare a DCSHPO Determination of Eligibility (DOE) Form for each resource. These forms are included in **Appendix F**.

Figure 3-17: APE for Historic Structures and Archeology



Source: Benning Road and Bridges Transportation Improvements EA Project Team

3.5.3 EXISTING CONDITIONS

3.5.3.1 Previously Identified Architectural Resources

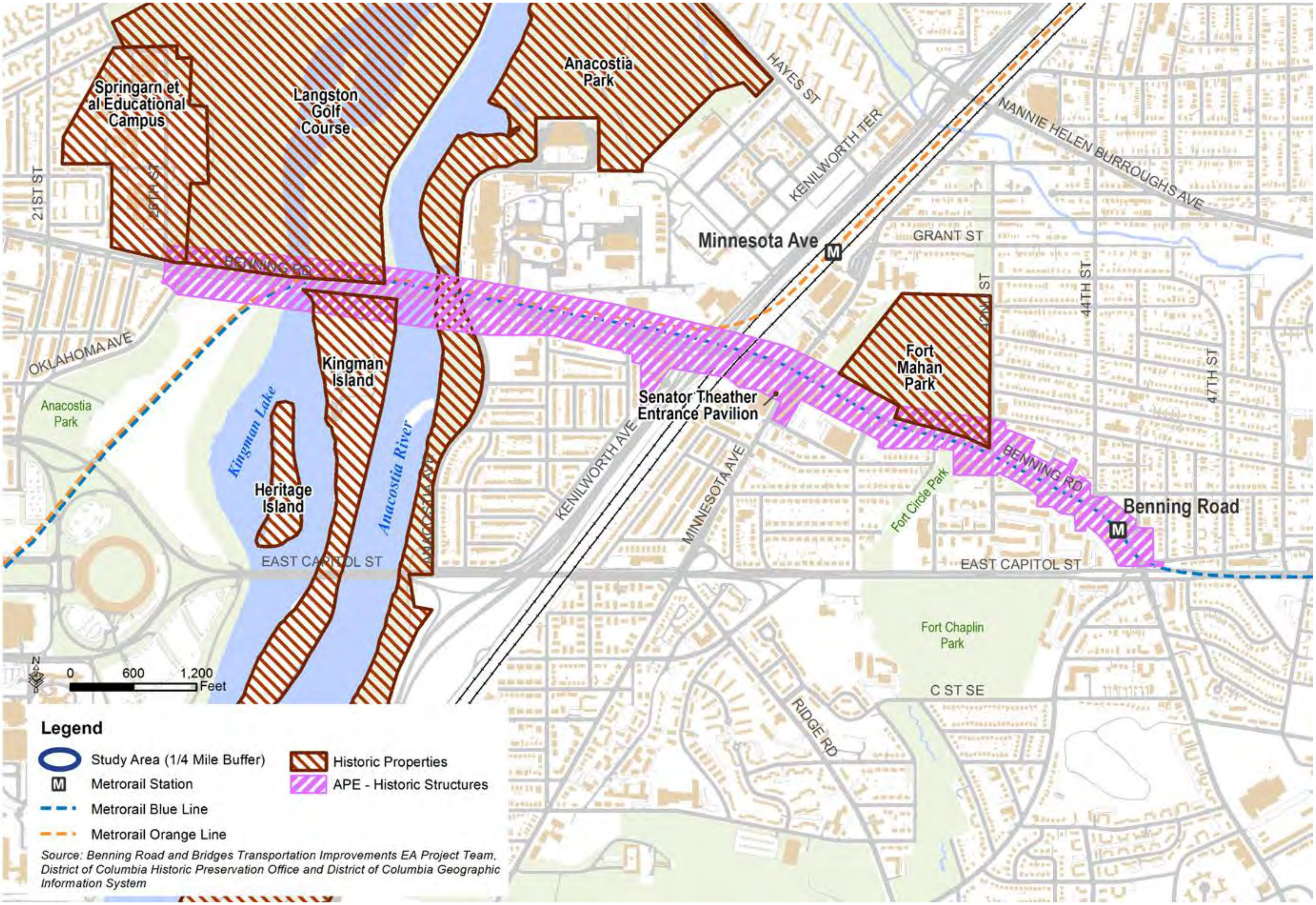
There are six previously identified historic properties in the APE. Two are listed on the NRHP: Fort Mahan, part of the Defenses of Washington (Civil War Fort Sites) District, and the Langston Golf Course Historic District. NPS considers Anacostia Park to be eligible for listing in the NRHP. The educational campus at 2500 Benning Road, which includes the Spingarn School (also listed on its own in the DCIHS), the Browne School, the Phelps School, and the Young School, is also eligible for the NRHP, and a landmark nomination is pending at the DCSHPO (**Appendix F**). The entrance pavilion and marquee of the former Senator Theater on Minnesota Avenue, south of Benning Road, is listed in the DCIHS; however the auditorium itself has been demolished. These resources are summarized in **Table 3-14** and shown in **Figure 3-18**. **Figures 3-19** through **3-24** illustrate these resources.

Table 3-14: Previously Identified Historic Resources

Resource Name	Designation	Status	NRHP#
Fort Mahan/ Civil War Sites (Defenses of Washington) District	NRHP	Listed	0011461
Langston Golf Course Historic District	NRHP	Listed	19911015
Anacostia Park	NRHP	Eligible	n/a
Senator Theater Entrance Pavilion	DCIHS	Listed	n/a
Spingarn School	DCIHS	Listed	n/a
Browne, Phelps, Spingarn, and Young Schools Historic District	NRHP	Eligible	n/a

Sources: DCSHPO; DC Inventory of Historic Sites and Pending Historic Landmark and Historic District Nominations; National Capital Parks – East, Environmental Assessment, Anacostia Riverwalk Trail Section 3 Realignment, Anacostia Park; NPS, NRHP Database and Research Page

Figure 3-18: Previously Identified Historic Architectural Resources



Sources: DCSHPO; DC Inventory of Historic Sites and Pending Historic Landmark and Historic District Nominations; National Capital Parks – East, Environmental Assessment, Anacostia Riverwalk Trail Section 3 Realignment, Anacostia Park; NPS, NRHP Database and Research Page

Figure 3-19: Fort Mahan from 42nd Street, view looking northwest, January 16, 2014

Figure 3-20: Langston Golf Course, view looking southeast, January 16, 2014

Figure 3-21: Anacostia Park, footbridges to Kingman and Heritage Islands, January 16, 2014

Figure 3-22: Spingarn School, January 16, 2014

Figure 3-23: Browne School, January 16, 2014

Figure 3-24: Young School, January 16, 2014

NRHP Multiple Property Listings

NRHP Multiple Property Listings record groups of thematically related properties that are historically significant. This type of NRHP listing defines and describes one or more historic contexts, associated property types related to the historic context(s), and establishes significance and integrity requirements for nominating properties to the National Register. This type of NRHP listing is established through a Multiple Property Documentation Form (MPDF). Apartment buildings within the APE may meet the criteria for the previously approved "Apartment Buildings of Washington DC 1870-1945" MPDF.

Table 3-15: Multiple Property Documentation Forms

Resource Name	Designation	Status	NRHP#
Apartment Buildings of Washington DC 1870-1945	NRHP	Listed	64500083

Source: NPS, NRHP Database and Research Page, http://www.nps.gov/nr/research/

3.5.3.2 Properties That Required a Determination of Eligibility

In letters dated March 25, 2014 and August 20, 2014, the DCSHPO identified an additional 29 properties in the APE that warrant a DOE evaluation for listing on the NRHP (**Figure 3-25**). Recommendations of NRHP eligibility of these properties have been formulated and are included in **Table 3-16**, which incorporates recommendations on NRHP eligibility made by DCSHPO on April 15, 2015.

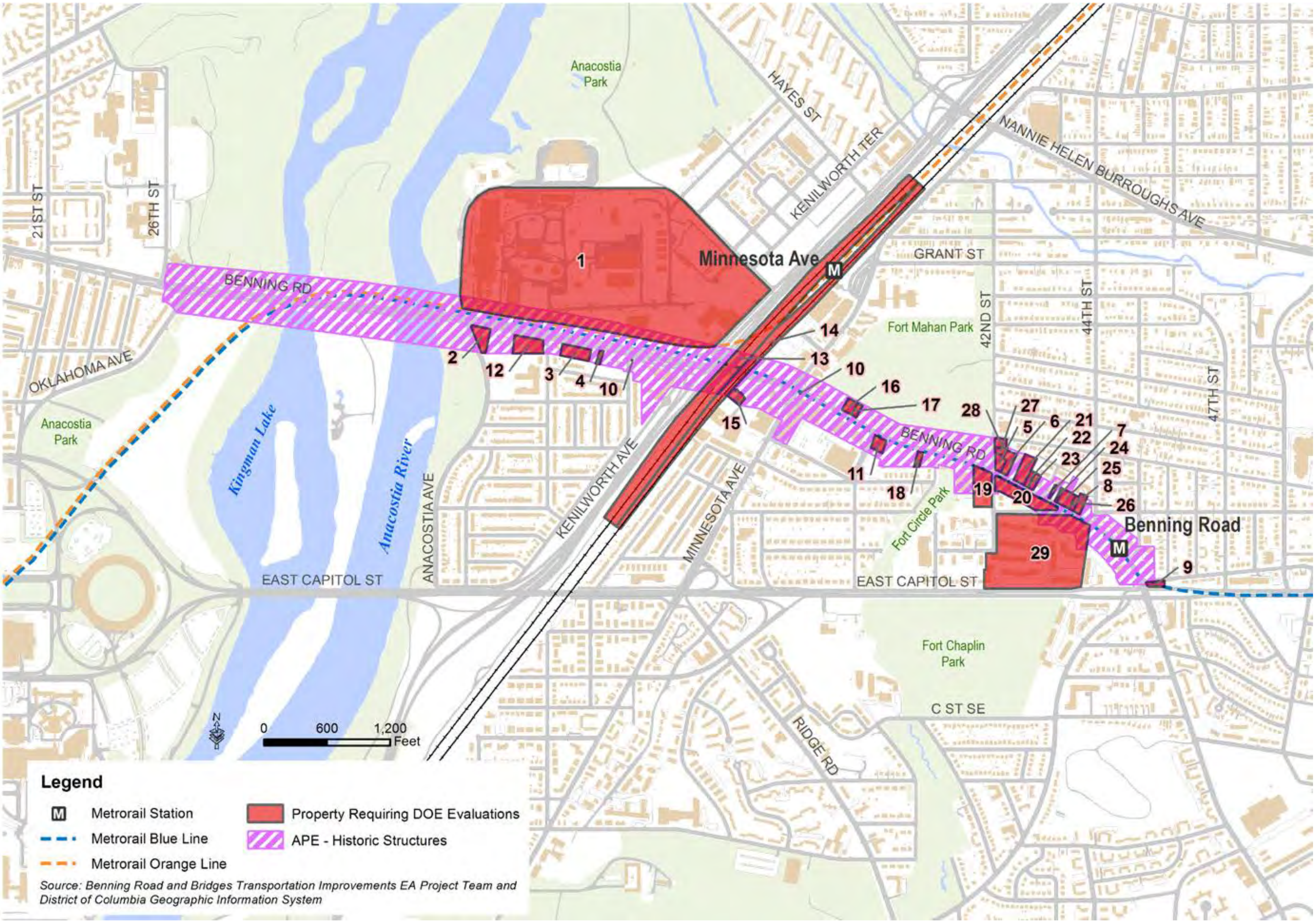
Table 3-16: Properties in the APE Requiring Determination of Eligibility Evaluation

Ref. No.	Address	Description	Recommended NRHP Status
1	3300 Benning Road	Pepco Power Plant Building 32, 1906 (most of plant demolished; Building 32 remains standing)	Eligible
2	3341 Benning Road	1948 commercial building obscured by large c. 1990 addition	Not Eligible
3	3423-39 Benning Road	River Terrace Shopping Complex, c. 1940, designed by George T. Santmyers. Not individually eligible, but contributes to a potential River Terrace Historic District.	Not Eligible
4	3445 Benning Road	19th century house, now "Benning Liquors;" substantially altered	Not Eligible
5	4202 Benning Road	Commercial building, now Mike's Market	Not Eligible
6	4208 Benning Road	Designed by African-American architect Cyril Bow in 1939. Eligible under "Apartment Buildings in Washington DC 1880-1945" MPDF	Eligible
7	4248 Benning Road	Commercial building, now Jamahri's Hair Studio	Not Eligible
8	4270 Benning Road	Jones Memorial Methodist Episcopal Church, now New Mount Calvary Baptist Church, designed by Woodson & Vaughn, built in 1923	Eligible
9	4510 East Capitol Street	The "Shrimp Boat," take-out restaurant, constructed c. 1953	Not Eligible

Ref. No.	Address	Description	Recommended NRHP Status
10	Benning Road	Fire and Police Call Boxes	Eligible
11	4001 Benning Road	Stewart Funeral Home, 1964. Designed by Donald H. Roberts for an African-American family-owned and	Eligible
12	3399 Benning Road	Mid-20th-century auto sales and service building, now D&C Cab	Not Eligible
13	Vicinity of 3700 Benning Road	Baltimore & Potomac Railroad	Eligible
14	Vicinity of 3700 Benning Road	Baltimore & Ohio Railroad, Alexandria Branch	Not Eligible
15	3701 Benning Road	A. Loffler Provision Co., 1916. Adjacent to the principal slaughterhouse and livestock facility for DC.	Not Eligible
16	3938 Benning Road	1931 residence designed by African-American Architect Lewis Giles	Eligible
17	3940 Benning Road	1940 Colonial Revival residence designed by African-American Architect Gus Bull	Not Eligible
18	4053 Benning Road	c. 1930 residence	Not Eligible
19	4145 Benning Road	No. 14 Police Precinct, 1948; Metropolitan Police Department Sixth District Headquarters, 1978 extension	Not Eligible
20	4201-4243 Benning Road	Block of row houses, c. 1940	Eligible
21	4228 Benning Road	1945-46 apartment building designed by African-American Architect R. C. Archer	Eligible
22	4234 Benning Road	c. 1930 residence	Not Eligible
23	4236 Benning Road	1941 apartment building designed by African- American Architect Cyril Bow. Eligible under "Apartment	Eligible
24	4254 Benning Road	c. 1930 residence	Not Eligible
25	4256-4264 Benning Road	c. 1950 apartment buildings	Not Eligible
26	4274 Benning Rd	1942 apartment building designed by George T. Santmyers. Eligible under "Apartment Buildings in	Eligible
27	217-223 42nd Street	Mid-20th-century duplexes	Not Eligible
28	227 and 231 42nd Street	Mid-20th-century apartments, currently a pre- school	Not Eligible
29	4212 East Capitol Street	Fort Chaplin Park Apartments & Townhomes	Not Eligible

Sources: DCSHPO, Benning Road and Bridges Transportation Improvements EA Project Team

Figure 3-25: Properties Requiring Determination of Eligibility Evaluation



Sources: DCGIS; Benning Road and Bridges Transportation Improvements EA Project Team

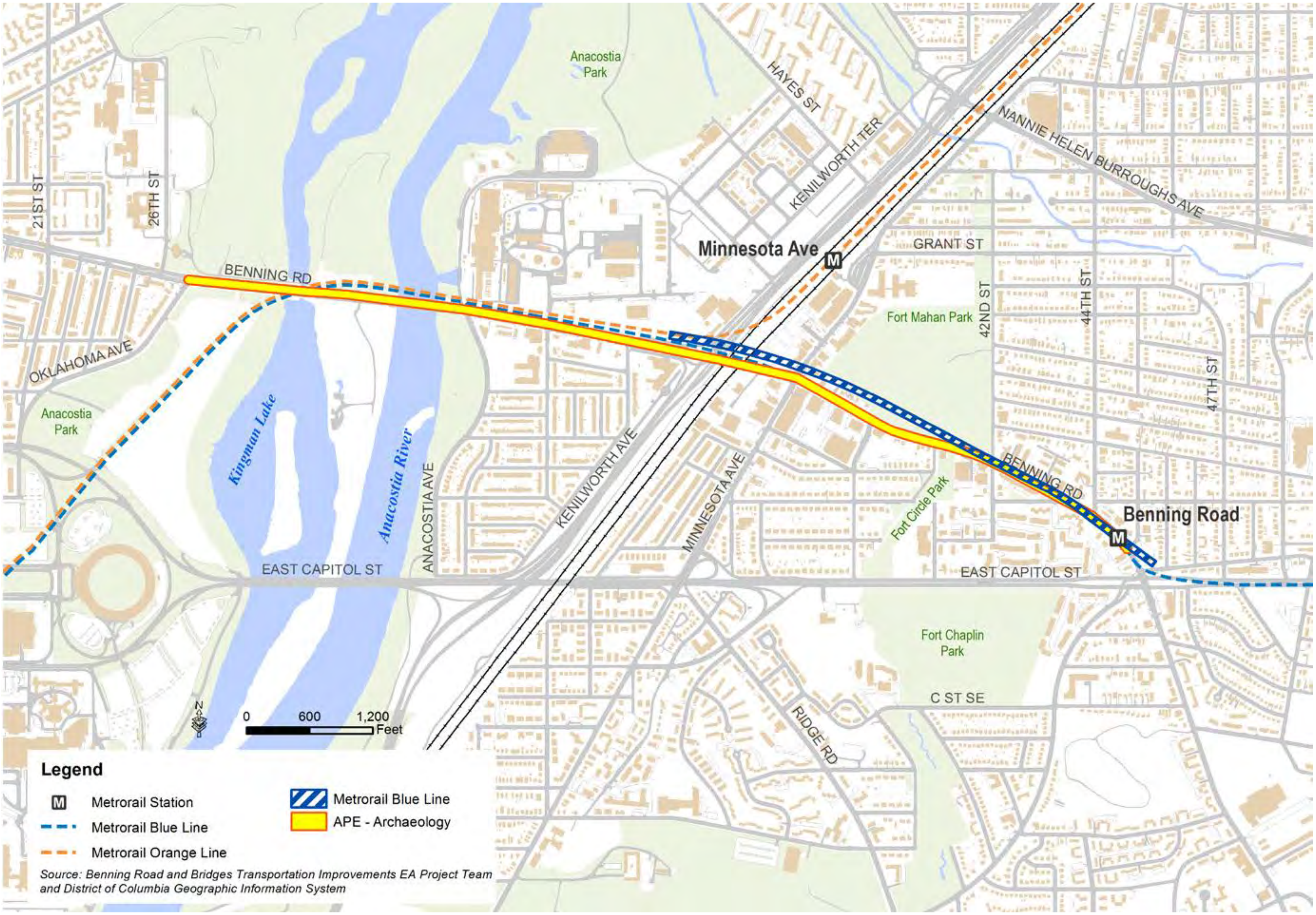
3.5.3.3 Potential Archaeological Resources

No archaeological resources have been previously reported within or proximate to the APE, which is located in an area of dense twentieth-century industrial, commercial, and residential development. The western portion of the study area around Anacostia Park—including Kingman Island and Heritage Island—appears to be the least disturbed portion of the study area; however, historic documents indicate that this area around the Anacostia River was substantially modified by an early-twentieth-century program of dredging, channelization, wetland-reclamation, and island-building that created both of the islands and Kingman Lake. Archaeological materials predating the early-twentieth century may be present at these locations beneath a package of historic fill material of variable but sometimes substantial thickness (re. Wagner 2015).

The existing right-of-way of Benning Road and Minnesota Avenue has been subject to decades of utility installation and resurfacing. The most significant and well-documented impact to naturally-occurring land surfaces within the APE for archaeology resulted from construction of WMATA's 'Blue Line' in the mid-1970s. As shown in **Figure 3-26,** the alignment of the Blue Line encompasses the APE for archaeology from a point west of 42nd Street in Fort Mahan Park on the west to the eastern end of the APE. The subway was constructed using the cut-and-cover method. Consequently, no intact archaeological deposits should be anticipated in this section of the APE.

There is moderate potential for intact archaeological resources dating to the late-nineteenth through early twentieth-centuries or earlier in previously undisturbed portions of the APE for below-ground resources. Of particular concern are areas adjacent to Fort Mahan Park, a Civil- War era fort constructed for the defense of Washington, DC and listed in the NRHP as part of the Defenses of Washington (Civil War Fort Sites) District. The DCSHPO has agreed that the assessment of the undertaking's impacts to archaeological deposits will be deferred until project design has advanced sufficiently to better understand the location and extent of all earth-moving activities related to construction and use, particularly areas outside of the DDOT right-of-way that may be used for the installation of electrical substations, construction lay-down or staging areas (**Appendix F**).

Figure 3-26: Areas of Recorded Disturbances in the APE



Sources: DCSHPO, Benning Road and Bridges Transportation Improvements EA Project Team

3.6 AESTHETICS AND VISUAL QUALITY

3.6.1 INTRODUCTION

This section describes the visual character and quality of selected viewsheds in the study area.

3.6.2 METHODOLOGY

Documentation of existing and opening year visual quality and viewsheds was based on the FHWA's *Visual Impact Assessment for Highway Projects* (FHWA, 1981). A visual resource inventory was developed for the study area consistent with the FHWA methodology. The inventory characterizes selected viewsheds using the concepts of visual character, quality, and viewer sensitivity. These concepts are described in more detail in the following sections. The inventory was developed through field review and photography and information gathered from published planning documents.

Viewshed Identification – The analysis identified six existing viewshed locations where the transportation improvements on the Benning Road corridor would be visible to visitors, pedestrians, drivers, and residents. The viewshed locations were selected due to their proximity to Benning Road. The viewsheds chosen are intended to be representative of views within the study area.

Visual Character – Visual character describes the natural, physical, and architectural/cultural features that give a location its distinct visual identify. Visual character is value-neutral in that character is qualified as neither good nor bad.

Visual Quality – Visual quality is a rating of the visual character of a landscape based on several criteria:

- **Vividness** (distinctiveness) refers to the memorable quality or distinctiveness of the landscape components. Vividness is composed of four elements – landform, vegetation, water features, and man-made elements – that influence the degree of vividness.
- **Intactness** is a measure of the visual integrity of the natural and human-built landscape and the extent to which the landscape is free from visual encroachment. This factor can be present in well-kept urban and rural landscapes, as well as in natural settings. High intactness means that the landscape is not broken up by features that appear to be out of place. Intactness is composed of two primary elements, development and encroachment, that influence the degree of intactness.
- **Unity** refers to the degree with which visual resources of the landscape join together in a coherent, harmonious visual pattern. High unity frequently attests to the careful design of individual components and their relationship in the landscape.

Visual Sensitivity – Viewers can be categorized as having low, average, or high sensitivity to changes in the visual environment. Viewer sensitivity is strongly influenced by a viewer's activity, awareness of their surroundings and the frequency and length of time using a resource.

3.6.3 EXISTING CONDITIONS

The study area contains numerous visual conditions encompassing areas that are primarily transportation infrastructure, parkland, residential, and commercial in character. The following viewsheds are representative of these varying conditions. Locations and direction of the viewshed are shown in **Figure 3-27**.

Viewshed 1- Western Benning Road

Viewshed 1 is located in the western portion of the study area and is represented by the view along Benning Road looking east (**Figure 3-28**). This view is characterized by a broad, six- lane roadway separated by a concrete median. Streetlights, numerous fencing types, and inconsistent trees line the street. Elevated Metrorail tracks, utility poles, a communications antenna, commercial signage, and trees from adjacent parklands are also visible. To the east, the viewshed terminates with views of man-made development and higher-elevation, vegetated parkland in the background

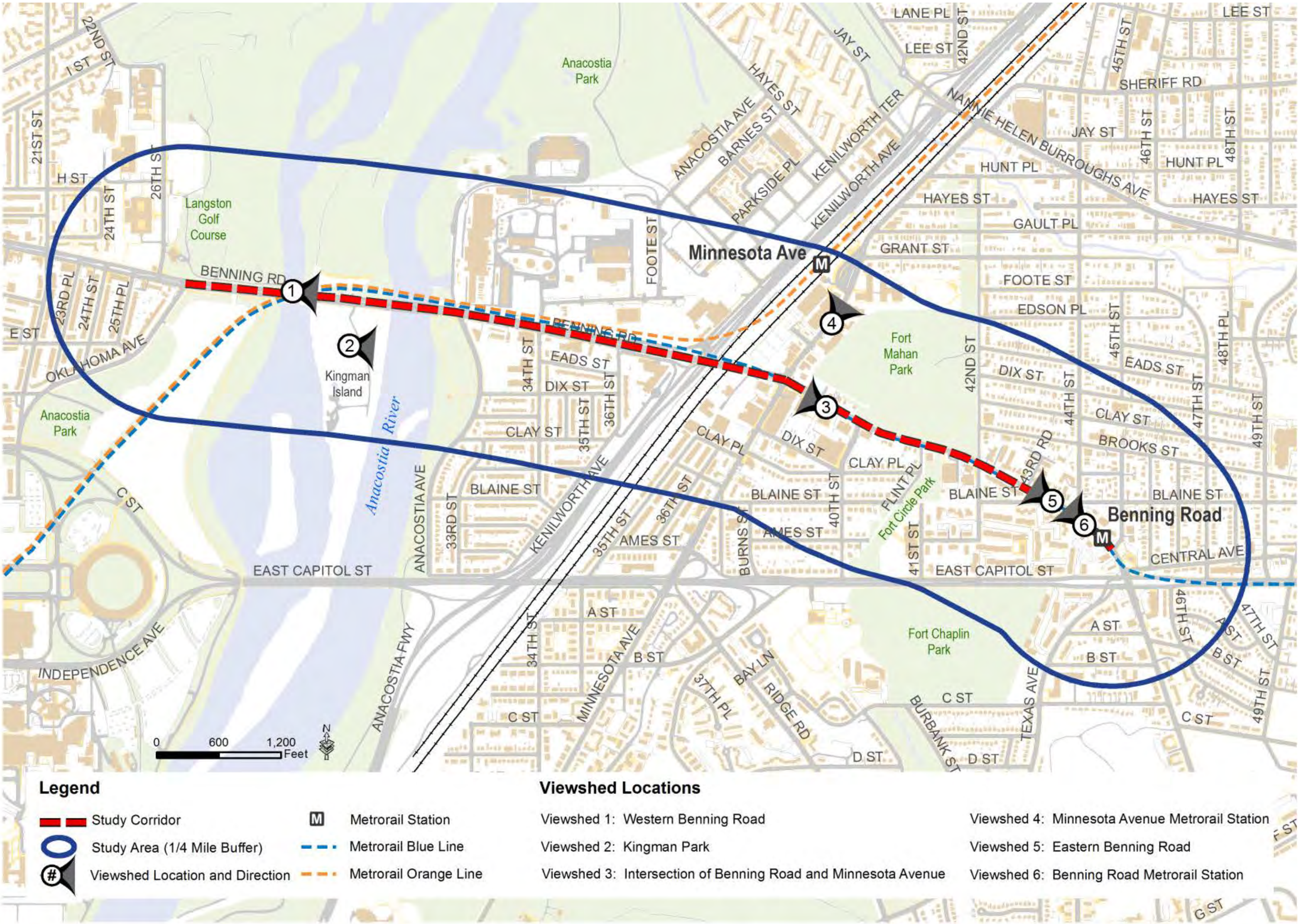
The overall quality of the viewshed is moderately low. Due to the multiple elements within the viewshed, the vividness is moderately low. The streetlights, trees, and median contribute to a defined pattern, while the power lines, commercial development, and fencing add visual distractions, resulting in moderately low degree of intactness. Similarly, the visual elements combine to form an overall viewshed with a moderately low degree of unity, with multiple elements disrupting visual lines. Because this area of this view primarily functions as a transportation corridor with heavy use, the viewer sensitivity of this view is moderate.

Viewshed 2 - Kingman Park

Viewshed 2 is located in the western portion of the study area at the Kingman Island Park entry plaza, facing northeast. The foreground is comprised primarily of natural vegetation along the banks of the Anacostia River, which is also visible (**Figure 3-29**). The bridge over the Anacostia River and elevated Metrorail tracks appear as prominent horizontal elements beyond the parkland. Numerous vertical elements punctuate the view including streetlights, smokestacks from the Pepco Power Plant, utility poles, and a communications antenna. In the periphery of the view, man-made development and the elevated topography of parkland are also visible.

The overall quality of the viewshed is moderate. The vividness of the park setting is reduced to moderate levels by the presence of both horizontal and vertical elements, such as the bridge, Metrorail tracks, and smokestacks. The intactness is also moderate due to the multiple encroachments of the vertical elements and the Metrorail tracks, which limit the openness of the view. These features combine to exhibit a moderate level of visual unity as a result of the strong horizontal lines and inconsistent vertical elements. The viewer sensitivity of this view is moderately high due to the high viewer awareness by park visitors and the moderate viewer exposure.

Figure 3-27: Location and Direction of Viewsheds



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 3-28: Viewshed 1 - Western Benning Road (looking East)

Figure 3-29: Viewshed 2 - Kingman Park (looking East)

Viewshed 3 - Intersection of Benning Road and Minnesota Avenue

Viewshed 3 is located in the central portion of the study area at the intersection of Benning Road and Minnesota Avenue, and is represented by the view facing west (**Figure 3-30**). The view is primarily composed of an ascending six-lane roadway lined with concrete guard rails, chain-link fencing, and a separated sidewalk. An access road adjacent to Benning Road also adds to the width of the roadway at the at-grade intersection. The medium-scale development frames the roadway at the northwest corner of the intersection, while low-scale development and densely located telephone and utility poles frame the southern portion of the viewshed. Streetlights, utility poles, and smokestacks are also visible from this vantage point.

The overall quality of the viewshed is low. The vividness of the viewshed is low due to the multiple elements that appear independent of one another and do not form a cohesive pattern. The primary view of the roadway is encroached by inconsistent development and prominent vertical elements, such as utility poles, limiting the intactness of the viewshed to low levels. Because the visual components are inconsistent, including the multiple levels of the roadway, the individual elements retain their distinctiveness. Therefore, the unity of the viewshed is low. Because this area of this view primarily functions as a transportation corridor with heavy use, the viewer sensitivity of this view is low.

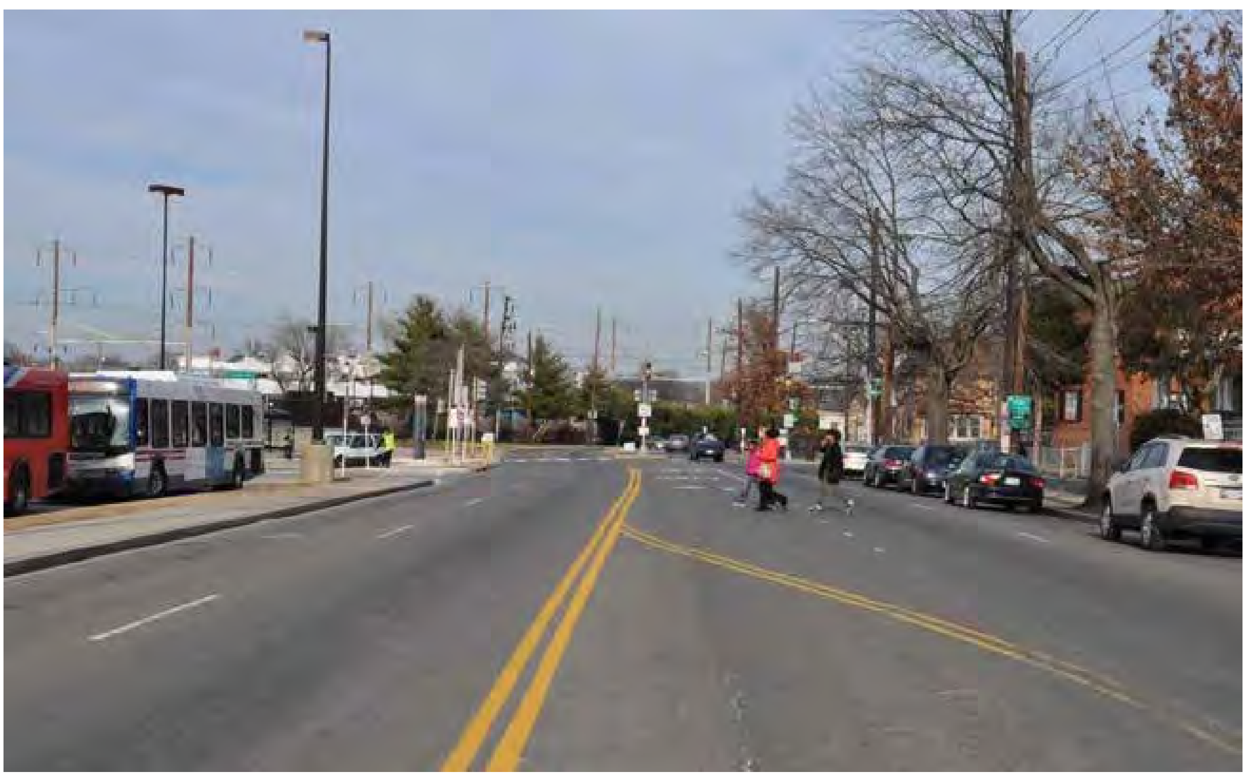
Figure 3-30: Viewshed 3 - Intersection of Benning Road and Minnesota Avenue (looking West)

Viewshed 4 - Minnesota Avenue Metrorail Station

Viewshed 4 is located in the north-central portion of the study area along Minnesota Avenue and is represented by the view facing north (**Figure 3-31**). The viewshed encompasses a four- lane roadway with on-street parking, sidewalks, and development on both sides. Along the west side of the roadway, the Minnesota Avenue Metrorail Station and Metrobus stop and the tall parking lot lights are visible, next to the mid-rise commercial development and street lights that form a consistent visual line. On the east side, low-rise, multi-family residential buildings that are not aligned with the street edge form an inconsistent building wall and telephone poles with street lights and street trees line the roadway. Minnesota Avenue’s intersection with Nannie Helen Burroughs Road forms the visual terminus of the view looking north.

The overall quality of the viewshed is moderately low. While the height of the residential buildings and the street trees along the eastern side of the roadway are consistent, the Metrorail station forms a visual gap along the western side of the road. The viewshed contains elements that do not create distinctive visual patterns, resulting in moderate vividness. Similarly, the height of telephone poles and the parking lot in the background interrupt the repetition of the street trees and residential and commercial buildings, resulting in moderately low intactness. Unity of the viewshed is moderately low due to the trees, and sidewalks that form an overall coherent pattern interrupted by telephone poles, parking lot lights, and gaps in the streetfront presence. Because this area of this view primarily functions as a transportation corridor with heavy use with few residences facing the roadway, the viewer sensitivity of this view is moderate.

Figure 3-31: Viewshed 4 - Minnesota Avenue Metrorail Station (looking North)



Viewshed 5 - Eastern Benning Road

Viewshed 5 is of a primarily residential area located in the eastern portion of the study area along Benning Road, looking west. A tree-lined, four-lane roadway (including on-street parking during off-peak hours) characterizes this viewshed, which is flanked by low-scale residential buildings with consistent setbacks (**Figure 3-32**). Landscaped yards and grass strips also line the roadway. Views of the tall telephone poles are largely filtered by mature trees, which extend across much of the roadway.

The overall quality of the viewshed is moderately high. The vividness of the viewshed is moderately high, due to the blend of built and vegetative patterns. The intactness of the viewshed is moderately high because the street trees serve largely to hide the visual intrusions of the telephone poles. Similarly the landscape and built elements combine to form a coherent pattern, with moderately high unity. Because this area contains numerous residences that face the roadway, in addition to serving as a transportation corridor, viewer sensitivity of this viewshed is high.

Figure 3-32: Viewshed 5 - Eastern Benning Road (looking West)

Viewshed 6 - Benning Road Metrorail Station

Viewshed 6 is located near the eastern edge of the study area, just west of the Benning Road Metrorail Station, in a primarily commercial area, and is represented by the view in **Figure 3-33**. A four-lane roadway bordered by sidewalks; stand-alone, low-rise commercial buildings and signs; and inconsistent street trees characterize Viewshed 6. Telephone poles with streetlights appear prominently along Benning Road.

The overall visual quality of Viewshed 6 is low. The roadway, buildings, telephone poles, and buildings do not combine to create a distinctive visual pattern, but instead retain their individuality. Many of these elements, including the telephone poles and signs, visually encroach into the view corridor, resulting in low intactness. The level of unity is low, due to the varying heights and depths from the roadway of the buildings, signs, and infrastructure. Because this area of this view primarily functions as a transportation corridor with heavy use, the viewer sensitivity of this view is moderate.

Figure 3-33: Viewshed 6 - Benning Road Metrorail Station (looking West)

3.7 NATURAL RESOURCES

3.7.1 GEOLOGY, TOPOGRAPHY, AND SOILS

3.7.1.1 INTRODUCTION

Geology and Topography

Geological conditions are defined as the earthy materials and rock below the soil boundary. Geological conditions are relevant to the environmental analysis, as they can affect the construction and structural stability of transportation facilities, and potential sources of public drinking water supplies.

Topography is defined by the U.S. Geological Survey (USGS) as "the shape and relief of the land surface." The "relief" of an area is defined as "differences in elevation" resulting from natural and man-made conditions. Topographic conditions also have the potential to affect the construction and stability of transportation facilities.

Soils

Soils are defined by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) as "…a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface, occupies space, and is characterized by one or both of the following: horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter or the ability to support rooted plants in a natural environment."

Like geological conditions, soils are relevant to the environmental analysis because they can affect the construction and structural stability of transportation facilities.

3.7.1.2 METHODOLOGY

Geology and Topography

Geological conditions were identified using web-based information on physiographic provinces provided by the USGS. The U.S. Environmental Protection Agency's (EPA) Region 3 Sole Source Aquifer Program database was queried to identify any potential sole source aquifers.

Elevation estimates are based on *Masspoint* (2-foot resolution) *and 10-Foot Topo* GIS data layers provided by OCTO. Topographic conditions within a 100-foot buffer of Benning Road were analyzed using GIS. The dataset contains Digital Terrain Model (DTM) masspoints derived photogrammetrically. The Masspoint elevations are based on North American Vertical Datum of 1988 (NAVD88) reported in US feet.

Soils

A USDA NRCS *Custom Soil Resource Report* was obtained in February 2014 to characterize soil conditions for the project. The analysis area was defined as a buffer 100 feet from the centerline of

Benning Road. The 100-foot buffer was selected as a conservative approximation for the limits of disturbance.

3.7.1.3 EXISTING CONDITIONS

Geology and Topography

The USGS identifies the study areas as being located near the western edge of the Mid-Atlantic Coastal Plain physiographic province. The "Fall Line", located approximately five miles west of the study area, marks the boundary between the Coastal Plain and the Piedmont physiographic provinces. The Coastal Plain is an eastward-thickening wedge of sedimentary deposits overlying igneous and metamorphic bedrock. Coastal Plain sediments consist of clays, silts, sands, and gravels deposited in river and marine environments. No EPA-designated sole source aquifers exist in the study area which could be used by residents for drinking water.

Topography within the 100-foot buffer area is flat to gently sloping (generally 0 to 15 percent as described by NRCS) with elevations ranging from approximately 4 to 91 feet, and a mean elevation of approximately 50 feet. **Figure 3-34** illustrates the existing topography of the study area with 10-foot contours.

Soils

The NRCS Soil Survey identified 14 soil complexes, and approximately 77 percent of the analysis area is made up of either Udorthents or Urban Land soil complexes. Urban Land complexes make up about 28 percent of the analysis area, and Udorthent complexes make up approximately 49 percent of soils in the analysis area. **Figure 3-34** shows the distribution of NRCS soil types within this area. **Table 3-17** provides a summary for soils in the analysis area.

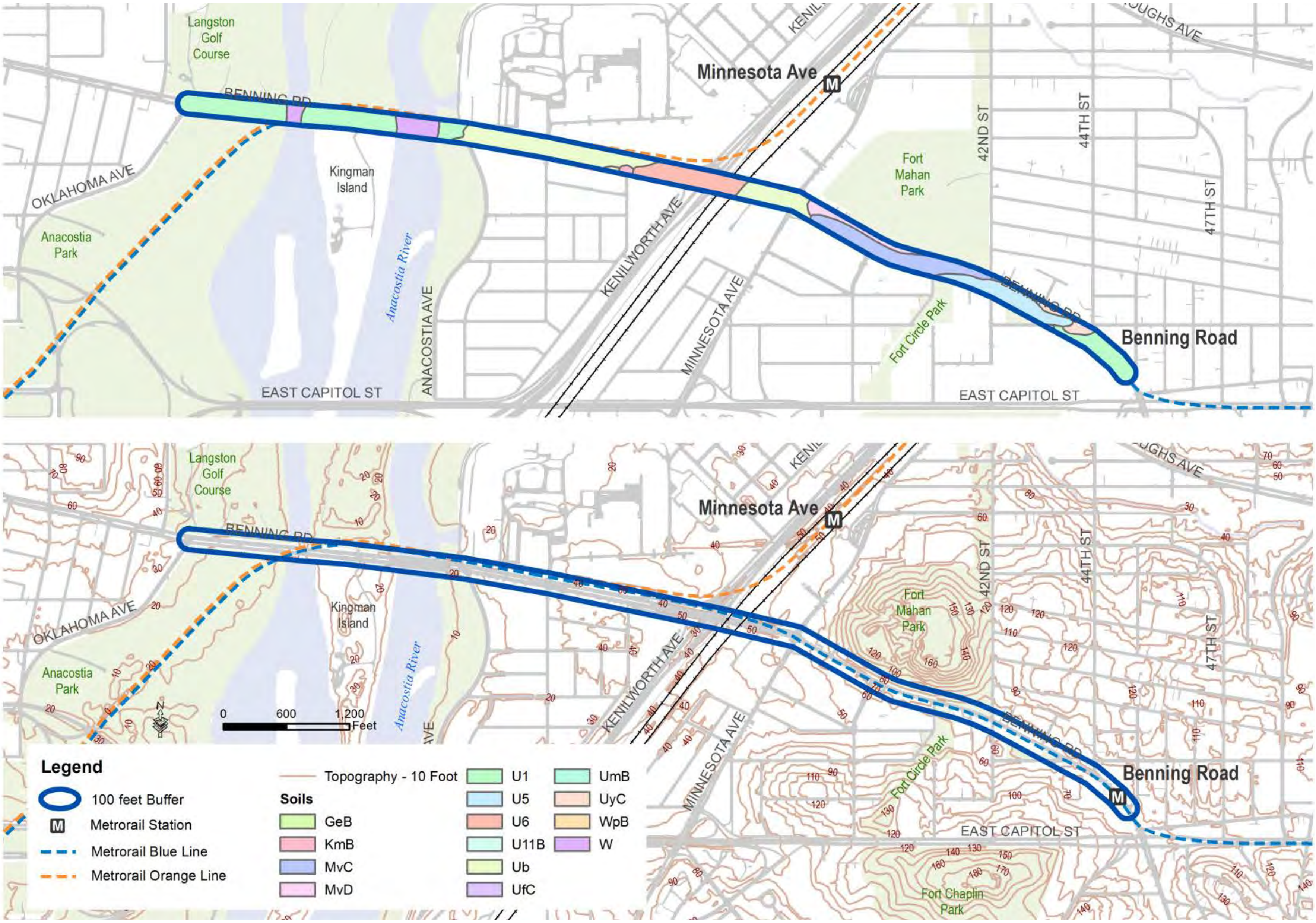
NRCS classifies Urban land soil complexes as "miscellaneous areas." The NRCS provides limited or no data on the constructability properties for these miscellaneous areas. Urban land can therefore be considered generic classifications for man-made or developed areas rather than distinct soil types with specific chemical and geological properties. The NRCS Custom Soil Resource Report is provided in **Appendix G**. The NRCS does not identify any Prime Farmland or Farmlands of Statewide Importance soil types in the study area; therefore, no further analysis of prime farmland soils is necessary for the project.

Table 3-17: Analysis Area Soils

Map Unit Symbol	Map Unit Name	Acres	Percent of Analysis Area
KmB	Keyport-Urban land complex, 0 to 8 percent slopes	0.2	0.5%
MvC	Muirkirk variant complex, 8 to 15 percent slopes	5.6	12.7%
MvD	Muirkirk variant complex, 15 to 40 percent slopes	1.8	4.1%
U1	Udorthents	13.0	29.5%
U5	Udorthents, clayey	4.0	9.1%
U6	Udorthents, smoothed	4.4	10.0%
U11B	Udorthents, deep, 0 to 8 percent slopes	0.1	0.2%
Ub	Urban land	10.8	24.5%
UfC	Urban land-Christiana complex, 8 to 15 percent slopes	0.1	0.2%
UyC	Urban land-Sunnyside complex, 8 to 15 percent slopes	1.4	3.2%
W	Water	2.5	5.7%
WpB	Woodstown-Urban land complex, 0 to 8 percent slopes	0.2	0.5%
	Total	**44.1**	**100.0%**

Source: USDA NRCS, Web Soil Survey

Figure 3-34: Soils and Topography



Source: DC OCTO, USGS, and USDA

3.7.2 SURFACE WATER RESOURCES

3.7.2.1 Introduction

Surface water resources are protected by federal and local laws and regulation including the following:

- Clean Water Act of 1972
- Presidential Executive Order 11990, Protection of Wetlands
- Presidential Executive Order 11988, Floodplain Management
- NPS, Director's Order #77-1: Wetland Protection
- NPS, Director's Order #77-2: Floodplain Management
- Rivers and Harbors Appropriations Act of 1899 (33 USC 401, 403, 407)
- Navigation and Navigable Waterways (33 CFR Part 114)

Waters of the U.S.

Waters of the U.S. (WOUS), including wetlands, are defined in the Code of Federal Regulations, 40 CFR 230.3(s), as follows:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
  - (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
  - (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
  - (iii) Which are used or could be used for industrial purposes by industries in interstate commerce;
- All impoundments of waters otherwise defined as waters of the United States under this definition;
- Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
- The territorial sea; or
- Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

3.7.2.2 Methodology

WOUS were identified using GIS data provided by the District of Columbia in 2013 and the National Wetlands Inventory (NWI). The NWI is maintained by the US Fish and Wildlife Service (USFWS) as a nationwide inventory of wetlands for use by biologists and environmental scientists for the purpose of wetland conservation. Additionally, USGS topographic maps of the study area (Washington East Quadrangle) were reviewed to identify any named water bodies.

Regulated floodplains were identified using the Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Maps (DFIRM) obtained from the District of Columbia in 2013.

3.7.2.3 Existing Conditions

Surface water resources are depicted in **Figure 3-35** and **Figure 3-36.** The Anacostia River is considered a WOUS, regulated under both the Clean Water Act and the Rivers and Harbors Act, as a navigable waterway. *Navigable Waterways of the United States* are defined in 33 CFR 2.36. This segment of the Anacostia River is considered navigable specifically by the definition provided in 33 CFR 2.36(a)(2) “Internal waters of the United States that are subject to tidal influence.” The Anacostia River is subject to tidal influence in the location of the study area. The National Oceanic and Atmospheric Administration (NOAA) reports tidal conditions from a monitoring station on Kingman Island, and as far north as Bladensburg, Maryland outside of the study area.

Adjacent and west of Kingman Island and the Anacostia River, is a water body named Kingman Lake. Piney Run is a stream that courses immediately south of Benning Road roughly paralleling the road’s alignment. Piney Run connects to the Anacostia River and has been channelized in sections through the study area. No other named water bodies were identified on the USGS quadrangle.

Wetlands

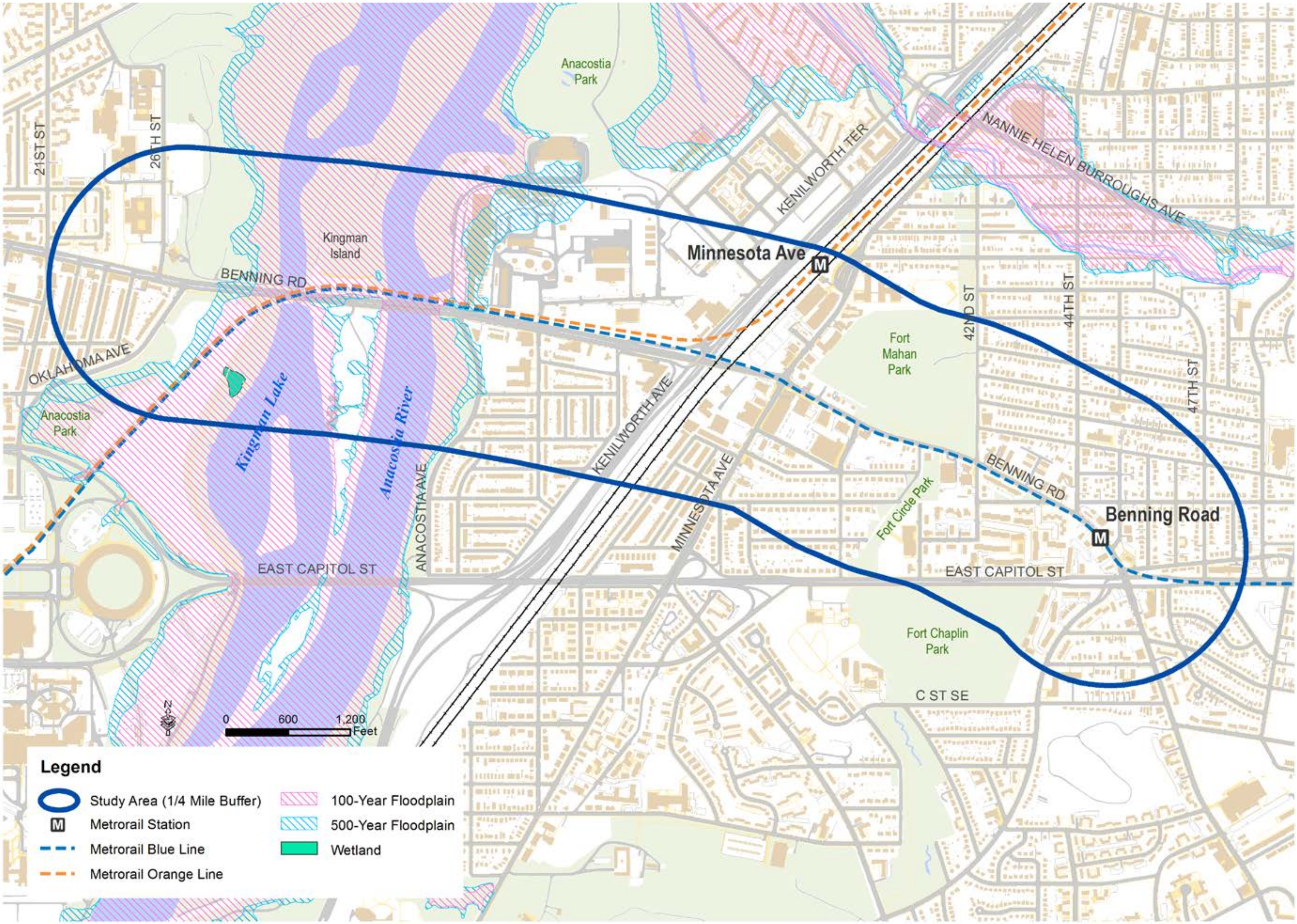
NWI-identified wetlands, shown in **Figure 3-35,** are concentrated around the Anacostia River and consist of the three wetland classifications: Riverine, Open Water Tidal, Riverine Tidal, and Palustine Emergent.

The Anacostia River, defined by the NWI as a “Riverine Open Water Tidal wetland,” is the predominant type of wetland in the study area. The NWI does not identify any other wetlands in the study area beyond the vicinity of the Anacostia River.

Regulated Floodplain

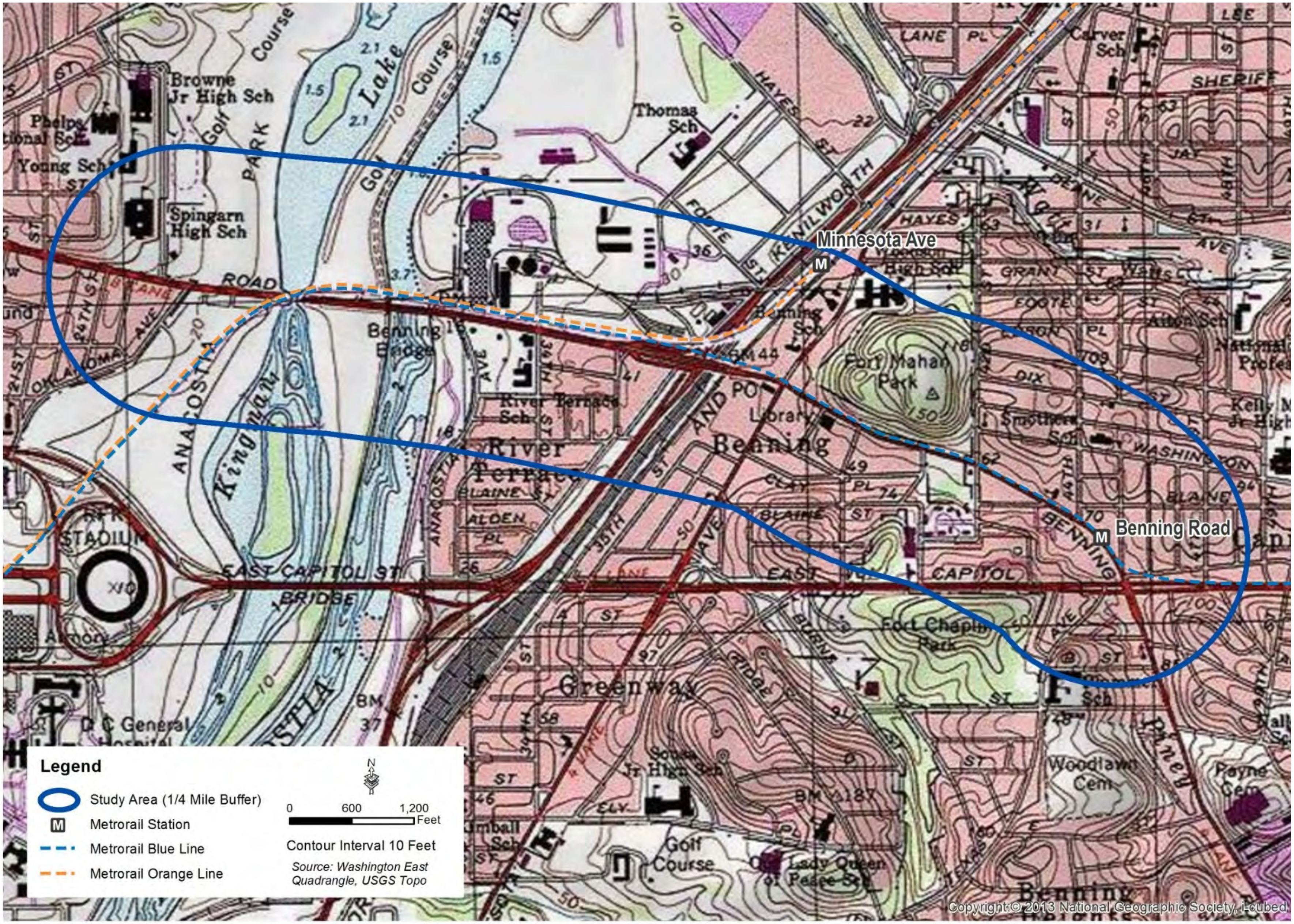
Figure 3-35 illustrates 100-year and 500-year flood zones. The 100-year flood zones are located around the Anacostia River. The Base Flood Elevation for 100-year flood zones is 14 feet as identified on the DFIRM. The 500-year flood zones areas are also located along the east and west shore of the Anacostia River. Besides the locations around Anacostia River and Kingman Lake, no other portions of the study area are within 100-year or 500-year flood zones.

Figure 3-35: Surface Water Resources



Source: DCGIS, USFWS, and FEMA, February 2014

Figure 3-36: USGS Topographic Map (Washington East quadrangle)



3.7.3 WILDLIFE INCLUDING THREATENED AND ENDANGERED SPECIES

3.7.3.1 Introduction

Wildlife

This section describes terrestrial species observed in the study area.

Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 provides for the conservation of endangered and threatened species and the ecosystems upon which they depend. Section 7 of the ESA requires that federal agencies aid the conservation of listed species and ensure that their activities do not jeopardize the continued existence of listed species or adversely modify designated critical habitat. At the federal level, USFWS and NOAA are responsible for the administration of the ESA.

3.7.3.2 Methodology

Wildlife

NPS completed an Environmental Assessment for the implementation of Section 3 of the Anacostia Riverwalk Trail in August 2011. The biological assessments and observations in that EA serve as the primary source for the identification of wildlife in the study area.

Threatened and Endangered Species

The USFWS Chesapeake Bay Preservation Office Information, Planning and Consultation system (IPaC) was queried in February 2014 to determine if any listed, proposed or candidate species may be present within the study area.

3.7.3.3 Existing Conditions

Wildlife

NPS reports that approximately 70 percent of the Anacostia Watershed has been developed, and only 25 percent of the watershed's original forest cover still exists which could serve as a habitat. NPS identified the presence of a riparian floodplain, emergent, and forested wetlands in the general study area which serves as wildlife habitat.

NPS documented 191 bird, 50 butterfly, 23 fish, 20 reptile, 18 amphibian, and 17 mammal species as either residents in or migrants passing through Anacostia Park. Local predators include red and gray foxes (Vulpes vulpes and Urocyon cinereoargenteus), raccoons (Procyon lotor), ospreys (Pandion haliaetus), red-tailed hawks (Buteo jamaicensis), and transitory bald eagles (Haliaetus leucocephalus). Other species identified by NPS were opossums (Didelphis marsupialis), gray squirrels (Sciurus carolinensis), and various species of bats, butterflies, dragonflies, snakes, turtles, migratory songbirds, and waterfowl. In prior studies, NPS identified additional species in the area:

- Various species of amphibians, including marbled salamander (Ambystoma opacum), red-spotted newt (Notophthalmus viridescens), and spring peeper (Pseudacris crucifer), in both emergent and forested wetlands;
- Eastern box turtle (Terrapene carolina) in forested uplands;
- Eastern tiger swallowtail butterfly (Papilio glaucus) in upland fields;
- Red-winged blackbird (Agelaius phoeniceus) in emergent wetlands and floodplain fields;
- Egret species in open water of the Anacostia River;
- Northern mockingbird (Mimus polyglottos) and American crow (Corvus brachyrhynchos);
- Black-crowned night heron (Nycticorax nycticorax) in the Anacostia River riparian buffer; and
- Great blue heron (Ardea herodias Linnaeus) and double-crested cormorant (Phalacrocorax auritus).

Threatened and Endangered Species

The USFWS IPaC database did not identify any federally-listed threatened or endangered species or habitat, bald or golden eagles, federally-designated critical habitat, or wildlife refuges within the study area (See **Appendix H**). Therefore, it is expected that this project will not have any effect on the threatened and endangered species and no further coordination under Section 7 is required (LaRouche, 2014).

3.7.4 VEGETATION

3.7.4.1 Introduction

This section describes native and planted vegetation and invasive species which have been observed in the study area. In addition to NEPA, the District Urban Forestry Administration (UFA) regulates the planting, pruning, or removal of trees within public right-of-way.

3.7.4.2 Methodology

NPS also completed vegetation surveys for the Anacostia Riverwalk Trail EA. The NPS analysis serves as the primary source for this discussion. In addition to the EA, field reviews were conducted to observe vegetation conditions. The UFA maintains a GIS database of trees within DDOT right-of-way. These street trees are under the maintenance, responsibility and regulation of the UFA. The database was used to analyze the existing tree coverage on study area streets.

The District of Columbia identifies invasive plants using a publication developed by NPS titled *Plant Invaders of Mid-Atlantic Natural Areas* (NPS, 2010). This list identifies invasive plants found in the District as well as in the Mid-Atlantic region.

3.7.4.3 Existing Conditions

Larger tracts of natural vegetation occur along the banks of the Anacostia River and Fort Mahan Park. Natural vegetation varies within this urban and densely populated area outside of parkland conservation areas. Within the parkland areas, along the Anacostia River, the NPS analysis found mid-successional Sycamore/Green Ash/Box Elder/Silver Maple forest association dominates.

Mid-successional Sycamore/Green Ash/Box Elder/Silver Maple forest consists of many species indicative of a bottomland riparian forest species. Common species include American sycamore

(Platanus occidentalis), silver maple (Acer saccharinum), box elder (Acer negundo), green ash (Fraxinus pennsylvanica), black cherry (Prunus serotina), and red maple (Acer rubrum), with inclusions of elm (Ulmus sp.), hickory (Carya sp.), oaks (Quercus spp.), tree of heaven (Ailanthus altissima), tulip poplar, (Liriodendron tulipifera), persimmon (Diospyros virginiana) and Eastern cottonwood (Populus deltoides) and white mulberry (Morus alba). Areas of upland forest are dominated by plant species including red mulberry (Morus rubra), black locust (Robinia pseudoacacia), willow oak (Quercus phellos), princesstree (Paulownia tomentosa), northern catalpa (Catalpa speciosa), silk tree (Albizia julibrissin), and slippery elm (Ulmus rubra).

Invasive vegetative species identified by NPS (and in the NPS invasive plant species publication) include poison ivy (Toxicodendron radicans), bush honeysuckle (Lonicera sp.), tree of heaven (Ailanthus altissima), white mulberry (Morus alba), Japanese Knotweed (Fallopia japonica), princess tree (Paulownia tomentosa), silk tree (Albizia julibrissin), and Japanese honeysuckle (Lonicera japonica).

The UFA database has inventoried 2,298 street trees within study area right-of-way, including approximately 175 street trees within the Benning Road right-of-way. Street trees along Benning Road include the American elm (Ulmus americana), Cherry tree (Prunus species), Katsuratree (Cercidiphyllum japonicum), Littleaf linden (Tilia cordata), Pin Oak (Quercus palustris), Princeton elm (Ulmus americana 'Princeton'), Red maple (Acer rubrum), Sawtooth oak (Quercus acutissima), Sweetgum (Liquidambar styraciflua), and Thornless honeylocust (Gleditsia triacanthos var. inermis).

3.8 UTILITIES

3.8.1 INTRODUCTION

This section describes existing utilities in the study area. Utilities are defined as infrastructure that deliver services such as electric, gas, water, sewer, telephone, cable television, and fiber optic lines. Utilities can be owned and maintained by public or private companies and may be located above or below ground level.

3.8.2 METHODOLOGY

A basic assessment of existing utilities was conducted based upon available data, visual observation, and Quality Level C field verification of surface utility features, and records from utility companies.

3.8.3 EXISTING CONDITIONS

Both overhead and underground utilities—including gas, water, electric, communications, storm sewer, sanitary sewer, and street lighting and traffic signals—are present throughout the proposed corridor. See **Table 3-18** for a description of existing utilities. The decommissioned Pepco Power Plant is located along Benning Road and introduces potentially major underground electric transmission and distribution utilities in the study area. Additionally, there are a substantial amount of overhead utility lines at the intersections along the project alignment, particularly the intersection of Benning Road and Minnesota Avenue. Throughout the corridor, there are also various utility structures within the sidewalk and buffer strip.

Traversing the study area are WMATA Metrorail facilities for the Orange, Blue, and Silver lines including aerial track structures and tunnels, respectively. DC Water also has large stormwater structures in the project vicinity.

Table 3-18: Utilities

Utility Type	Utility Owner	Description
Gas	Washington Gas	Underground distribution lines and service connections; size and locations varies.
Water	DC Water (WASA)	Underground distribution lines and service connections; size and locations vary (4” to 30”). Fire hydrants are located throughout corridor.
Electric	Pepco	Aerial – Overhead wires mounted typically to wooden poles are found throughout the study area along both sides of the roadways; size and type unknown. Subsurface – Underground facilities throughout project. Extensive underground transmission and distribution facilities from the western project limit to the Benning Road Viaduct, typically in the westbound roadway, including twin 69kv electric cable pipes and several multi-way duct banks ranging in size from 4-way (W) to 24W duct banks. Although information is not available for the eastern study area, it is believed that transmission lines are present in and around East Capitol Street. Along Minnesota Avenue, underground electric is typically beneath the southbound lanes except for limited areas between Grant and Hayes Streets.

Utility Type	Utility Owner	Description
Telephone	Verizon Communications	Aerial – Overhead wires mounted typically to wooden poles are found throughout the study area along both sides of the roadways; size and type unknown. Subsurface – Underground facilities present throughout corridor. Along Benning Road, west of Minnesota Avenue, underground facilities are typically found beneath the eastbound roadway. East of Minnesota Avenue, underground telephone facilities are typically beneath the westbound lane of Benning Road. For the area along Minnesota Avenue, underground facilities are beneath the northbound lanes.
Communication / CATV	TBD	Aerial – Overhead communication wires mounted typically to wooden poles are observed throughout the study area along both sides of the roadways; size and type unknown. Subsurface – Unknown.
Sanitary Sewer	DC Water (WASA)	Underground service connections and trunk lines located throughout the project limits, primarily along Minnesota Avenue and along Benning Road east of Minnesota Avenue; size and locations varies.
Rail	WMATA and CSX	Project is adjacent to WMATA and CSX facilities. As such, underground utilities may be present. Project crosses beneath and over existing rail facilities.
Street Lighting	DDOT	Street lighting is throughout the project limits including bridge mounted lights. Luminaires are typically cobra-head style mounted on aluminum poles or wooden utility poles. Along Benning Road and Minnesota Avenue, lighting mounted to wooden poles are fed from an overhead power source, whereas bridge-mounted street lights are on dedicated aluminum poles and fed via underground service.
Traffic Signals/ Enforcement	DDOT and Metropolitan Police Department	DDOT standard traffic signals, control cabinets, and cameras and devices are throughout the project and are typically surface mounted on a standalone pole or foundation. DDOT cameras are typically for traffic surveillance while the MPD owned facilities are for red light and speed enforcement. Underground facilities including manholes, hand holes, and conduit are also present to services the aboveground equipment. Size and location of underground facilities are unknown.
Storm Drainage	DC Water (WASA)	Storm runoff is conveyed by gutters to catch basins; size and location of drainage piping varies.

Source: DDOT

3.9 HAZARDOUS MATERIALS

3.9.1 INTRODUCTION

The section summarizes the results of a contaminated and hazardous material survey of existing conditions in the study area. The basic components of the survey include a historical records search and a public agency file review of the study area.

3.9.2 METHODOLOGY

The survey of existing contaminated and hazardous material conditions includes reviews of Federal and State database record searches provided by Environmental Data Resources, Inc. (EDR). The EDR search identified the presence of potential areas of concern, the possible presence of contaminated substances, and determined any potential "Recognized Environmental Conditions" (RECs) in the study area.

The term REC indicated the presence or likely presence of any hazardous substances or petroleum products on a property that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with federal, state, and local laws and regulations.

3.9.3 EXISTING CONDITIONS

A survey of existing contaminated and hazardous material conditions which included reviews of Federal and State database record searches identified a combined total of 97 hazardous and contaminated material REC sites within 660 feet of the corridor.

The EDR searched for RECs within 100 feet of the existing roadway centerlines. Descriptions of the categories of RECs found in the study area are provided in **Table 3-19**. These include sites regulated under the Resource Conservation and Recovery Act (RCRA), Leaking Underground Storage Tanks (LUSTs), and Underground Storage Tanks (USTs).

RECs within the study area are summarized in **Appendix I** and shown in **Figure 3-37**. **Appendix I** provides detailed information on the facility name, physical address, database reference, description, and map identification numbers used in **Figure 3-37**. Many RECs are located within close proximity to each other, and in some cases are located at the same physical address and previous ownership associated with past regulatory reporting. All RECs located immediately adjacent to the District right-of-way may have the potential to be encountered during project activities.

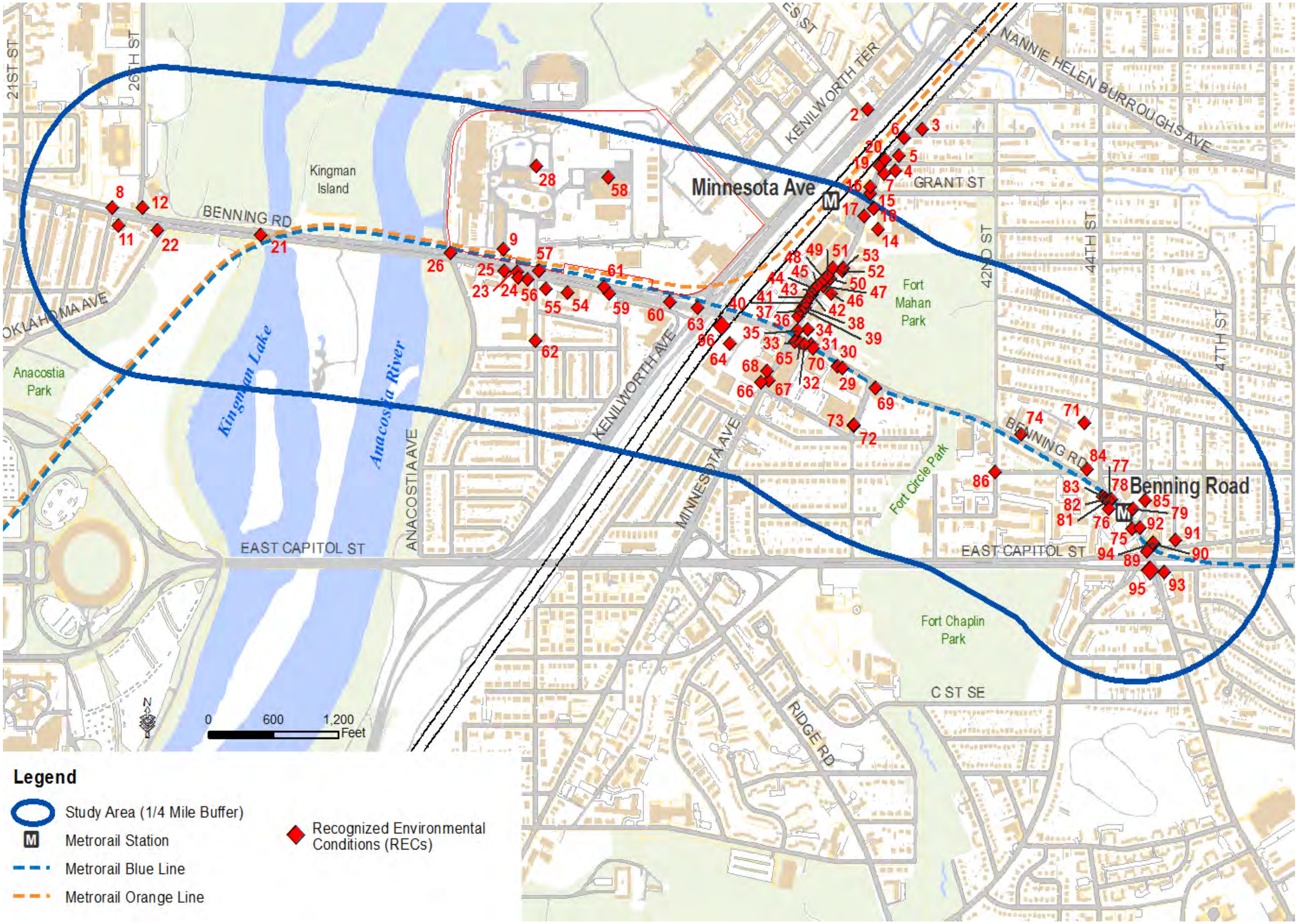
Table 3-19: Recognized Environmental Condition (REC) Categories

REC Category	Acronym	Description	Number of Sites in the Study Area
RCRA Large Quantity Generators (LQGs)	RCRA-LQG	Sites which generate, transport, store, treat and/or dispose of hazardous waste regulated under RCRA). LQGs generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.	2
RCRA Conditionally exempt small quantity generators (CESQGs)	RCRA-CESQG	Sites which generate, transport, store, treat and/or dispose of hazardous waste regulated under RCRA. CESQGs generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.	11
RCRA Non-Generators	RCRA NonGen/ NLR	Sites which generate, transport, store, treat and/or dispose of hazardous waste regulated by RCRA. RCRA NonGen sites do not presently generate hazardous waste.	12
Emergency Response Notification System (ERNS)	ERNS	Sites listed in EPA's ERNS database which records and stores information on reported releases of oil and hazardous substances.	9
Facility Index System	FINDS	Sites listed in EPA's FINDS database contains facility information and "pointers" to other sources of information that contain more detail on permitted activities and enforcement.	22
Aerometric Information Retrieval System (AIRS)	US AIRS	Sites listed in an EPA-maintained database containing compliance data on air pollution point sources regulated by the EPA, state, and local air regulatory agencies. The database is used to track emissions and compliance data from industrial plants.	7
EPA Watch List		Sites on the EPA-maintained "Watch List" used to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority.	2
PCB Activity Database	PADS	Sites listed in the EPA-maintained PCB Activity Database identifies generators, transporters, commercial storers and/or brokers and disposers of PCBs who are required to notify the EPA of such activities.	1
Hazardous Materials Incident Report System	HMIRS	Sites listed in an EPA-maintained database which contains hazardous material spill incidents reported to the Department of Transportation.	2
Integrated Compliance Information System	ICIS	Sites listed in the Integrated Compliance Information System (ICIS) used by the EPA for national enforcement and compliance program as well as NPDES program.	6
DC Brownfields		Sites listed as potential brownfields by the District of Columbia	11

REC Category	Acronym	Description	Number of Sites in the Study Area
Solid Waste Facility Listing	DC SWF/LF	Sites listed as a solid waste facility. Since the District does not have landfills, collected waste is deposited at two solid waste transfer stations and then taken out of the District by contractor vehicles to a waste-to-energy plant and landfill in Virginia.	1
Leaking Underground Storage Tanks	DC LUST	Sites with a reported LUST incident identified by the District of Columbia Department of Consumer and Regulatory Affairs (DCRA).	13
Underground Storage Tanks	DC UST	Sites with an UST regulated under the RCRA. The database is provided by the DCRA.	25
Historic Underground Storage Tanks	DC HIST UST	During the process of the database upgrade, all facilities that the UST Program was unable to confirm their existence were removed from the working revelation UST Database before the conversion and put into an excel spreadsheet.	15
EDR Recovered Government Archive LUSTs	DC RGA LUST	Sites listed in an EDR Recovered Government Archive (RGA) for LUSTs database provides a list of LUST incidents derived from historical databases and other records that no longer appear in current government lists.	13
US Historic Cleaners		Proprietary EDR database of potential dry cleaner sites including historic dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as High Risk Historical Records (HRHR).	9
US Historic Auto Stations		Proprietary EDR database of potential of potential historic gas station/filling station/service station sites .including gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as HRHR.	17

Source: Environmental Data Resources, Inc.

Figure 3-37: Potential/Former Recognized Environmental Condition Sites (RECs)



Source: Environmental Data Resources, Inc., February 2014

3.10 NOISE AND VIBRATION

3.10.1 INTRODUCTION

This section describes existing noise and vibration conditions in the study area. A comprehensive noise and vibration assessment was conducted to assess the existing conditions and potential impacts of the project. The complete analysis is provided in **Appendix J**.

3.10.2 METHODOLOGY

The noise and vibration assessment was prepared in accordance with NEPA and the guidelines set forth by FTA's *Transit Noise and Vibration Impact Assessment* (FTA, 2006). The future predicted noise and vibration levels from the project were evaluated using FTA guidelines including cumulative noise exposure (such as the day-night noise level over 24-hours).

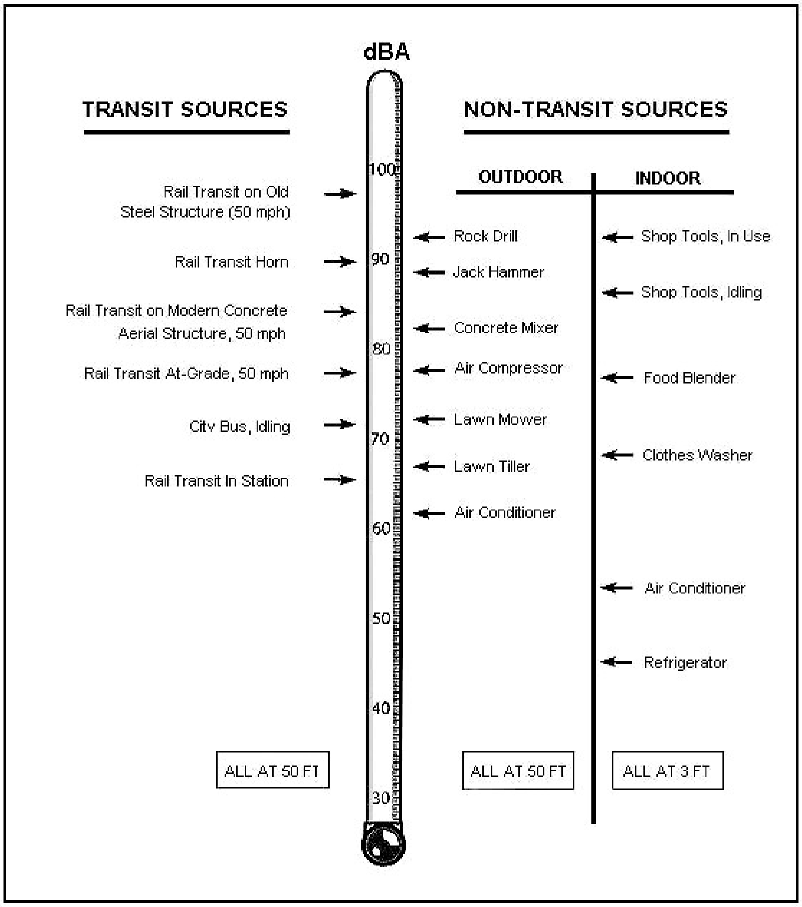
3.10.2.1 Noise

Noise is "unwanted sound" and, by this definition, the perception of noise is a subjective process. Several factors affect the actual level and quality of sound as perceived by the human ear and can generally be described in terms of loudness, pitch (or frequency), and time variation. The loudness, or magnitude, of noise determines its intensity and is measured in decibels (dB) that can range from below 40 dB (the rustling of leaves) to over 100 dB (a rock concert). Pitch describes the character and frequency content of noise, such as the very low "rumbling" noise of stereo subwoofers or the very high-pitched noise of a piercing whistle. Finally, the time variation of noise sources can be characterized as continuous, such as with a building ventilation fan; intermittent, such as for trains passing by; or impulsive, such as pile- driving activities during construction.

Various sound qualities are used to quantify noise from transit sources, including a sound's loudness, duration, and tonal character. For example, the A-weighted decibel (dBA) is commonly used to describe the overall noise level because it more closely matches the human ear's response to audible frequencies. Because the A-weighted decibel scale is logarithmic, a 10 dBA increase in a noise level is generally perceived as a doubling of loudness, while a 3 dBA increase in a noise level is just barely perceptible to the human ear. Typical A-weighted sound levels from transit and other common sources are shown in **Figure 3-38**.

Several A-weighted noise descriptors are used to determine impacts from stationary and transit-related sources including the L_{max}, which represents the maximum noise level that occurs during an event such as a bus or train passby; the L_{eq}, which represents a level of constant noise with the same acoustical energy as the fluctuating noise levels observed during a given time interval; the L_{90}, which represents the noise level exceeded 90 percent of the time and is used to establish the background ambient level; and the L_{dn}, or the 24-hour day-night noise level, which includes a 10-decibel penalty for all nighttime activity between 10 pm and 7 am.

Figure 3-38: Typical A-Weighted Noise Levels



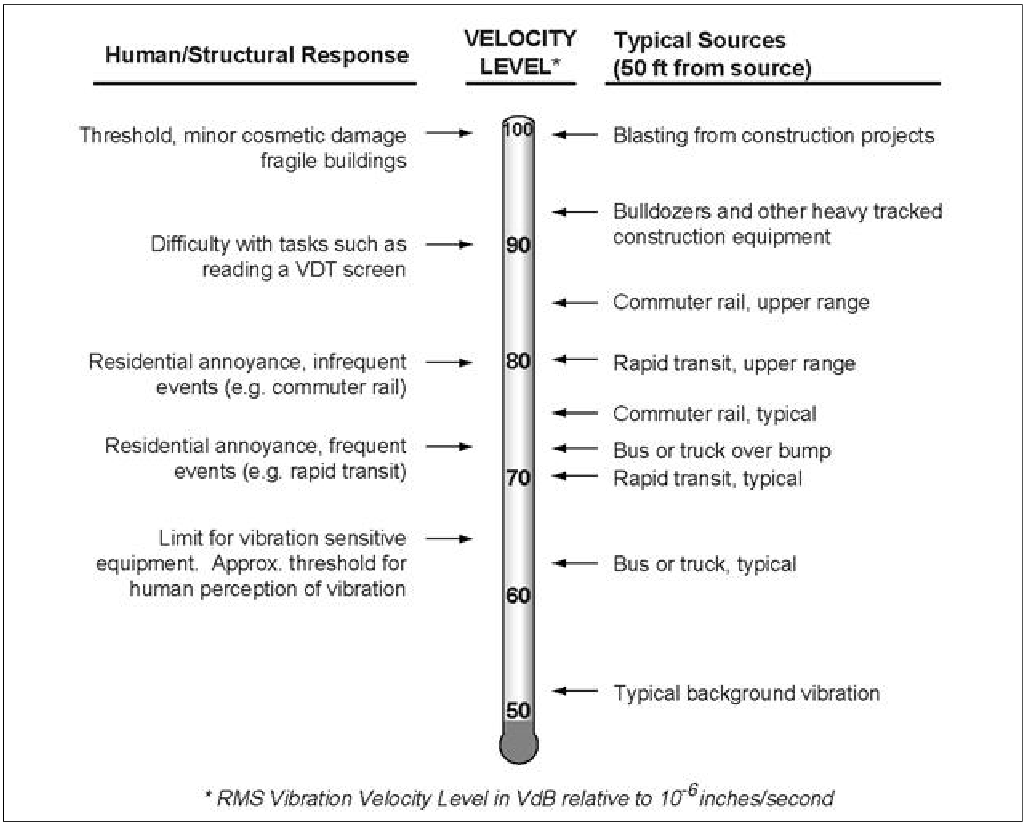
Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

3.10.2.2 Vibration

Ground-borne vibration associated with vehicle movements is usually the result of uneven interactions between wheels and the road or rail surfaces. Examples of such interactions (and subsequent vibrations) include train wheels over a jointed rail, an untrue rail car wheel with "flats," and a motor vehicle wheel hitting a pothole, a manhole cover, or any other uneven surface. Typical ground-borne vibration levels from transit and other common sources are summarized in **Figure 3-39.** For example, typical ground-borne vibration levels at a receptor 50 feet from different transportation sources traveling at 50 miles per hour range from 61 VdB (velocity level in decibels) for trucks and buses, to 73 VdB for LRT vehicles, to 85 VdB for diesel locomotives.

Similarly, a typical background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of perception for humans, which is around 65 VdB (FTA, 2006). The typical background levels refer to ambient ground vibrations not related to any specific transportation source (e.g., naturally occurring ground vibration). This background vibration level is assumed to be fairly constant from site to site, except in the vicinity of active fault lines.

Figure 3-39: Typical Ground-Borne Vibration Levels



Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

Unlike noise, which travels in air, transit vibration typically travels along the surface of the ground. Depending on the geological properties of the surrounding terrain and the type of building structure exposed to transit vibration, vibration propagation can be more or less efficient. Buildings with a solid foundation set in bedrock are "coupled" more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings located in sandier soil. Heavier buildings (such as masonry structures) are less susceptible to vibration than wood-frame buildings because they absorb more vibration energy.

Vibration induced by passing vehicles can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments and other objects are most accurately described with velocity. Therefore, the vibration velocity level is used to assess vibration impacts from transit projects.

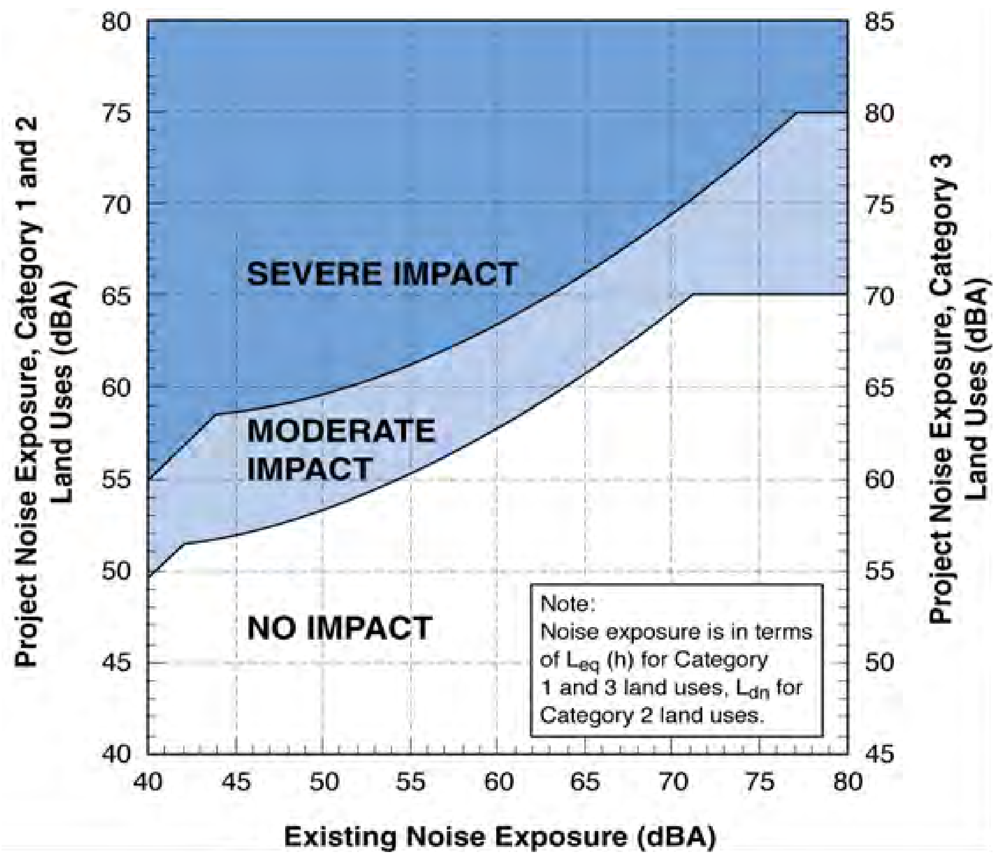
To describe the human response to vibration, the average vibration amplitude (called the root mean square, or RMS, amplitude) is used to assess impacts. The RMS velocity level is expressed in inches per second or VdB. All VdB vibration levels are referenced to 1 micro-inch per second (ips). Similar to noise decibels, vibration decibels are dimensionless because they are referenced to (i.e., divided by) a standard level (such as 1x10-6 ips in the U.S.). This convention allows compression of the scale over which vibration occurs, such as 40-100 VdB rather than 0.0001 ips to 0.1 ips.

3.10.2.3 Operational Noise Criteria

FTA's guidance manual *Transit Noise and Vibration Impact Assessment* (May 2006) presents the basic concepts, methods and procedures for evaluating the extent and severity of noise impacts from transit projects. Transit noise impacts are assessed based on land use categories and sensitivity to noise from transit sources under the FTA guidelines. As shown in **Figure 3-40** and **3-41**, the FTA noise impact criteria are defined by two curves that allow increasing project noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone. FTA land use categories and required noise metrics are described in **Table 3-20**.

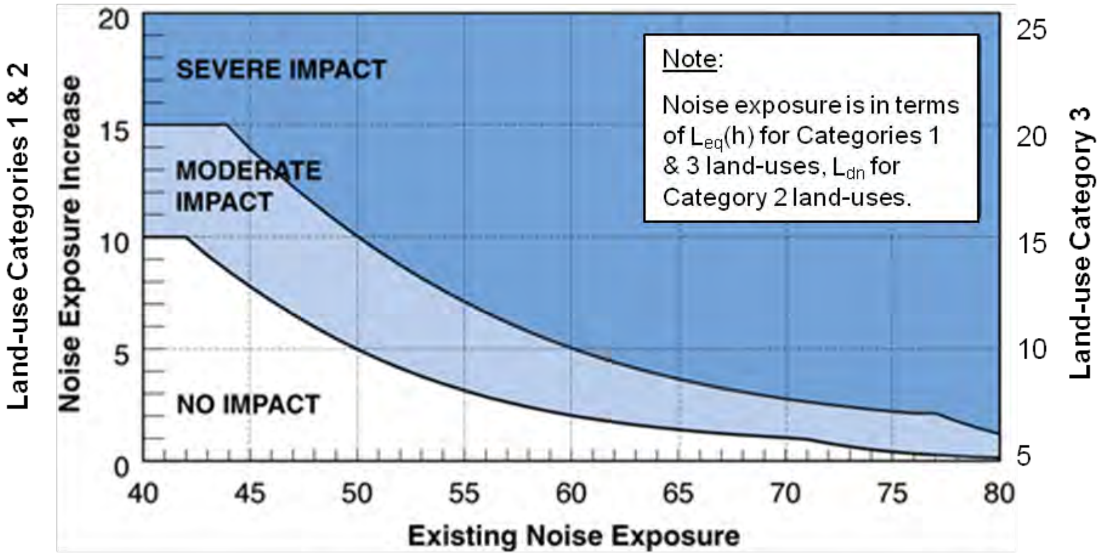
FTA noise criteria are delineated into two categories: moderate and severe impact. The moderate impact threshold defines areas where the change in noise is noticeable but may not be sufficient to cause a strong, adverse community reaction. The severe impact threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. The level of impact at any specific site can be established by comparing the predicted future project noise level to the existing noise level.

Figure 3-40: FTA Increase in Cumulative Noise Levels Allowed by Criteria



Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

Figure 3-41: FTA Noise Impact Criteria for Transit Projects



Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

Table 3-20: FTA Land-Use Categories and Noise Metrics

Land-Use Category	Noise Metric[1]	Description
1	L_{eq}(h)	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks.
2	L_{dn}	Buildings used for sleeping such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance.
3	L_{eq}(h)	Institutional land uses with primarily daytime and evening uses including schools, libraries, churches, museums, cemeteries, historic sites, and parks, and certain recreational facilities used for study or meditation.

[1]Leq(h) = Average hourly equivalent noise level; Ldn = 24-hour day-night noise level.

Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

In most cases when a new transit source is proposed, the level of impact at any specific site can be established by comparing the predicted future project noise level at the site to the existing noise level at the site.

The average day-night noise level over a 24-hour period (or L_{dn}) was used to characterize noise exposure for residential areas (FTA Category 2). The L_{dn} descriptor describes a receiver's cumulative noise exposure from all events over a full 24 hours, with events between 10 pm and 7 am increased by 10 decibels to account for greater nighttime sensitivity to noise. For other noise-sensitive land uses, such as parks and schools (FTA Category 3), the average hourly equivalent noise level (or L_{eq}(h)) was used to represent the corridor's peak operating period.

3.10.2.4 Operational Vibration Criteria

FTA vibration criteria for evaluating ground-borne vibration impacts from train pass-bys at nearby sensitive receptors are shown in **Table 3-21**. These vibration criteria are related to ground-borne vibration levels that are expected to result in human annoyance, and are based on RMS velocity levels expressed in VdB referenced to one micro inch per second (ips). FTA's experience with community response to ground-borne vibration indicates that when there are only a few train events per day, it would take higher vibration levels to evoke the same community response that would be expected from more frequent events.

This experience is taken into account in the FTA criteria by distinguishing between projects with frequent, occasional, or infrequent events. The frequent events category is defined as more than 70 events per day, the occasional events category is defined as between 30 and 70 events per day, and the infrequent events category is defined as less than 30 events per day. To be conservative, the FTA frequent criteria were used to assess ground-borne vibration impacts in the study area.

Table 3-21: Ground-Borne RMS Vibration Impact Criteria for Annoyance during Operations and Construction

Receptor Land Use		RMS Vibration Levels (VdB)			Ground-borne Noise Levels (dBA)		
Category	Description	Frequent Events	Occasional Events	Infrequent Events	Frequent Events	Occasional Events	Infrequent Events
1	Buildings where low vibration is essential for interior operations	65	65	65	N/A	N/A	N/A
2	Residences and buildings where people normally sleep	72	75	80	35	38	43
3	Daytime institutional and office use	75	78	83	40	43	48
Specific Buildings	TV/Recording Studios/ Concert Halls	65	65	65	25	25	25
	Auditoriums	72	80	80	30	38	38
	Theaters	72	80	80	35	43	43

Source: Transit Noise and Vibration Impact Assessment, FTA, Washington, DC, May 2006

The vibration criteria levels shown in **Table 3-21** are defined in terms of human annoyance for different land use categories such as high sensitivity (Category 1), residential (Category 2), and institutional (Category 3). In general, the vibration threshold of human perceptibility is approximately 65 VdB.

3.10.3 EXISTING CONDITIONS

To determine the existing background noise levels at sensitive receptors near the proposed corridor, a noise-monitoring program was conducted at two representative locations shown in **Figure 3-42**. Noise levels were measured from April 9 to April 10, 2014 during various periods of the day in accordance with FTA guidelines to determine the average ambient conditions on a typical weekday.

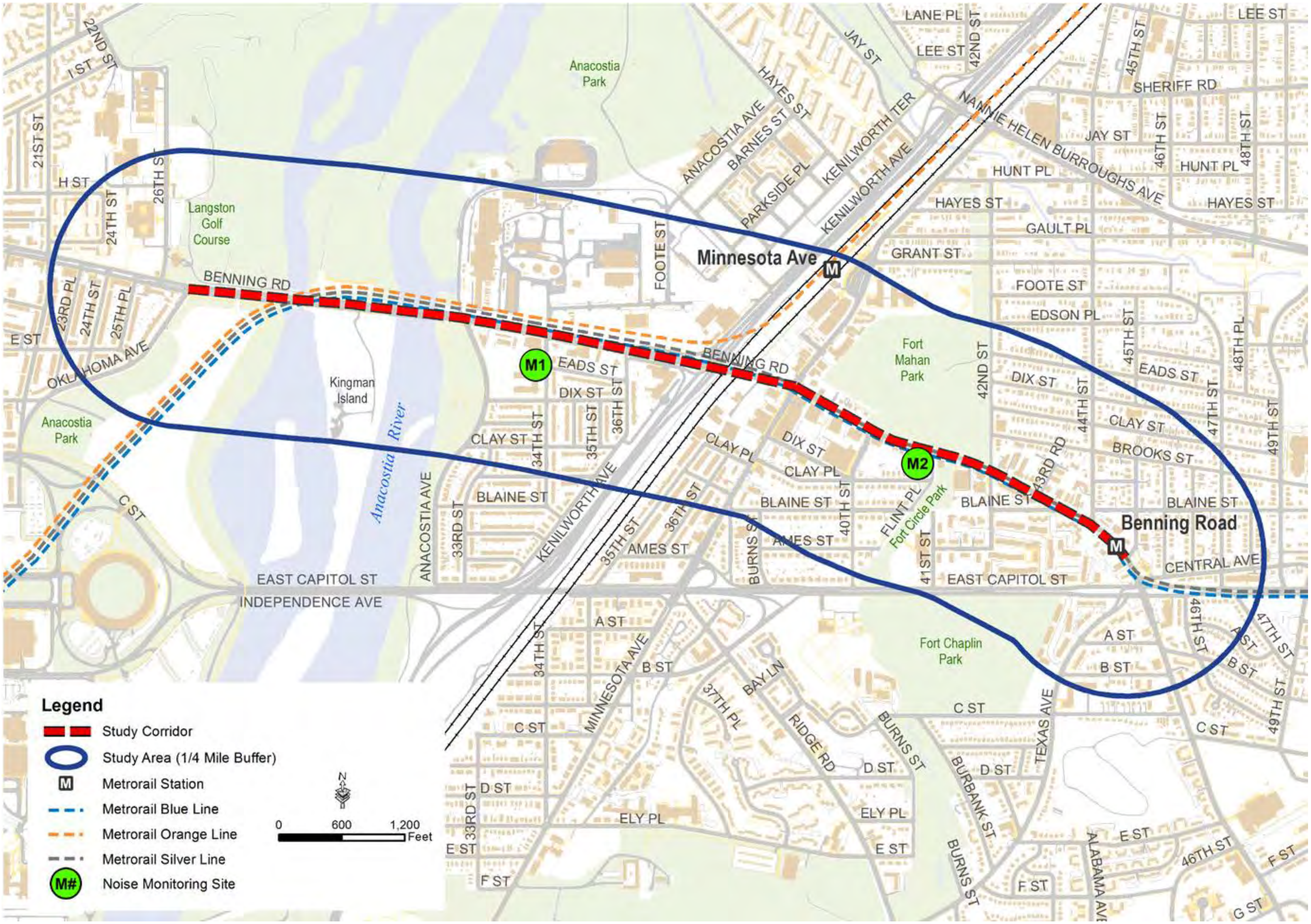
Day-night noise levels (or L_{dn}) residences range from 64-65 dBA at Site M1 along 34th Street (residences adjacent to the River Terrace Elementary School) and 65-73 dBA at Site M2 along Benning Road (residences opposite Fort Mahan). These noise levels are all representative of urban land uses, which includes traffic along Benning Road, Minnesota Avenue, DC-295 and the Metrorail Orange, Silver, and Blue Line train operations. **Table 3-22** summarizes existing noise levels.

Table 3-22: Baseline Noise Monitoring Results

Receptor	Description	FTA Land Use Category	24-Hour L_{dn}
M1	River Terrace Elementary School, 34th Street	3	64-65 dBA
M2	Residences, Benning Road at 41st Street opposite Fort Mahan Park	2	65-73 dBA

Source: Benning Road and Bridges Transportation Improvements EA Project Team, April 2014

Figure 3-42: Noise Monitoring Sites



Source: Benning Road and Bridges Transportation Improvements EA Project Team, April 2014

3.11 AIR QUALITY

3.11.1 INTRODUCTION

An air quality assessment was conducted to assess the existing conditions and potential for localized air quality impacts in the vicinity of congested intersections along the study corridor. The complete air quality analysis is provided in **Appendix K**.

The Clean Air Act (CAA), as amended, is the basis for most federal air pollution control programs. Under the CAA, EPA regulates air quality nationally. The EPA delegates authority to the District Department of the Environment (DDOE) for monitoring and enforcing air quality regulations in the District of Columbia. The Washington, DC-MD-VA Region State Implementation Plan (SIP), developed in accordance with the CAA, contains the major state-level requirements with respect to transportation in general. The MWCOG is responsible for preparing the SIP and submitting it to the EPA for approval.

Under the authority of the CAA, the EPA established a set of National Ambient Air Quality Standards (NAAQS) for various "criteria" air pollutants. **Table 3-23** lists the NAAQS for the seven criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter sized 10 micrometers or less (PM_{10}), particulate matter sized 2.5 micrometers or less ($PM_{2.5}$), and lead (Pb). Any project constructed in the District of Columbia has to achieve compliance with these standards.

Areas where ambient concentrations of a criteria pollutant are below the corresponding NAAQS are designated as being in "attainment". Areas where a criteria pollutant level exceeds the NAAQS are designated as being in "nonattainment." A maintenance area is one that has been re-designated from nonattainment status and has an approved maintenance plan under Section 175 of the CAA. Where insufficient data exist to determine an area's attainment status, the area is designated unclassifiable or in attainment. The project is located in the District of Columbia, which has been designated a nonattainment area for ozone and $PM_{2.5}$ and a maintenance area for CO. The District of Columbia is in attainment for all other criteria pollutants.

Table 3-23: National Ambient Air Quality Standards

Pollutant	Standard Type	Averaging Period	Standard Value[a]
Carbon Monoxide (CO)	Primary[b]	8-Hour average	9 ppm (10 mg/m^3)[c]
	Primary	1-Hour average	35 ppm (40 mg/m^3)
Nitrogen Dioxide (NO_2)	Primary and Secondary	Annual arithmetic mean	53 ppb [d]
	Primary	1-Hour average	100 ppb
Ozone (O_3)	Primary and Secondary	8-Hour average	0.075 ppm (155 µg/m^3) [e]
Sulfur Dioxide (SO_2)	Primary	Annual arithmetic mean	0.03 ppm (80 µg/m^3)
	Primary	24-Hour average	0.14 ppm (365 µg/m^3)
	Secondary	3-Hour average	0.5 ppm (1300 µg/m^3)
	Primary	1-Hour Average	75 ppb (0.075 ppm)
Particulate Matter (PM_{10})	Primary and Secondary	24-Hour average	150 µg/m^3 [f]
Particulate Matter ($PM_{2.5}$)	Primary and Secondary	Annual arithmetic mean	12 µg/m^3
		24-Hour average	35 µg/m^3
Lead (Pb)	Primary and Secondary	3-month rolling average	0.15 µg/m^3

NOTES:

a. Short-term standards (1 to 24 hours) are not to be exceeded more than once per calendar year.
b. Former national secondary standards for carbon monoxide have been repealed.
c. Concentrations are shown in parts per million (ppm), milligrams per cubic meter (mg/m^3) or micrograms per cubic meter (µg/m^3
d. The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
e. Maximum daily one-hour (eight-hour) average. The ozone standard is attained when the expected number of days with maximum hourly (eight-hourly) average concentrations above the value of the standard, averaged over a three year period, is less than or equal to one. The O3 criterion was updated by the EPA on May 27, 2008 from 0.08 to 0.075 ppm.
f. For each particle size, the annual PM standard is met when the three-year average of the annual mean concentration is less than or equal to the value of the standard. The 24-hour PM_{10} ($PM_{2.5}$) standard is met when the three-year average of the annual 99th (98th) percentile values of the daily average concentrations is less than or equal to the value of the standard.
g. National standards are block averages rather than moving averages.
h. Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

CO, NO_2, O_3, and PM are transportation related pollutants.

Source: 40 CFR 50, National Primary and Secondary Ambient Air Quality Standards

Under the CAA, federal agencies are responsible to ensure that a proposed project conforms to the SIP. The EPA also developed the CAA transportation conformity rule (40 CFR 51.390 and Part 93), applicable to transportation projects funded and approved by FHWA and/or FTA in nonattainment and maintenance areas for the transportation related criteria pollutants: O_3, $PM_{2.5}$, PM_{10}, NO_2 and CO. The transportation conformity rule requires the analysis of project-related air emissions to show the project would not cause or contribute to any new violations of NAAQS and would be in conformance of the corresponding SIPs and the established motor vehicles emissions budget (MVEB). The MWCOG is responsible for developing the SIP-conforming Transportation Improvement Program (TIP) to address mobile source emissions within the region. Transportation conformity requires two conformity determinations:

- Regional conformity: Applicable to metropolitan transportation plans and TIPs. For the metropolitan Washington region, the transportation plan is known as National Capital Region's Financially Constrained Long-Range Transportation Plan (CLRP) and the FY 2013-2018

Transportation Improvement Program is the current TIP. The regional conformity determination must show the total emissions from on-road travel on the region's transportation system are within the MVEB outlined in the SIP and are consistent with the goals for air quality found in the SIP. The regional emissions analysis must include all federally funded projects; non-federally funded projects considered regionally-significant projects; and non-federally funded and/or non-regionally significant projects that will affect vehicle travel in the area. Regional conformity determination is made by the National Capital Region Transportation Planning Board (TPB). Because the proposed project is listed in an approved CLRP (Project #1669) and TIP (Project #5754), the project has met the regional conformity determination.

- Project-level conformity: For specific transportation projects, the conformity determination must show the individual project is consistent with the regional conformity determination and that potential localized emissions impacts are addressed and are consistent with goals for air quality found in the SIP. The state or local transportation agency is responsible for the project-level conformity determination. The analysis described in this section is for meeting the project level conformity requirement through a hot spot analysis. In nonattainment and maintenance areas, project level conformity determination must be completed before the completion of the NEPA process.

3.11.2 METHODOLOGY

3.11.2.1 Data Collection

As part of the existing conditions assessment, ambient air quality conditions were established by reviewing data from existing air quality monitoring stations operated by the DDOE. The monitoring station closest to the project area is the River Terrace Site located at 34th and Dix Streets, NE. Input to the mobile source emission factor prediction model (e.g., MOVES) was requested as part of the data collection phase. This data established the background concentrations closest to the study area for input into the prediction modeling. See **Appendix K** for a more detailed methodology of the air quality modeling.

3.11.2.2 Regional Conformity

To demonstrate compliance with the federal transportation conformity rule, a regional conformity determination was required. The project is included in the MWCOG 2014 CLRP and the 2015-2020 TIP. TPB (the regional metropolitan planning organization) determined that the 2014 CLRP and the FY2015-2020 TIP conform to all requirements of the CAA Amendments of 1990 (*Air Quality Conformity Analysis*, October 2014). Therefore, no regional emissions analysis will be required for this project.

3.11.2.3 CO and $PM_{2.5}$ Hot Spot Analysis

Because O_3 is a regional pollutant that is formed in the presence of VOC and NOx, O_3 is evaluated indirectly through its precursors. However, because the CO standard would be exceeded first before either NO_2 or VOCs, only CO is typically evaluated at intersection hot spots. As a result, concentrations of O_3 are typically measured directly in the atmosphere rather than through modeling predictions.

In determining whether a hot spot analysis is required for the proposed project, the transportation conformity guidelines "for determining localized Carbon Monoxide (CO), Particulate Matter under 10 microns (PM_{10}), and Particulate Matter under 2.5 microns ($PM_{2.5}$) concentrations (hot-spot analysis)", were reviewed (as described in 40 CFR 93.123). According to these guidelines, the project would not exceed the relevant criterion in 40 CFR 93.123(b)(1)(iii). Specifically, the project would not create, "new bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location."

Based on Appendix A of EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* (March 2010), an example of a project that is not an air quality concern under 40 CFR 93.123(b)(1) would be a "new or expanded highway project that primarily services gasoline vehicle traffic (i.e., does not involve a significant number or increase in the number of diesel vehicles), including such projects involving congested intersections operating at level of service LOS D, E, or F."

Although feeder bus lines would serve the new streetcar system, these existing bus routes currently operate in the study area and would simply supplement the new streetcar service as part of their existing routes. Even if the future bus dwell times at the streetcar stops would be slightly longer than at a current bus stop, this slight increase would not result in a "significant number of diesel vehicles congregating at a single location" as defined by 40 CFR 93.123.

Similarly, although motor vehicle emissions at congested intersections are the predominant source of CO, the study area continues to be designated as in attainment for CO. Although CO is classified as a maintenance area due to violation almost 30 years ago, a CO hot spot analysis is also not required because the project is not expected to significantly degrade the level of service at nearby congested intersections. However, recent concentrations of CO monitored in the vicinity of the project by the DDOE are well below the NAAQS. The maximum 8-hour concentrations of 1.4 to 1.8 parts per million (ppm) monitored over the past three years are well below the applicable CO standard of 9 ppm.

Based on the insignificant level of traffic increase and bus service proposed as part of the project, neither a qualitative nor a quantitative $PM_{2.5}$ or CO hotspot analysis is required since this project is not of local air quality concern under 40 CFR 93.123(b)(1). The Clean Air Act Amendments and the transportation conformity requirements are met without a hotspot analysis since this project has been found not to be of air quality concern under 40CFR 93.123(b)(1). Therefore, the project meets statutory and regulatory transportation conformity requirements for $PM_{2.5}$ without a hot-spot analysis.

Nevertheless, a hot spot modeling assessment was conducted as a conservative approach at the following congested intersections to evaluate the potential for impact for CO:

- Benning Road and East Capitol Street
- Benning Road and Minnesota Avenue

3.11.3 EXISTING CONDITIONS

The DDOE develops and implements plans and programs to meet and maintain federal and DC air quality standards. The DDOE monitors air quality to ensure that the county meets and maintains national air quality health standards. The DDOE protects and manages the region's air resources in accordance with the District's Air Pollution Control Act of 1984 (effective March 15, 1985) and Amendments as described in Title 20 of the District of Columbia Municipal Regulations (DCMR).

Based on recent monitoring data, no exceedances of the NAAQS have been reported through 2012 (the last period for which a full year of data is available) except one ozone violation on August 21, 2012. This violation of the ozone NAAQS is currently being validated by the DDOE.

Recent monitored values of secondary particulate precursors, such as nitrogen dioxide (NO_2) and sulfur dioxide (SO_2), are decreasing. This downward trend in NO_2 and SO_2 may be due to the ultra-low sulfur diesel (ULSD) fuel that has been produced in the last few years and has been required of all manufacturers by December 1, 2010. The ULSD fuel has a sulfur content of only 15 ppm compared to the previous diesel fuel, which had a sulfur content of 500 ppm.

3.12 ENERGY USE AND CLIMATE CHANGE

3.12.1.1 Introduction

This section describes the baseline conditions to assess the risks to transportation systems and services from climate change.

3.12.1.2 Methodology

Existing conditions information is based on studies by EPA, U.S. DOT's Center for Climate Change and Environmental Forecasting, and the District of Columbia's Climate Action Plan, A Climate of Opportunity.

3.12.1.3 Existing Conditions

The transportation sector is the second-largest source of total greenhouse gases in the United States and the largest source of CO_2 emissions, the predominant greenhouse gas. In 2013, the transportation sector was responsible for 27 percent of all CO_2 emissions produced in the United States (EPA, 2013). Compared to other cities, the District's per capita emissions are relatively high at 18 percent. A leading trigger of these high emissions is the swelling of the District's daytime population by 400,000 workers every weekday, which is the largest percentage increase in daytime population of any large city in the nation (Sustainable DC, 2013).

Recognizing this concern, FTA and FHWA are working with other agencies through the U.S. DOT's Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases—particularly CO2 emissions—and to assess the risks to transportation systems and services from climate changes. In addition, in 2010 the District released their Climate Action Plan, A Climate of Opportunity. The Climate Action Plan indicates that the District is making good progress toward limiting transportation related emissions.

In 2010, 39 percent of residents commuted by mass transit and more than a third of households (37 percent), do not own cars. Car-sharing and fleetsharing by the District Government, and bike sharing are all expanding and would allow the District to be less reliant on fossil fuel and further decrease greenhouse gas emissions. The District Government is committed to reducing its greenhouse gas emissions by 20 percent (below 2006 levels) by 2012, 30 percent by 2020, and 80 percent by 2050 (Climate Action Plan 2010). The Sustainability DC Plan calls for a 50 percent reduction in overall energy use with a 50 percent increase in renewable energy use by 2032. A reduction in fossil fuel based energy is identified as an action to meet this goal.

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4 ENVIRONMENTAL CONSEQUENCES

This section includes a discussion of the potential impacts associated with the No Build Alternative and Build Alternatives 1 and 2 to each of the resources areas identified in **Chapter 3**, **Affected Environment**. Unless otherwise specified, a quarter-mile radius, the typical walking distance to high-quality, high-frequency transit, around the Benning Road corridor was determined to be the appropriate study area boundary for the Benning Road and Bridges Transportation Improvements Environmental Analysis (EA). Where noted, the "Benning Road and Bridges Transportation Improvements EA Project Team" as listed includes the technical team members also listed in **Chapter 6, List of Preparers**.

4.1 SOCIOECONOMIC RESOURCES

This section discusses socio-economic conditions in the project corridor and assesses the potential effects of the No Build Alternative and Build Alternatives 1 and 2. Resource areas evaluated include:

- Zoning and Land Use;
- Right of Way and Relocation Impacts;
- Neighborhoods and Community Resources;
- Environmental Justice; and
- Development and Joint Development.

4.1.1 ZONING AND LAND USE

4.1.1.1 Introduction

This section describes the effects of the alternatives described in **Chapter 2** on existing and future land use and zoning. For effects on land use and zoning, the analysis focuses on those areas in the study area where a new use is proposed.

4.1.1.2 Environmental Consequences

No Build Alternative

Existing land use along Benning Road includes a mix of residential, commercial, utilities, industrial, local public uses, and parks and open spaces. Future land use, reflected in the existing zoning, includes an increase in density and a mix of uses especially near the Benning Road and Minnesota Avenue Metrorail Stations as identified in the *District of Columbia Comprehensive Plan* (DC Office of Planning, 2006) and other neighborhood plans. The No Build Alternative would not result in any conversion of land use or rezoning.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way and would not result in any conversion of land use or rezoning.

Eight potential locations have been identified for locating underground traction power substation (TPSS) vaults along the Benning Road corridor. Up to two of these locations would be used in the future; however, all potential locations are shown in **Figure 4-1**. All proposed locations lie within DDOT right-of-way and allow the placement of public utilities on them. During future phases of project planning, the location and design of the vaults may be approved by the DDOT Director if the Director finds it is in the public interest to do so (DCMR 24-215.4).

Build Alternative 2 – Median Running

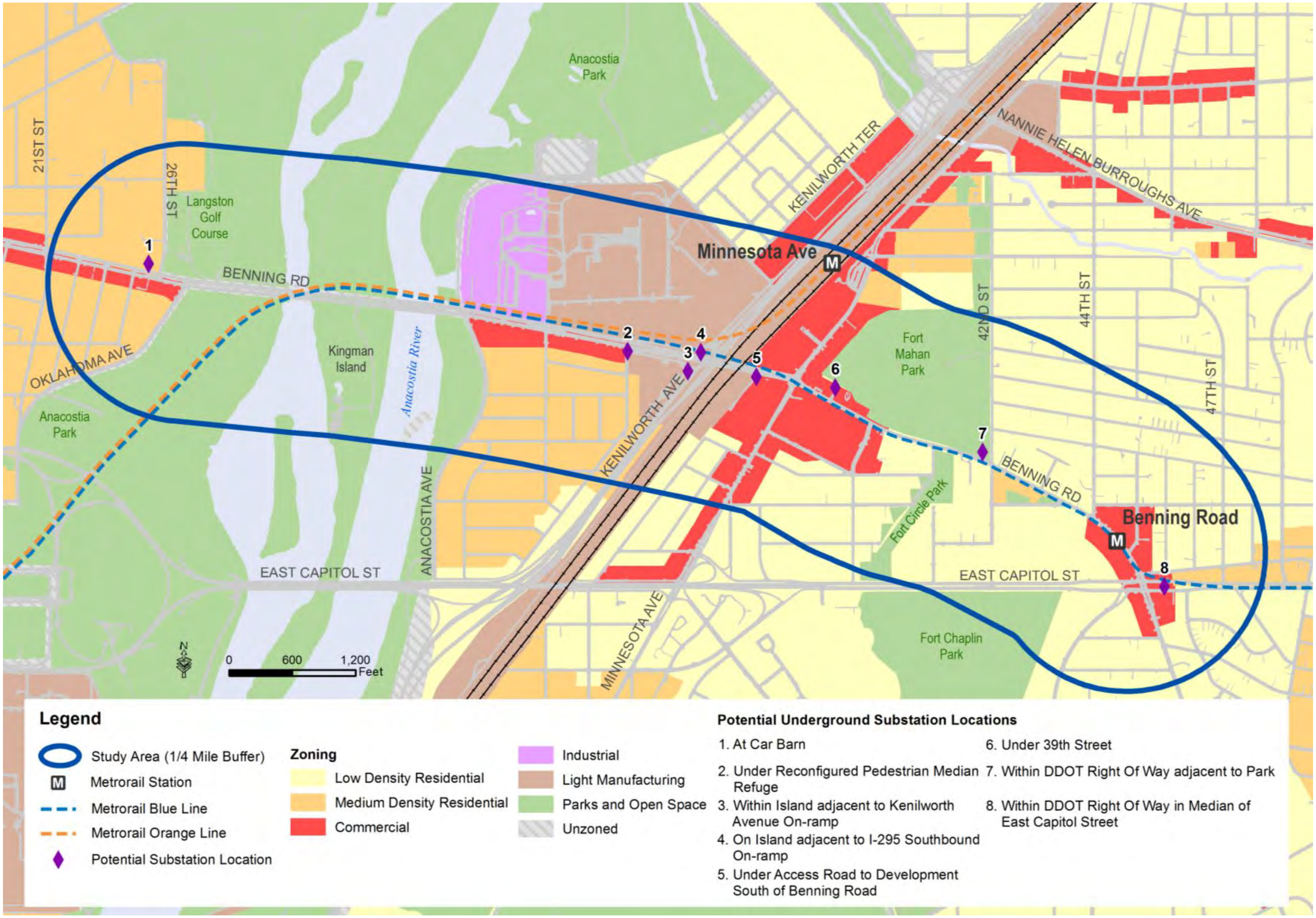
Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way and would not result in any conversion of land use or rezoning.

The eight locations identified in **Figure 4-1** for Build Alternative 1 are being considered for providing up to two underground TPSS vaults along Benning Road. No change to existing or proposed zoning or land use is anticipated.

4.1.1.3 Minimization and Mitigation Measures

No impacts on land use or zoning have been identified for any of the alternatives; therefore no minimization or mitigation measures are proposed.

Figure 4-1: Potential TPSS Locations



Source: Benning Road and Bridges Transportation Improvements EA Project Team

4.1.2 RIGHT-OF-WAY AND RELOCATION IMPACTS

4.1.2.1 Introduction

This section describes the effects of the alternatives described in **Chapter 2** on residential and business displacements.

4.1.2.2 Environmental Consequences

No Build Alternative

The No Build Alternative would not require right-of-way from any adjacent properties. Therefore, the No Build Alternative would not result in the displacement or relocation of any residence, business or community facility along the corridor.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way and would not result in the displacement or relocation of any residence, business or community facility along the corridor.

Eight potential locations have been identified for locating underground TPSS vaults along the Benning Road corridor. Up to two of the eight potential locations shown in **Figure 4-1** would be used in the future. All proposed locations lie within the DDOT right-of-way and allow the placement of public utilities on them. Installation of the TPSS vaults would also not result in any displacements or relocations to residences, businesses or community facilities along the corridor.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way and would not result in any displacement or relocation of any residence, business or community facility along the corridor.

Eight locations identified in **Figure 4-1** for Build Alternative 1 are being considered for providing up to two underground TPSS vaults along Benning Road for Build Alternative 2. The TPSS vaults would lie within the DDOT right-of-way and allow the placement of public utilities on them. Installation of the TPSS vaults would also not result in any displacements or relocations to residences, businesses or community facilities along the corridor.

4.1.2.3 Minimization and Mitigation Measures

No residential, business or community displacements or relocations have been identified with either Build Alternative 1 or Build Alternative 2, therefore no minimization or mitigation measures are proposed.

4.1.3 NEIGHBORHOODS AND COMMUNITY FACILITIES

4.1.3.1 Introduction

This section describes the adverse or beneficial effects of the proposed alternatives on neighborhoods and community facilities. An adverse effect on neighborhoods would result if an alternative resulted in a neighborhood being isolated through the creation of barriers that would dramatically change accessibility and typical travel patterns for that neighborhood. An adverse effect on a community facility would result from an alternative restricting access to a community facility or one that would result in a direct impact on that facility rendering it unusable.

4.1.3.2 Environmental Consequences

No Build Alternative

Under the No Build Alternative, existing conditions would remain unchanged. Therefore, no direct impacts to neighborhoods or community facilities would occur. However, residents, workers, and visitors would not benefit from an additional transit option that enhances connectivity between activity centers east and west of the Anacostia River, facilitates intermodal transfer opportunities, and relieves currently crowded Metrorail and Metrobus lines.

Build Alternative 1 – Curbside Running

Neighborhoods and community facilities would benefit from improved safety measures for all modes of travel and enhanced transportation services that would be provided by Build Alternative 1. Build Alternative 1 would (a) provide the benefit of an additional transit service, thereby increasing area residents' transit mobility options to include streetcar in addition to Metrobus and Metrorail; and (b) connect Ward 7 neighborhoods east of the Anacostia River with employment and activity centers located west of the river, improving an important transit corridor for District residents, workers and visitors. Build Alternative 1 would also provide intermodal connections to the regional Metrorail system as well as commuter rail and intercity rail at Union Station via the H/Benning Streetcar Line.

Build Alternative 1 would eliminate on-street parking in perpetuity along Benning Road. While on-street parking along Benning Road is currently limited to off-peak hours and the majority of businesses and community facilities provide off-street parking, the elimination of on-street parking between 42nd Street and 44th Street could impact some of the residences and places of worship located in this area; however, this impact can be minimized through design options.

Build Alternative 1 would also require traction power that would be provided by a TPSS facility located along the corridor. Eight potential vault locations (see **Figure 4-1**), that would have the least potential impact on the surrounding community, have been identified based on the need for spacing approximately every half to 2.5 miles. All potential TPSS locations are within DDOT right-of-way. No impacts on neighborhoods or community facilities would occur as a result of the TPSS facility.

Build Alternative 1 would not result in the isolation or the creation of barriers in neighborhoods within the study area, or change travel patterns and accessibility to those neighborhoods. Build Alternative 1 would not restrict access to any community facilities along the corridor. As mentioned in **Section 4.1.2**, improvements would not extend outside the DDOT right-of-way and would not result in displacement or relocation of any residences, businesses or community facilities along the corridor.

With Build Alternative 1, exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are also predicted at nine other residences (four at the Car Barn track switches and five near the 42nd Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower travel speeds. FTA frequent vibration impact criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 1 alignment; however track ballast mats would be used to decouple the vibration from streetcar passbys. These impacts will be mitigated as discussed in **Section 4.10**.

Build Alternative 2 – Median Running

Neighborhoods and community facilities would benefit from improved safety measures for all modes of travel and enhanced transportation services that would be provided by Build Alternative 2. Build Alternative 2 would (a) provide the benefit of an additional transit service, thereby increasing area residents' transit mobility options to include streetcar in addition to Metrobus and Metrorail; and (b) connect Ward 7 neighborhoods east of the Anacostia River with employment and activity centers located west of the river, improving an important transit corridor for District residents, workers and visitors. Build Alternative 2 would also provide intermodal connections to the regional Metrorail system as well as commuter rail and intercity rail at Union Station via the H/Benning Streetcar Line.

To accommodate a median platform at 42nd Street, Build Alternative 2 would require the eastbound and westbound lanes of Benning Road to be shifted to the north and south sides, respectively. The existing distance from the residences and businesses to the curb in this area is approximately 32 feet as shown in **Figure 4-2**. Although the lane shift would occur within DDOT right-of-way, this would place the roadway and sidewalks approximately 8 feet closer to the residences and businesses on the north and south side of the 42nd Street platform location as shown in **Figure 4-3**. Despite the lanes shifting approximately 8 feet closer, the lane shift would not move the noise source closer than one half the distance to the receptor; this allows the project to remain a Type III project for FHWA noise considerations (not requiring a noise analysis for the roadway improvements). The results of the noise and vibration analysis conducted for this study indicate that several exceedances of FTA vibration impact criterion are predicted in the vicinity of Benning Road and 42nd Street under Build Alternative 2 (see **Section 4.10** for more details).

Build Alternative 2 would also require traction power that would be provided by a TPSS facility located along the corridor. Eight potential vault locations (see **Figure 4-1**), that would have the least potential impact on the surrounding community, have been identified based on the need for spacing approximately every half to 2.5 miles. All potential TPSS locations are within DDOT right-of-way. No impact on neighborhoods or community facilities would occur as a result of the TPSS facility.

Build Alternative 2 would not result in the isolation or the creation of barriers in neighborhoods within the study area, or change travel patterns and accessibility to those neighborhoods. Build Alternative 2 would not restrict access to any community facilities along the corridor. As mentioned in **Section 4.1.2**, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way and would not result in displacement or relocation of any residences, businesses or community facilities along the corridor.

With Build Alternative 2, exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26^{th} Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are predicted at five other residences (four at the Car Barn track switches and one near the 42^{nd} Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower travel speeds. FTA frequent vibration impact criteria are predicted at 20 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 2 alignment; however, this would be less than the impacts experienced due to Build Alternative 1 and track ballast mats would be used to minimize the vibration from streetcar passbys. These impacts will be mitigated as discussed in **Section 4.10**.

Figure 4-2: Looking East on Benning Road at 42nd Street - Existing

Source: Google Maps, August 2014

Figure 4-3: Looking East on Benning Road at 42nd Street – Proposed Build Alternative 2

Note: This is an artistic rendering concept. Specific details would be determined during final design.
Source: Artistic rendering based on imagery from Google Maps dated August 2014, retrieved June 16, 2015.

4.1.3.3 Minimization and Mitigation Measures

Adverse noise and vibration impacts and associated mitigation are discussed in **Section 4.10**. Under Build Alternative 1, the impact of the loss of on-street parking to some residences and places of worship between 42nd Street and 44th Street can be minimized through a design option such as bump out parking. This parking option can be constructed within existing DDOT right-of-way and would enhance the existing condition by providing parking at all times, whereas currently on-street parking is limited to off-peak hours only. No other impacts on neighborhoods or community facilities were identified for the No Build Alternative or Build Alternative 2; therefore, no additional minimization or mitigation measures would be required.

4.1.4 ENVIRONMENTAL JUSTICE

4.1.4.1 Introduction

This section assesses the potential effects of the proposed alternatives on environmental justice (EJ) populations, which include the minority and/or low-income populations identified in **Section 3.1.3.**

USDOT Order 5610.2(a) defines a disproportionately high and adverse effect on minority and low-income populations as an impact that "(1) is predominately borne by a minority and/or low-income population, or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or low-income population."

Neither Build Alternative 1 nor Build Alternative 2 would result in any displacements or relocations to residences, businesses or community facilities. Potential effects to minority and low-income populations, such as traffic, noise and vibration, and air quality, were assessed using the findings of the specific analyses conducted separately for those environmental resources as part of this EA. The methodologies used in those resource analyses and their complete findings are reported in the individual technical memoranda found in the appendices of this EA.

4.1.4.2 Environmental Consequences

No Build Alternative

No disproportionately high or adverse effects on minority and/or low-income populations were identified under the No Build Alternative.

Build Alternative 1 – Curbside Running

With Build Alternative 1, exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are also predicted at nine other residences (four at the Car Barn track switches and five near the 42nd Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower travel speeds. FTA frequent vibration impact criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 1 alignment; however track ballast mats would be used to decouple the vibration from streetcar passbys. These impacts will be mitigated as discussed in **Section 4.10** and will therefore not be disproportionately high or adverse to the EJ populations in the study area.

Although the loss of on-street parking between 42nd and 44th Street may have an impact to the residences and places of worship located in this identified EJ community, the impact can be minimized through design options such as bump out parking. This parking option can be constructed within existing DDOT right-of-way and would enhance the existing condition by providing parking at all times, whereas currently on-street parking is limited to off-peak hours only.

Most effects of the project would occur during the construction phase (described in **Section 4.13 Construction Impacts**) and would be temporary. Where impacts could occur, DDOT has committed to apply Best Management Practices (BMP) and mitigation measures equally throughout the project. Taking these factors into account, Build Alternative 1 would not have disproportionately high and adverse effects on minority and low-income populations.

Under Alternative 1, there would be many long-term improvements to the study area that would benefit the community, including minority and low-income populations. These benefits include improved safety measures for all modes of travel, enhanced transportation services, and an additional transit option that would increase area residents' transit mobility options to include streetcar, Metrobus, and Metrorail service.

Build Alternative 2 – Median Running

With Build Alternative 2, exceedances of the FTA severe noise criteria are predicted at four residences due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA moderate impact criteria are predicted at five other residences (four at the Car Barn track switches and one near the 42nd Street station due to rail transit idling). In most cases, project noise levels from streetcar operations are predicted to be well below the existing ambient noise levels due to the slower travel speeds. FTA frequent vibration impact criteria are predicted at 20 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) within 50 feet of the proposed Build Alternative 2 alignment; however, this would be less than the impacts experienced due to Build Alternative 1 and track ballast mats would be used to minimize the vibration from streetcar passbys. These effects will be mitigated as discussed in **Section 4.10** and will therefore not be disproportionately high or adverse to the EJ populations in the study area.

Most effects of the project would occur during the construction phase, (described in **Section 4.13 Construction Impacts**). Where impacts could occur, DDOT has committed to apply BMP and mitigation measures equally throughout the project. Taking these factors into account, Build Alternative 2 would not have disproportionately high and adverse effects on minority and low-income populations.

Under Build Alternative 2, there would be many long-term improvements to the study area that would benefit the community, including minority and low-income populations. These benefits include: improved safety measures for all modes of travel, enhanced transportation services, and an additional transit option that increases area residents' transit mobility options that would now include streetcar, Metrobus, and Metrorail service.

4.1.4.3 Public Involvement

Full and fair access to meaningful involvement by minority and low-income populations in project planning and development is an important aspect of EJ. Ensuring full and fair access means actively seeking the input and participation from groups typically underrepresented throughout all project stages. Residents provide important feedback on community issues and concerns which can be used in the design and evaluation of the project, to avoid negative impacts to neighborhood resources, and support the development of transportation options that are responsive to the concerns of EJ communities and the community-at-large.

DDOT actively solicited public participation as part of the planning process and gave equal consideration to input from persons regardless of age, race, income status, or other socioeconomic factors. The engagement of local residents, business owners, and other stakeholders began during Spring 2014 and continued through the EA review process. The public involvement included activities to encourage productive and meaningful dialogue with the community that would be served by the project.

Because the project is located entirely within a geographic area identified as an EJ community, public involvement activities provided opportunities for the community to comment on the project as it developed, and facilitated awareness and understanding of the project by residents, businesses, local officials, community-based organizations, and other stakeholders in the project area. A variety of communication methods were used to reach as much of the community as possible. See **Chapter 5** for a more detailed discussion of public involvement activities.

4.1.4.4 Minimization and Mitigation Measures

Mitigation of adverse impacts from noise and vibration are discussed in **Section 4.10**. No other disproportionate or adverse impacts to identified minority and/or low-income communities are anticipated for any of the proposed alternatives; therefore no other minimization or mitigation measures would be required.

4.1.5 DEVELOPMENT AND JOINT DEVELOPMENT

4.1.5.1 Introduction

This section identifies and assesses the potential effects on recent development and proposed sites for redevelopment or joint development near the project alternatives.

4.1.5.2 Environmental Consequences

No Build Alternative

The Benning Road corridor serves an area that the District has targeted for commercial and residential redevelopment. Benning Road is a designated Great Street by the District government allowing existing small businesses and new businesses to apply for up to $85,000 in reimbursable grants for capital expenditures. Redevelopment is already occurring along the corridor and will likely continue as a result of its proximity to employment centers and the Metrorail system, as evidenced by the new Minnesota-Benning Government Center which houses 450 employees of the Department of Employment Services (DOES). In addition, a number of sites have been recently constructed, are currently under construction, or have proposals for redevelopment near the project alternative and are listed below:

- Spingarn Streetcar Facility at the intersection of 26th Street and Benning Road;
- Park 7 Project in the northwest quadrant at the intersection of Minnesota Avenue and Benning Road;
- East River Park Shopping Center in the southeast quadrant at the intersection of Minnesota Avenue and Benning Road; and
- Benning Road and East Capitol Gateway north of Benning Road between 44th Street and the Benning Road Metrorail Station.

The developments described above will continue as planned without the proposed action and no effects are anticipated due to the No Build Alternative. However, residents, workers, and visitors would not benefit from an additional transit option that would enhance connectivity and mobility to jobs and services within the District and to the regional transit network.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way and would not result in any changes to the current plans for development and joint development. Districtwide and neighborhood plans have identified the need for investment in higher-capacity, fixed-guideway transit along this corridor to support medium- to high-density mixed-use development within the core commercial areas. Introducing an additional transit option would accommodate the anticipated growth and support development projects that are currently under construction or have proposals for redevelopment by improving mobility and connectivity.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way and would not result in any changes to the current plans for development and joint development. Introducing an additional transit option would support the development projects that are currently under construction or have proposals for redevelopment by improving mobility and connectivity to accommodate the anticipated growth.

4.1.5.3 Minimization and Mitigation Measures

No impacts on development and joint development have been identified for any of the alternatives; therefore no minimization or mitigation measures are proposed.

4.2 TRANSPORTATION AND TRAFFIC OPERATIONS

This section discusses future transportation and traffic operation conditions in the project corridor and assesses the potential transportation effects of the No Build Alternative and Build Alternatives 1 and 2. Areas of transportation service and performance evaluated include:

- Roadway Network and Mass Transit;
- Parking and Access;
- Pedestrian and Bicycle Network; and
- Freight Rail Service.

4.2.1 ROADWAY NETWORK AND MASS TRANSIT

4.2.1.1 Introduction

Using the two major inputs of land use data (MWCOG Round 8.2 Cooperative Land Use Forecasts) and transportation networks identified in the regional Financially Constrained Long-Range Plan (CLRP), this section summarizes the overall environmental consequences of transit, and forecasts the travel demand and the potential effects of the No Build Alternative and Build Alternatives 1 and 2 on the surrounding roadway network. Opening Year (2018) and Design Year (2040) conditions were simulated for all the alternatives.

4.2.1.2 Summary of Environmental Consequences

Overall Transit

- No Build Alternative: No changes are proposed to existing Metrorail or Metrobus service and no impact is anticipated under the No Build Alternative.
- Build Alternative 1: No changes are proposed to existing Metrorail service or Metrobus routes and service in Build Alternative 1. However, two local Metrobus stops would need to be relocated to accommodate the streetcar platform at the Benning Road Metrorail Station.
- Build Alternative 2: No changes are proposed to existing Metrorail service or Metrobus routes and service in Build Alternative 2. However, one local Metrobus stop would need to be relocated to accommodate the streetcar platform at the Benning Road Metrorail Station.

Travel Demand in the Opening Year 2018

__No Build Alternative__

- Traffic Volumes: Except for East Capitol Street, VISSIM results indicated an annual growth of 0.75 percent along the corridor, which corresponds to a 3 percent increase in traffic volumes between the years of 2014 and 2018. Traffic volumes on East Capitol Street would remain the same or decrease as a result of the planned through-lane reduction.
- Intersection Conditions:
  - The Benning Road and East Capitol Street intersection would degrade to operate at an LOS F both in the morning and evening peak hour due to the removal of one through lane in each direction on East Capitol Street.
  - Benning Road and 44th Street, and Benning Road and 45th Street would operate with LOS F in the evening peak hour due to the queue spillback from the Benning-East Capitol intersection, reducing westbound Benning Road capacity at these intersections.

Build Alternatives

- Daily streetcar ridership would increase from 1,300 (H/Benning Streetcar Line) to 3,692 riders.
- Daily bus ridership in the study area would decrease by approximately 13 percent (about 1,500 riders) compared to the 2018 No Build scenario due the introduction of the streetcar service, which offers faster service and higher frequency during the off-peak periods.
- Intersection Conditions:
  - The operation of streetcar and transitions at most intersections would result in marginal increase in intersection delay.
  - The intersection of Benning Road and East Capitol Street would operate with LOS F in the morning peak and evening peak hour under both streetcar alignments.
  - Intersection LOS at Benning Road and 44th Street would improve from LOS F to LOS E in the evening peak hour with the curbside running alternative, and from LOS F to LOS D in the median running alternative. This improvement can be attributed to the signal timing modifications at the Benning Road and East Capitol Street intersection.
  - Signal timing modifications at the Benning Road and East Capitol Street intersection would cause higher delays for vehicular traffic.
  - During the evening peak hour, the Benning Road and 44th Street intersection would operate with LOS D in the median running alternative and LOS E in the curbside running alternative.

Travel Demand in the Design Year 2040

No Build Alternative

- Traffic Volumes:
  - At the intersection of Benning Road and East Capitol Street, the analysis assumed that volumes on Benning Road would increase by 0.55 percent annually.
  - East Capitol Street traffic volumes were kept constant in the morning peak and decreased by 0.2 percent annually in the evening peak to factor in changes indicated in the CLRP.
  - In the rest of the corridor, traffic volumes were increased by 0.55 percent annually, which corresponds to an increase of approximately 15 percent between 2014 and 2040.
- Intersection Conditions:
  - The intersections of Benning Road and Minnesota Avenue, Benning Road and 45th Street, and Benning Road and East Capitol Street would operate at LOS F in the morning peak hour.
  - Benning Road and 45th Street, and Benning Road and East Capitol Street would operate at LOS F in the evening peak hour also.
  - Benning Road and Minnesota Avenue in the morning peak hour, and Benning Road and East Capitol Street in the morning and evening peak hour, would operate with LOS F due to heavy traffic volumes and inadequate capacity.
  - LOS F at the Benning Road and 45th Street intersection may be explained by the long queues at the downstream link and queue spillback from the Benning Road and East Capitol Street intersection, resulting in significant reduction in intersection capacity.

Build Alternatives

- Daily streetcar ridership would increase from 4,125 (H/Benning Streetcar Line) to 9,719 riders.
- Daily bus ridership in the study area would decrease by approximately 11 percent (about 1,850 riders) compared to the 2040 No Build scenario due the introduction of the streetcar service, which offers faster service and higher frequency in particular during the off-peak periods.
- Intersection Conditions:

- The operation of streetcar and transitions at most intersections would result in very little impact on vehicular delay.
- Benning Road and East Capitol Street intersection would operate with LOS F in the morning and evening peak hour under both streetcar alignments.
- Compared to the 2040 No Build scenario, intersection LOS at Benning Road at 44th Street would improve from LOS E to LOS D in the evening peak hour under both the curbside running and median running alternatives. This improvement is explained by the signal timing changes at the Benning Road and East Capitol Street intersection to favor the operation of the southbound approach of the streetcar which limits the congestion on Benning Road.
- Signal timing modifications at Benning Road and East Capitol Street intersection to improve streetcar operation, in particular in the evening peak, would cause higher vehicular delays.
- The LOS improvement at the Benning Road and 45th Street intersection from LOS F to LOS D in the evening peak can be attributed to the change in intersection control type from unsignalized to signalized, and signal timing changes at the Benning Road and East Capitol Street intersection, which limit the extent of queue spillback to upstream intersections.

4.2.1.3 Overall Environmental Consequences to Transit

No Build Alternative

The study area is currently served by the Orange, Blue, and Silver Metrorail lines at Minnesota Avenue and Benning Road Metrorail Stations respectively. Metrobus service has 17 routes, including 15 routes with direct connections to local Metrorail stations. H Street/Benning Road between Minnesota Avenue Metrorail Station and west through downtown is also a priority corridor identified by WMATA in their *Priority Corridor Network Plan*. No changes are proposed to existing Metrorail or Metrobus service and no impact is anticipated under the No Build Alternative.

Build Alternative 1 – Curbside Running

Build Alternative 1 would provide a 12-foot, curbside running shared streetcar lane for the length of the Benning Road corridor. Streetcar tracks would be constructed in the lane adjacent to the outside curb and pedestrian facilities. Build Alternative 1 would include all facilities and structures needed for the streetcar operations including TPSS, wired propulsion system poles, and streetcar stops. Build Alternative 1 would place stop platforms at the following six locations about a quarter-mile apart along the eastbound and westbound directions of Benning Road.

- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metrorail Station (eastern terminus).

No changes are proposed to existing Metrorail service or Metrobus routes and service in Build Alternative 1. However, the following local Metrobus stops would need to be relocated:

- The northbound U8 Metrobus stop at Benning Road and 45th Street would be relocated from near side to far side of the intersection to accommodate the streetcar platform at the Benning Road Metrorail Station.
- The westbound Metrobus stop at Benning Road and Minnesota Avenue would be relocated, but would remain on the same side of the intersection to accommodate the streetcar platform at the Benning Road Metrorail Station.

Build Alternative 2 – Median Running

Build Alternative 2 would provide a 12-foot, median running shared streetcar lane for the length of the Benning Road corridor. Streetcar tracks would be constructed in the inside lane adjacent to the median. It would include all facilities and structures needed for the streetcar operations including TPSS, catenary poles, and streetcar stops. Streetcar stops would not be shared with local bus service, which would continue to board and alight at the curbside stops along the corridor. Build Alternative 2 would place platforms at the following six locations, similar to Build Alternative 1, about a quarter-mile apart and constructed within the median to serve both eastbound and westbound directions of Benning Road.

- Oklahoma Avenue (western terminus);
- Kingman Island;
- 34th Street;
- 39th Street;
- 42nd Street; and
- Benning Road Metro Station (eastern terminus).

Unlike Build Alternative 1, the proposed median platform at 34th Street proposed with Build Alternative 2 would eliminate the existing left turn lane into the Pepco facility. No changes are proposed to existing Metrorail service or Metrobus routes and service in Build Alternative 2. The northbound U8 Metrobus stop at Benning Road and 45th Street would be relocated from the near side to the far side of the intersection to accommodate the streetcar platform at the Benning Road Metrorail Station.

Travel Demand for both Build Alternative 1 and Alternative 2

MWCOG Version 2.3 regional travel demand model and Round 8.2 Cooperative Land Use Forecasts were used for the opening year 2018 and for design year 2040 for forecasting traffic conditions and to generate streetcar and transit ridership. The streetcar ridership for both Build Alternative 1 and Build Alternative 2 would be the same since both alternatives run on the same route and serve the same station locations with very similar travel times. The details of the analysis and forecast are provided in the following sections.

4.2.1.4 Environmental Consequences - Travel Demand in the Opening Year 2018

A No Build scenario was analyzed for the year 2018 to serve as a baseline comparison for the Build Alternatives. No Build refers to planned and/or programmed highway, transit, High-Occupancy Vehicle (HOV), and bicycle and pedestrian projects defined in the CLRP. For the 2018 Opening Year analysis under the Build Alternatives, it was assumed that the extension of streetcar service from Benning Road and Oklahoma Avenue to the Benning Road Metrorail Station would be fully operational. Traffic and transit operations during the morning and evening peak hours were evaluated for 2018.

2018 No Build Alternative

Land Use

For the opening year 2018 No Build scenario, the regional land use was determined based on the MWCOG Round 8.2 Cooperative Land Use Forecasts for 2010 and 2020, using linear interpolation to derive growth rates and estimate the data for 2018. Regionally, the model shows a growth of 3.4 percent in number of households, 2.9 percent in population, and 11 percent in employment over the 2010 baseline conditions.

Transportation Network

The transportation network for the 2018 No Build scenario includes the changes proposed in the 2020 CLRP. Within the study area, the only change to the roadway network identified is the removal of one of the three lanes in each direction along East Capitol Street between 40th Street and Southern Avenue to improve pedestrian safety[1]. As a result, East Capitol Street would operate with two through lanes in both directions between 40th Street and Southern Avenue.

Metrorail

Regional Metrorail service improvements provide some changes to the services provided at the two stations within the study area. The Metrorail system in 2020 will provide headways of 6 minutes in the peak and 12 minutes in the off-peak period on the Orange and Silver Lines, and 7 and 12 minutes in the peak and off-peak periods on the Blue Line.

Local Bus

Local bus service in the study area is provided primarily by Metrobus. **Appendix E** summarizes the peak and off-peak headways for the local routes serving the study area.

VISSIM Simulation Modeling

The 2018 No Build future year intersection traffic volumes were developed using a growth rate obtained from MWCOG Version 2.3 regional travel demand model. Except for East Capitol Street, results indicated an annual growth of 0.75 percent along the corridor, which corresponds to a 3 percent increase in traffic volumes between the years of 2014 and 2018. Traffic volumes on East Capitol Street remained the same or decreased as a result of the through-lane reduction. **Figure 4-4** shows the projected peak hour traffic volumes for the opening year 2018.

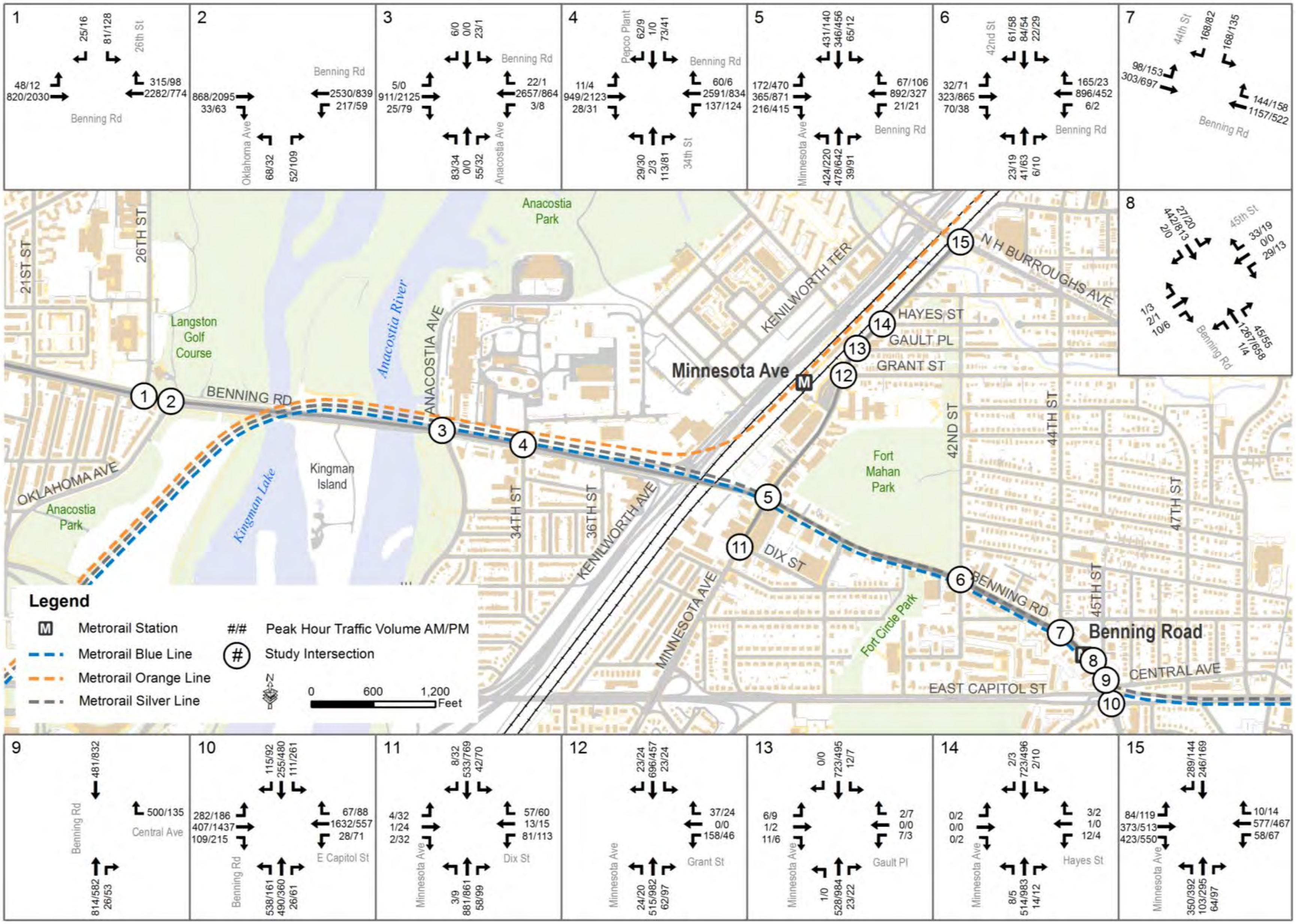
[1] *http://www.mwcog.org/clrp/projects/new/proposed_2013.asp*

Intersection Conditions

Figure 4-5 displays No Build intersection LOS at the study intersections during the morning and evening peak hours for the opening year 2018. The Benning Road and East Capitol Street intersection operates with LOS F both in the morning and evening peak hour. Degraded intersection LOS (LOS F) compared to the existing conditions (LOS E) can be attributed to the removal of one through lanes in each direction on East Capitol Street. Results also show that Benning Road and 44th Street and Benning Road and 45th Street intersections operate with LOS F in the evening peak hour due to the queue spillback from the Benning Road and East Capitol Street intersection, reducing westbound Benning Road capacity at these intersections.

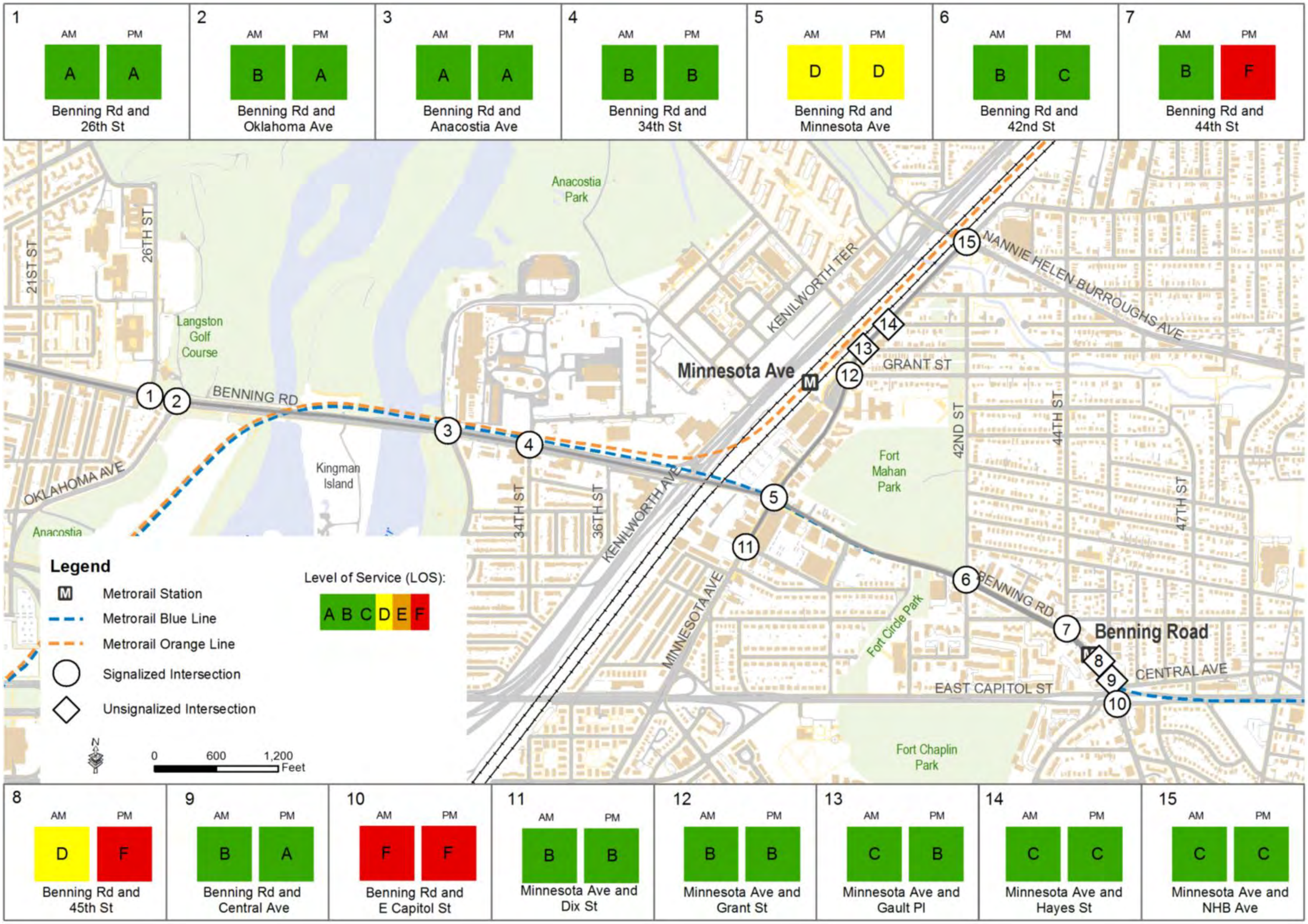
Delay and LOS by movement, and the associated maximum queue lengths, for all the intersections in the morning and evening peak hours for the 2018 No Build scenario are shown in **Appendix E**.

Figure 4-4: 2018 No Build Morning and Evening Peak Hour Intersection Traffic Volumes



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-5: 2018 No Build Morning and Evening Peak Hour Intersection LOS



Source: Benning Road and Bridges Transportation Improvements EA Project Team

2018 Build Alternative

The 2018 Build Alternative, which included streetcar operations on Benning Road, combined regional baseline assumptions with a more fine-grained roadway system to predict travel patterns, transit usage and vehicular turning movements in the study area.

Land Use

The regional land use of the travel demand analysis area was the same as for the No Build scenario using the MWCOG Round 8.2 Cooperative Land Use Forecasts for 2020.

Transportation Network

The transportation network was based on the regional CLRP transportation network. This was the same as the No Build scenario, except the Benning Road Streetcar Extension extending the H/Benning Streetcar Line to the Benning Road Metrorail Station. The proposed frequency of service for the line is 10 minutes in both directions through the entire service day.

Ridership Forecasting

Table 4-1 summarizes the streetcar ridership under the No Build (terminating at Oklahoma Avenue) and the Build (includes extension to Benning Road Metrorail Station) scenarios. **Figure 4-6** compares the No Build and Build ridership by station in 2018. Note that the MWCOG regional model can only place transit stops at network nodes. Since the MWCOG model does not have a node on 5th Street, the streetcar stop at 5th Street and H Street was not modeled. However, the zone connectors providing access to the adjacent stations are adequate for transit access to all trips generated in the adjacent zones and it is unlikely this stop would have increased total streetcar ridership.

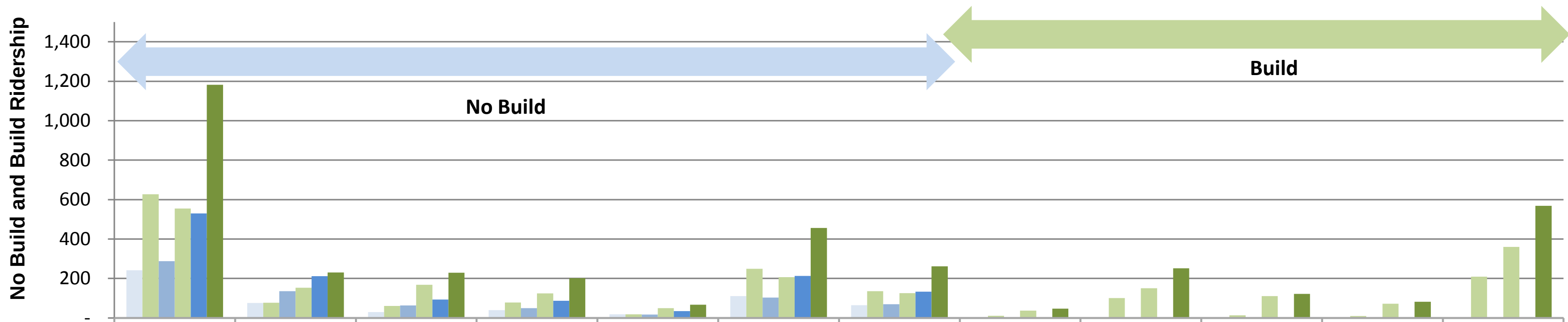
The extension of streetcar service along Benning Road is projected to carry approximately 2,400 daily riders in 2018. These values are in addition to the projected initial Oklahoma Avenue to Union Station H/Benning Streetcar segment daily ridership of 1,300.

Table 4-1: No Build and Build Streetcar Ridership in 2018

Stop	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
Union Station	242	627	288	555	530	1182
3rd Street and H Street, NE	76	77	136	153	212	230
8th Street and H Street, NE	30	61	63	168	93	229
13th Street and H Street, NE	39	78	49	124	87	202
15th Street and Benning Road, NE	18	18	17	49	35	67
19th Street and Benning Road, NE	111	249	103	207	213	456
Oklahoma Avenue and Benning Road, NE	64	136	69	126	133	261
Kingman Island and Benning Road, NE	-	11	-	37	-	47
34th Street and Benning Road, NE	-	101	-	150	-	251
Minnesota Avenue and Benning Road, NE	-	13	-	110	-	122
42nd Street and Benning Road, NE	-	10	-	72	-	82
Benning Road Metrorail Station	-	209	-	360	-	569
Total	**580**	**1,590**	**725**	**2,111**	**1,303**	**3,698**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-6: No Build and Build Street Ridership by Station in 2018



	Union Station	3rd Street and H Street, NE	8th Street and H Street, NE	13th Street and H Street, NE	15th Street and Benning Road, NE	19th Street and Benning Road, NE	Oklahoma Avenue and Benning Road, NE	Kingman Island and Benning Road, NE	34th Street and Benning Road, NE	Minnesota Avenue and Benning Road, NE	42nd Street and Benning Road, NE	Benning Road Metrorail Station
Peak No Build	242	76	30	39	18	111	64	-	-	-	-	-
Peak Build	627	77	61	78	18	249	136	11	101	13	10	209
Off-Peak No Build	288	136	63	49	17	103	69	-	-	-	-	-
Off-Peak Build	555	153	168	124	49	207	126	37	150	110	72	360
Daily No Build	530	212	93	87	35	213	133	-	-	-	-	-
Daily Build	1,182	230	229	202	67	456	261	47	251	122	82	569

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-2 provides the total daily bus ridership by bus route (for the entire route) serving the study area under the No Build and the Build scenarios. **Table 4-3** shows daily ridership by route within the study area.

Table 4-2: 2018 No Build and Build Route Level Daily Bus Ridership

Bus Route	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
X1,X3	1,792	1,769	0	0	1,792	1,769
X2	6,321	5,965	5,224	4,309	11,545	10,274
X9	1,931	1,869	1,160	1,081	3,091	2,950
U2	351	349	338	332	689	681
U4	24	24	4	4	28	28
U5,U6	498	497	819	778	1,317	1,275
U8	114	88	505	334	619	422
96,97	6,249	6,101	1,882	1,792	8,131	7,893
V7,V8,V9	2,368	2,362	1,603	1,605	3,971	3,967
W4	4,887	5,031	4,110	4,274	8,997	9,305
Total	24,535	24,055	15,645	14,509	40,180	38,564
Percent Change from No Build	**-**	**-2%**	**-**	**-7%**	**-**	**-4%**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

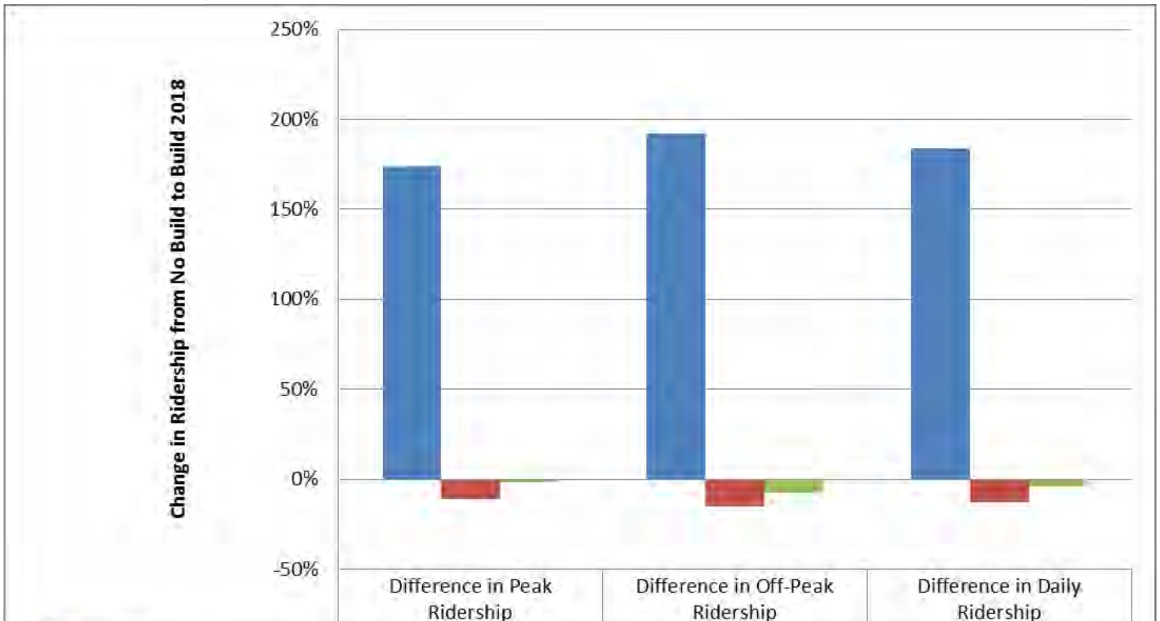
Table 4-3: 2018 No Build and Build Daily Bus Ridership that Occurs within the Study Area

Bus Route	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
X1,X3	826	805	0	0	826	805
X2	3,537	2,766	3,306	2,511	6,843	5,277
X9	286	254	255	220	541	474
U2	238	237	122	117	360	354
U4	6	6	2	2	8	8
U5,U6	337	334	372	338	709	672
U8	14	10	34	25	48	35
96,97	733	667	200	174	933	841
V7,V8,V9	528	525	266	265	794	790
W4	1020	1,106	606	718	1,626	1,824
Total	7,525	6,710	5,163	4,370	12,688	11,080
Percent Change from No Build	**-**	**-11%**	**-**	**-15%**	**-**	**-13%**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Compared to the 2018 No Build scenario, the total daily bus ridership in the study area would decrease by approximately 13 percent (about 1,500 riders) in the Build scenario (**Table 4-3**). This decrease may be explained by the introduction of the streetcar service, which offers faster service and higher frequency, in particular during the off-peak periods because the streetcar would operate with the same 10-minute headway both during the peak and off-peak, thereby reducing passenger waiting time between the Benning Road Metrorail Station and Union Station (see **Figure 4-7**).

Figure 4-7: Change in Streetcar and Bus Ridership from No Build to Build 2018



	Difference in Peak Ridership	Difference in Off-Peak Ridership	Difference in Daily Ridership
Streetcar	174%	192%	184%
Study Area Bus Ridership	-11%	-15%	-13%
Total Ridership on Bus Routes	-2%	-7%	-4%

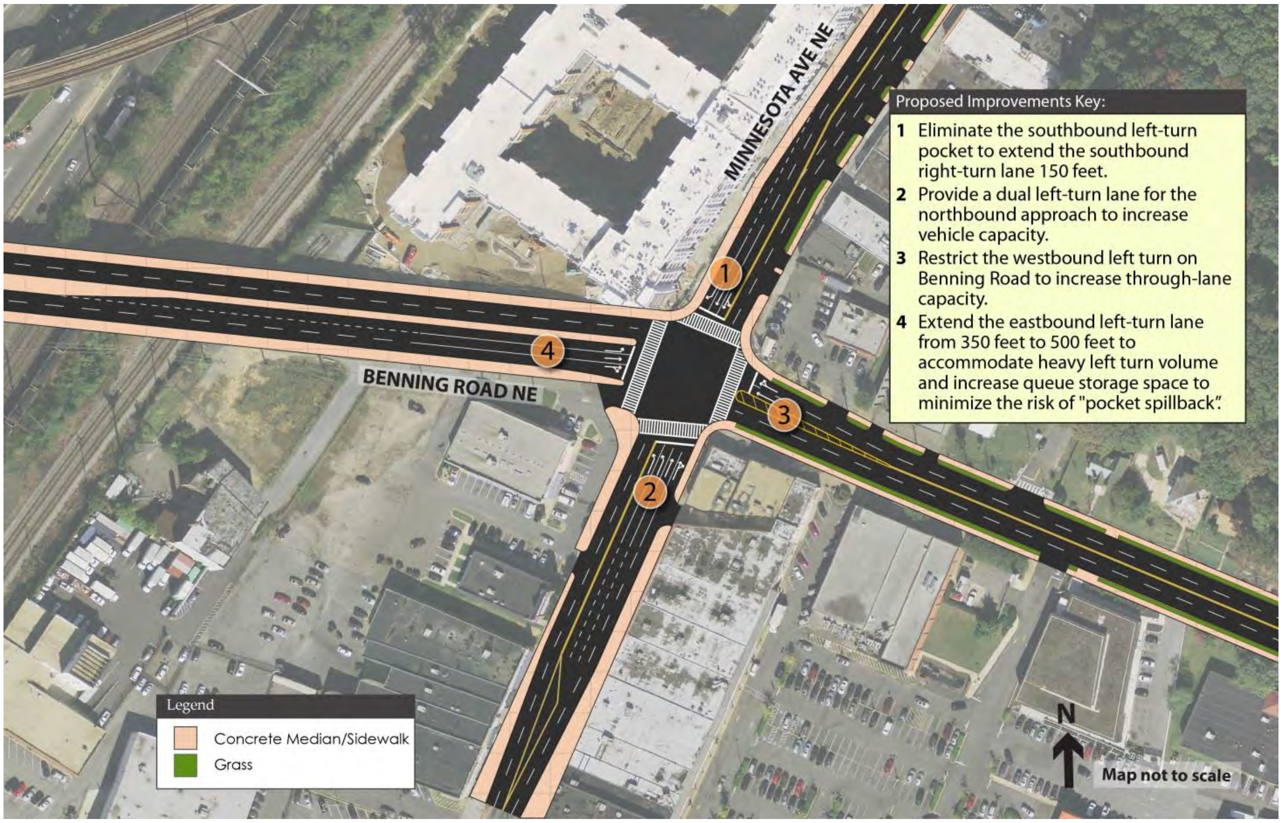
Source: Benning Road and Bridges Transportation Improvements EA Project Team

VISSIM Simulation Modeling

The Build scenario assumes the same transportation network as in the No Build with the exception of two changes associated with the proposed action: (1) the introduction of the streetcar from Oklahoma Avenue to Benning Road Metrorail Station; and (2) proposed lane changes at the intersection of Benning Road and Minnesota Avenue to improve traffic operations. Intersection improvements at Benning Road and East Capitol Street intersection to reduce vehicular delay are beyond the scope and therefore not considered in this study.

The proposed lane configuration at the Benning Road and Minnesota Avenue intersection is shown in **Figure 4-8**. Although the simulation results for the 2018 No Build scenario indicated LOS D (about 50 seconds intersection delay) at the Benning Road and Minnesota Avenue intersection, this is close to the LOS E threshold of 55 seconds. Further, visual observations and sensitivity tests showed potential capacity failure at this intersection, in particular for the southbound Minnesota Avenue intersection. Therefore, the proposed lane configuration changes are found to be more effective in 2040.

Figure 4-8: Proposed Lane Configuration at Benning Road and Minnesota Avenue, NE Intersection



Source: Benning Road and Bridges Transportation Improvements EA Project Team

The proposed improvements would include:

- Eliminating the southbound left turn pocket on Minnesota Avenue in order to provide a southbound right turn pocket lane (in 2018, the southbound Minnesota Avenue approach is projected to carry approximately 430 right turn vehicles versus 65 left turn vehicles in the morning peak hour);
- Providing a dual left turn lane for the northbound approach on Minnesota Avenue to increase vehicle capacity, in particular in the morning peak (approximately 425 vehicles are projected to make a left turn from Minnesota Avenue to westbound Benning Road);
- Restricting the westbound left turn on Benning Road to increase through-lane capacity; and
- Extending the eastbound left turn pocket lane on Benning Road from 350 feet to 500 feet to accommodate heavy left turn volume in the evening peak hour (approximately 470 vehicles are projected in 2018) and increasing queue storage space to minimize the risk of "pocket spillback" (i.e., left turn vehicles spilling from pocket lane onto the adjacent through lane).

The Build scenario also considered special transit-only signals at certain intersections to allow the streetcar transition. The intersections where transitions occur in streetcar alignments for Build Alternative 1 and 2 are described below:

Build Alternative 1 – Curbside Running (Eastbound Streetcar Alignment)

- Benning Road and Oklahoma Avenue intersection: Transition from the recently constructed median tracks onto curbside running alignment.
- Benning Road and 34th Street intersection: Transition from the curb lane onto the third lane through a special transit-only signal phase to continue in curb lane on the eastbound Viaduct Bridge.
- Benning Road and 45th Street intersection: Transition from the curb lane onto the Benning Road Metrorail Station terminus. This transition would require signalization of the intersection as it currently operates as an unsignalized intersection.

Build Alternative 1 – Curbside Running (Westbound Streetcar Alignment)

- Benning Road and 45th Street intersection: Transition from the Benning Road Metrorail Station terminus onto the curb track.
- Benning Road and 36th Street intersection: Transition from curb tracks to curb tracks. Only Kenilworth Avenue westbound on-ramp traffic would be stopped to allow the streetcar to make this transition.

Build Alternative 2 – Median Running (Eastbound Streetcar Alignment)

- Benning Road and 45th Street intersection: Transition from the median tracks onto the Benning Road Metrorail Station terminus.

Build Alternative 2 – Median Running (Westbound Streetcar Alignment)

- Benning Road and 45th Street intersection: Transition from the median tracks onto the Benning Road Metrorail Station terminus.
- Benning Road and Kingman Island intersection: Transition from the fourth lane onto the third lane to align the operation with the recently constructed median tracks at Benning Road and Oklahoma Avenue intersection. This would require a new signalized intersection at Kingman Island to stop westbound traffic and allow the transition.

Intersection Conditions

MWCOG model forecasts indicated that the reduction in automobile trips due to people switching from automobiles to transit with the introduction of streetcar is not substantial. To plan on the conservative side, the same traffic volume projections developed for the No Build model were used in the Build VISSIM model. **Figure 4-9** and **Figure 4-10** provide intersection LOS at the study intersections during the morning and evening peak hours with the curbside running and median running alignment, respectively. Note that the traffic control type at Benning Road and 45th Street intersection was changed from an unsignalized to signalized control to accommodate the transition of the streetcar at the Benning Road Metrorail Station.

The findings of the 2018 Build traffic analysis are summarized below:

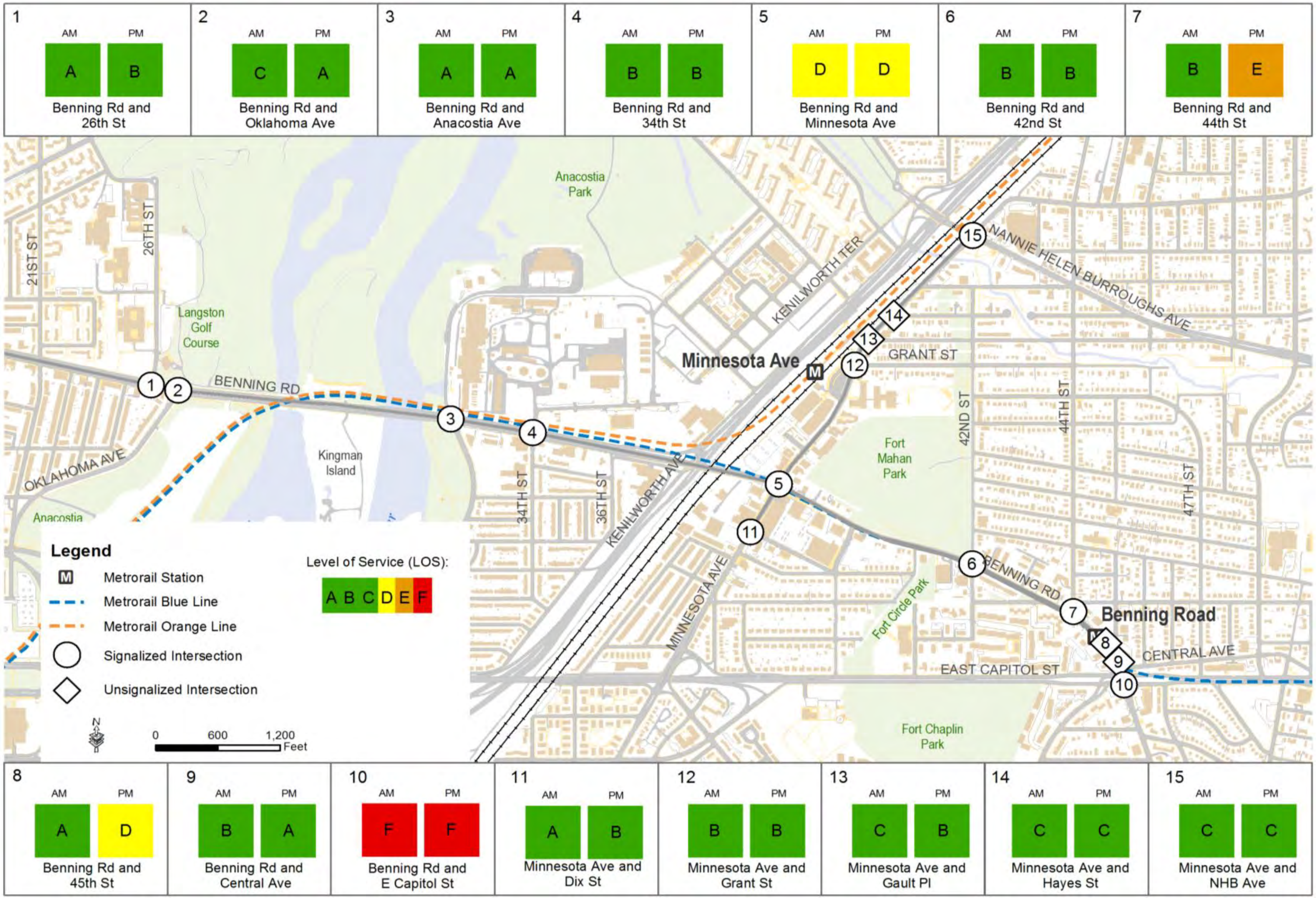
- Benning Road and East Capitol Street intersection would operate with LOS F in the morning peak and evening peak hour under both streetcar alignments.
- Intersection LOS at Benning Road and 44th Street would improve from LOS F to LOS E in the evening peak hour with the curbside running alternative and from LOS F to LOS D in the median running alternative. This improvement can be attributed to the signal timing modifications at the Benning Road and East Capitol Street intersection to favor the operation of the southbound

approach of the streetcar as a means of congestion protection for transit. Note that the change is more pronounced in the evening peak hour since the southbound approach is the critical approach during the evening peak.

- Signal timing modifications at the Benning Road and East Capitol Street intersection to improve streetcar operation, in particular in the evening peak, causes higher delay for vehicular traffic at this intersection (refer to **Appendix E**).
- During the evening peak hour, the Benning Road and 44th Street intersection operates with LOS D in the median running alternative and LOS E in the curbside running alternative. The improved LOS can be explained by the impact of streetcar transition at the Benning Road and 45th Street intersection. While the curbside running alternative requires transition from the inner lane, which stops southbound Benning Road, the median running alternative can run concurrently with the southbound general traffic because the transition is from the outside lane.
- The operational enhancements at the Benning Road and 45th Street intersection from LOS F to LOS E can be attributed to the change in intersection control type from unsignalized to signalized and signal timing modifications at the Benning Road and East Capitol Street intersection, which limit the extent of queue spillback to upstream intersections.
- The operation of streetcar and transitions at most intersections results in typically very marginal increase in intersection delay.

Appendix E provides delay and LOS, as well as the associated queue lengths, by movement for the study intersections for the 2018 Build Alternatives.

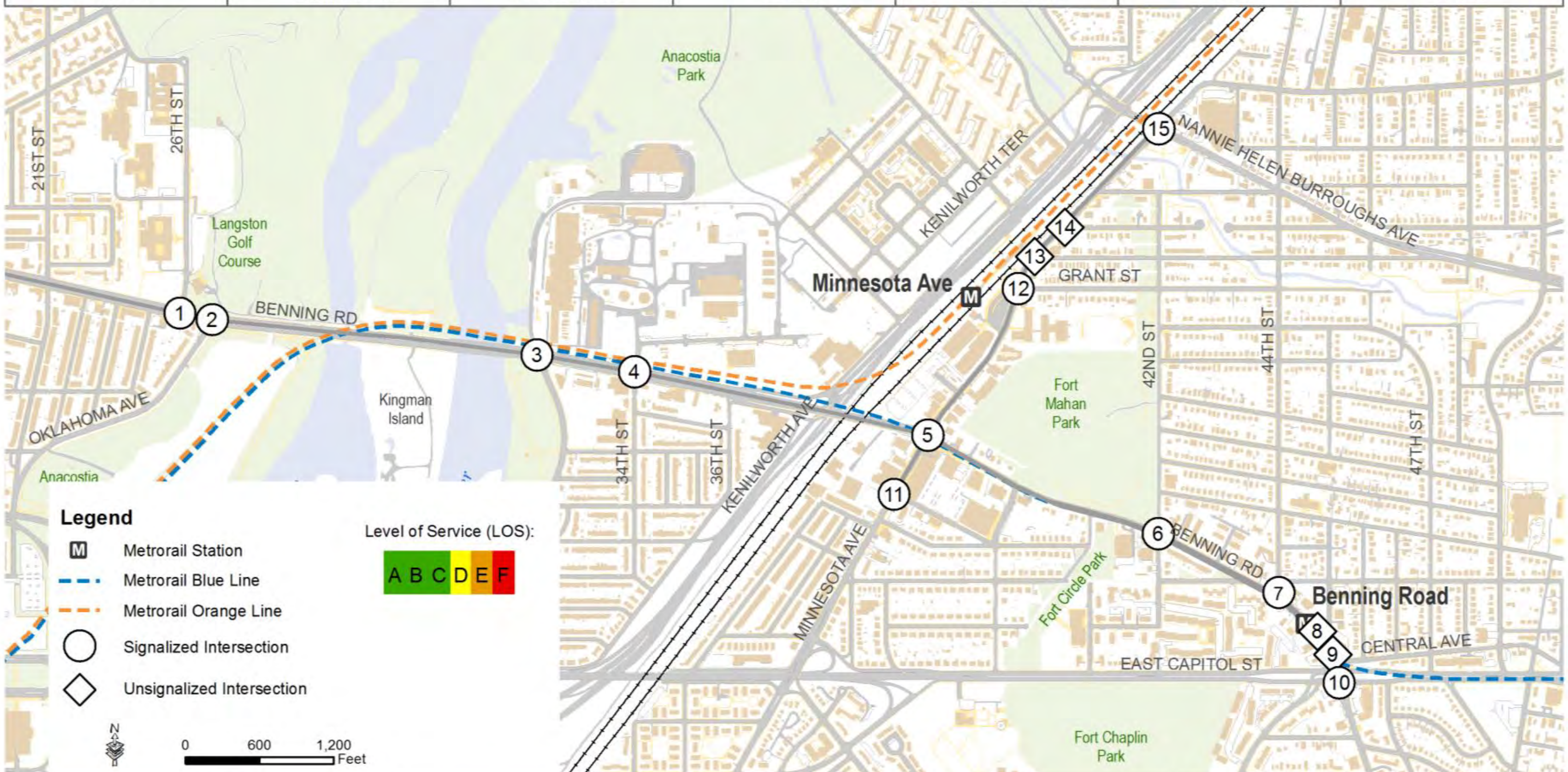
Figure 4-9: 2018 Build Alternative 1 – Curbside Running Morning and Evening Peak Hour Intersection LOS



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-10: 2018 Build Alternative 2 – Median Running Morning and Evening Peak Hour Intersection LOS

#	Intersection	AM	PM
1	Benning Rd and 26th St	A	B
2	Benning Rd and Oklahoma Ave	C	A
3	Benning Rd and Anacostia Ave	A	A
4	Benning Rd and 34th St	B	B
5	Benning Rd and Minnesota Ave	D	D
6	Benning Rd and 42nd St	B	B
7	Benning Rd and 44th St	B	D



#	Intersection	AM	PM
8	Benning Rd and 45th St	A	D
9	Benning Rd and Central Ave	B	A
10	Benning Rd and E Capitol St	F	F
11	Minnesota Ave and Dix St	A	B
12	Minnesota Ave and Grant St	B	B
13	Minnesota Ave and Gault Pl	C	B
14	Minnesota Ave and Hayes St	C	C
15	Minnesota Ave and NHB Ave	C	C

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2018 Build Streetcar Operations

To evaluate the operation of the streetcar alignments, average travel speeds were obtained from the VISSIM simulation model. VISSIM travel time segments were defined from 20th Street to the Benning Road Metrorail Station in the eastbound direction and from Benning Road Metrorail Station to 26th Street in the westbound direction. **Table 4-4** provides average travel time and speed for the curbside running and median running streetcar alignment in the morning and evening peak hours.

Table 4-4: 2018 Average Travel Time and Speed for the Streetcar Alignments in the Morning and Evening Peak hour

Direction	Peak Hour	Travel Time (min)	Speed (mph)
Build Alternative 1 – Curbside Running			
Eastbound	AM	10.0	12.7
Westbound*	AM	11.0	10.2
Eastbound*	PM	13.9	9.2
Westbound	PM	9.4	11.8
Build Alternative 2 – Median Running			
Eastbound	AM	8.5	14.5
Westbound*	AM	9.8	11.5
Eastbound*	PM	11.0	11.6
Westbound	PM	8.3	13.4

**indicates the peak (critical) direction during that peak hour.*

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Results show that the curbside running alignment operates with relatively slower speeds compared to the median alignment during the both peak hours. This can be attributed to the higher number of transitions for the curbside running alignment, which increases intersection delay as no signal pre-emption was provided for the special streetcar signals to limit the disruption of general traffic. Another important finding is that the average streetcar speed is generally higher than 10mph, faster than the typical peak period bus speeds in downtown Washington DC[2], as a result of off-board fare collection, level boarding, and relatively larger spacing between streetcar stations.

4.2.1.5 Environmental Consequences- Travel Demand in the Design Year 2040

Similar to the 2018 opening year analysis, transit and traffic conditions in the study area for the design year 2040 was evaluated. A No Build scenario was analyzed for the year 2040 to serve as a baseline comparison for the Build Alternatives. For the Build Alternatives, curbside running and median running streetcar alternatives were tested and their impact on general traffic evaluated.

Table 4-5 shows station to station travel times for both streetcar alternatives in 2018 based on VISSIM results. Vehicle travel times along Benning Road for the same travel segments are also presented in **Table 4-6** for comparison purposes.

[2] http://www.wmata.com/pdfs/planning/November2009_AMSpeedMap.pdf

Table 4-5: 2018 Station to Station VISSIM Travel Time Results for Build Alternatives 1 and 2

Segment	Build Alternative 1		Build Alternative 2	
	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour
Eastbound Direction				
20th Street to Oklahoma Avenue	0.7	0.8	0.7	0.8
Oklahoma Avenue to Kingman Island	2.0	2.1	1.5	1.2
Kingman Island to 34th Street	1.0	1.3	1.0	1.1
34th Street to Minnesota Avenue	3.3	3.6	2.4	2.4
Minnesota Avenue to 42nd Street	1.0	1.3	1.0	1.1
42nd Street to Benning Road Metrorail Station	2.0	4.9	2.3	4.5
TOTAL	**10.0**	**13.9**	**8.9**	**11.2**
Westbound Direction				
Benning Road Metrorail Station to 42nd Street	2.0	1.6	2.0	1.5
42nd Street to Minnesota Avenue	2.0	1.2	1.7	1.2
Minnesota Avenue to 34th Street	2.3	3.0	2.0	2.4
34th Street to Kingman Island	1.4	1.2	1.1	1.2
Kingman Island to Oklahoma Avenue	2.7	2.2	2.5	1.4
Oklahoma Avenue to 26th Street	0.5	0.4	0.5	0.7
TOTAL	**10.9**	**9.6**	**9.8**	**8.3**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-6: 2018 Corridor Vehicle Travel Times for Build Alternatives 1 and 2

Segment	Build Alternative 1		Build Alternative 2	
	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour
Eastbound Direction				
20th Street to Benning Road Metrorail Station	6.3	9.9	6.1	9.0
Westbound Direction				
Benning Road Metrorail Station to 26th Street	6.0	5.3	5.9	5.3

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2040 No Build Alternative

Land Use

The regional land use was determined based on the MWCOG Round 8.2 Cooperative Land Use Forecasts for 2040. Regionally, this represents growth of approximately 30 percent in population and 59 percent in employment over the existing conditions.

Transportation Network

The only change to the roadway network in the study area is the removal one of the three lanes in each direction along East Capitol Street from 40th Street to Southern Avenue to improve pedestrian safety. As a result, East Capitol Street would operate with two through lanes in both directions between 40th Street and Southern Avenue.

Metrorail

Regional Metrorail service improvements provide some changes to the services provided at the two Metrorail stations within the study area. The Metrorail system in 2020 will provide headways of 6 minutes in the peak and 12 minutes in the off-peak period on the Orange Line, and 7 and 12 minutes in the peak and off-peak periods on the Blue and Silver Lines.

Local Bus

Local bus service in the study area is provided primarily by Metrobus. **Appendix E** summarizes the peak and off-peak headways for the local routes serving the study area.

VISSIM Simulation Modeling

The 2040 No Build future year intersection traffic volumes were developed using a growth rate obtained from the MWCOG Version 2.3 regional travel demand model. With the exception of the Benning Road and East Capitol Street intersection, traffic volumes under the No Build conditions were increased by 0.55 percent annually, which corresponds to an increase of approximately 15 percent between 2014 and 2040. At the intersection of Benning Road and East Capitol Street, while the volumes on Benning Road increased by 0.55 percent annually, East Capitol Street traffic volumes were kept constant in the morning peak and decreased by 0.2 percent annually in the evening peak to factor in the through-lane reduction on East Capitol Street, as indicated in the CLRP. **Figure 4-11** shows the projected peak hour traffic volumes for the year 2040.

Intersection Conditions

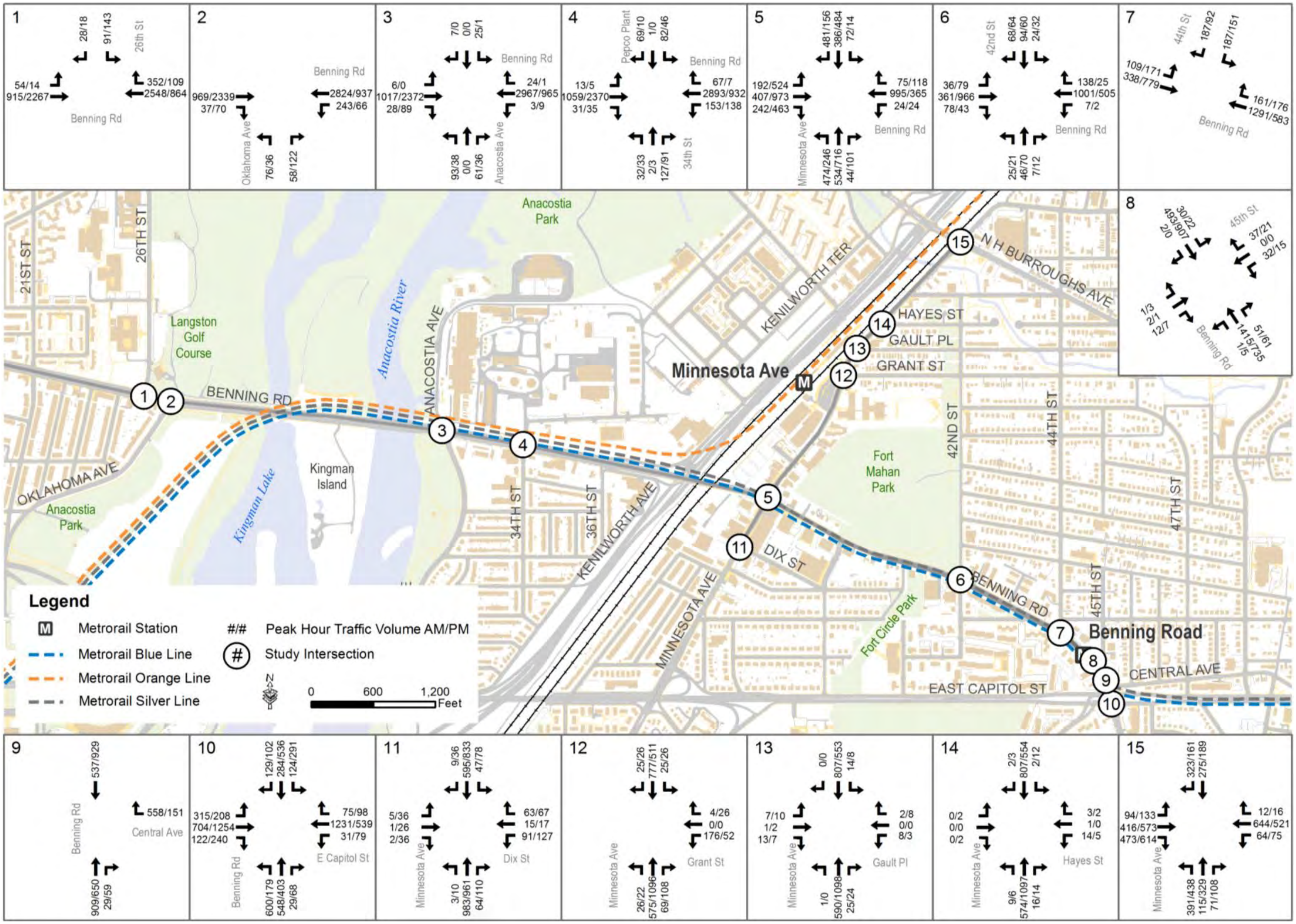
Figure 4-12 displays intersection LOS at the study intersections for the morning and evening peak hours. The following intersections would operate with LOS F in the morning peak hour:

- Benning Road and Minnesota Avenue (Intersection #5)
- Benning Road and 45th Street (Intersection #8)
- Benning Road and East Capitol Street (Intersection #10)

The following intersections would operate with LOS F in the evening peak hour:

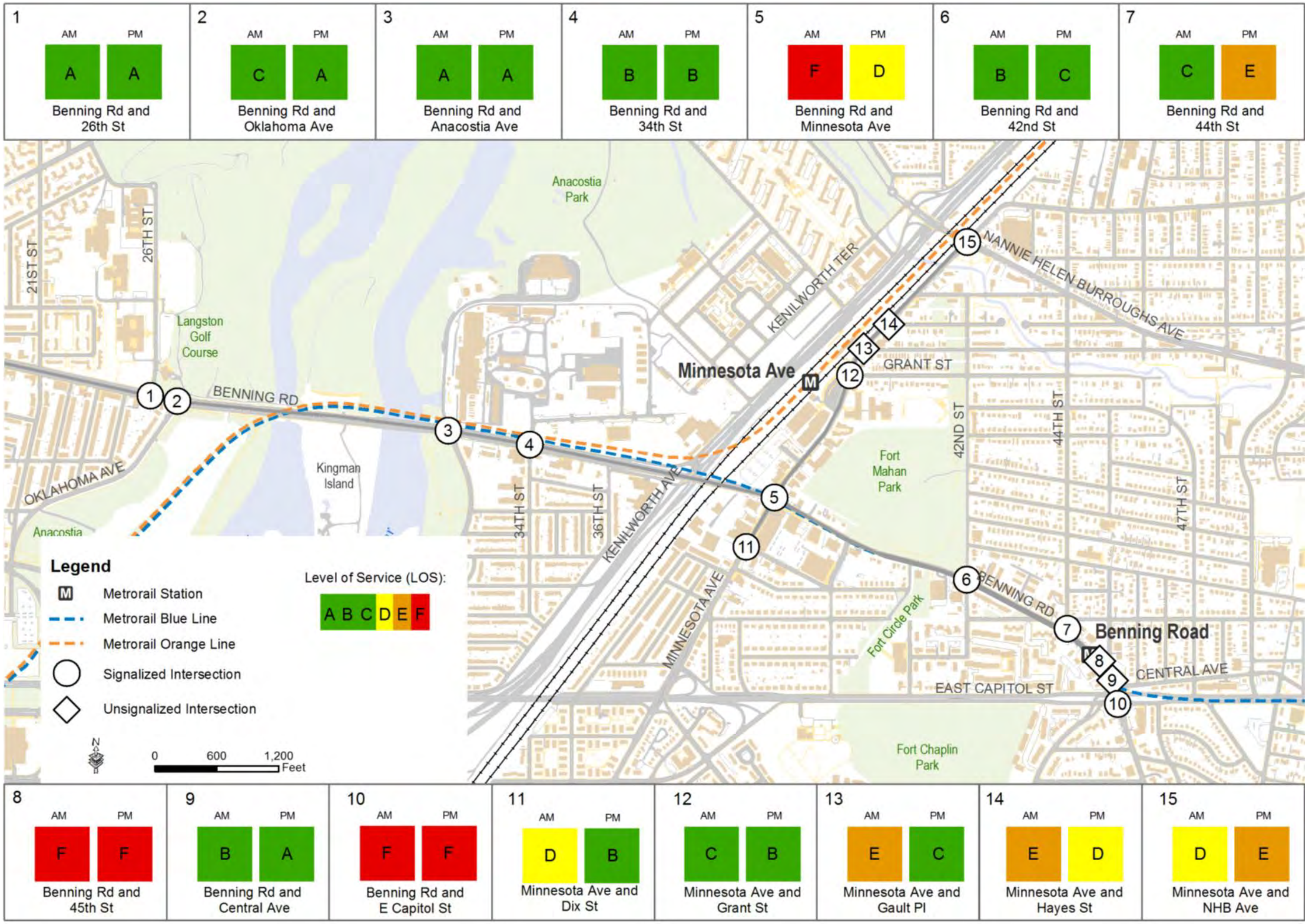
- Benning Road and 45th Street (Intersection #8)
- Benning Road and East Capitol Street (LOS F, Intersection #9)

Figure 4-11: 2040 No Build Morning and Evening Peak Hour Intersection Traffic Volumes



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-12: 2040 No Build Morning and Evening Peak Hour Intersection LOS



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Benning Road and Minnesota Avenue in the morning peak hour, and Benning Road and East Capitol Street in the morning and evening peak hour, operate with LOS F due to heavy traffic volumes and inadequate capacity. LOS F at the Benning Road and 45th Street intersection may be explained by the long queues at the downstream link and queue spillback from the Benning Road and East Capitol Street intersection, resulting in significant reduction in intersection capacity.

Table 4-7 provides delay and LOS by movement for the critical intersections for the 2040 No Build for the morning and evening peak hours. **Table 4-8** shows the associated maximum queue lengths by movements. Delay and queuing results for all study intersections for the 2040 No Build conditions are provided in **Appendix E**.

Table 4-7: 2040 No Build Peak Hour (AM and PM) Delay and LOS at the Critical Intersections

Intersection	Traffic Control	Peak Hour	Intersection		Northbound		Southbound		Westbound		Eastbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Benning Rd and Minnesota Ave	Signalized	AM	84	F	54	D	176	F	63	E	47	D
Benning Rd and 45th St*	Unsignalized	AM	146	F	2	A	29	D	146	F	18	C
Benning Rd and East Capitol St	Signalized	AM	187	F	252	F	80	E	206	F	264	F
Minnesota Ave and Gault Pl*	Unsignalized	AM	49	E	1	A	20	C	29	D	49	E
Minnesota Ave and Hayes St*	Unsignalized	AM	37	E	2	A	9	A	37	E	-	-
Benning Rd and 44th St	Signalized	PM	63	E	20	B	105	F	33	C	-	-
Benning Rd and 45th St*	Unsignalized	PM	82	F	1	A	82	F	47	E	29	D
Benning Rd and East Capitol St	Signalized	PM	198	F	340	F	65	E	374	F	162	F
Minnesota Ave and NHB Ave	Signalized	PM	64	E	61	E	33	C	27	C	94	F

Stop-controlled intersection, in which intersection LOS is expressed in terms of the average vehicle delay of the worst movement

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-8: 2040 No Build Peak hour (AM and PM) Maximum Queue Length (feet) by Movement at the Critical Intersections

Intersection	Peak Hour	Northbound			Southbound			Westbound			Eastbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Benning Rd and Minnesota Ave	AM	565	385	385	1,335	1,540	1,540	660	660	660	450	345	345
Benning Rd and 45th St	AM	205	200	200	300	300	285	245	220	245	40	25	45
Benning Rd and East Capitol St	AM	1,075	1,075	1,075	300	300	310	1,675	1,675	1,675	715	715	715
Minnesota Ave and Gault Pl*	AM	50	45	45	250	245	280	85	-	85	110	105	110
Minnesota Ave and Hayes St*	AM	100	100	100	210	195	195	65	50	70	-	-	-
Benning Rd and 44th St	PM	320	305	305	60	420	355	290	290	290	1,560	1,560	1,560
Benning Rd and 45th St	PM	135	125	125	1,290	1,290	1,270	105	80	105	40	20	40
Benning Rd and East Capitol St	PM	1,070	1,070	1,465	1,070	1,070	1,070	555	555	555	1,465	1,465	1,465
Minnesota Ave and NHB Ave	PM	715	715	715	-	200	220	205	205	225	910	910	910

Source: Benning Road and Bridges Transportation Improvements EA Project Team

2040 Build Alternatives

The 2040 Build Alternative combined regional baseline assumptions for 2040 with the Benning Road Streetcar Extension.

Land Use

The regional land use of the travel demand analysis area was the same as for the No Build scenario using the MWCOG Round 8.2 Cooperative Land Use Forecasts for 2040.

Transportation Network

The transportation networks in the Build Scenario are the same as for the No Build scenario with the exception of Benning Road Streetcar Extension, extending the H/Benning Streetcar Line to the Benning Road Metrorail Station.

Ridership Forecasting

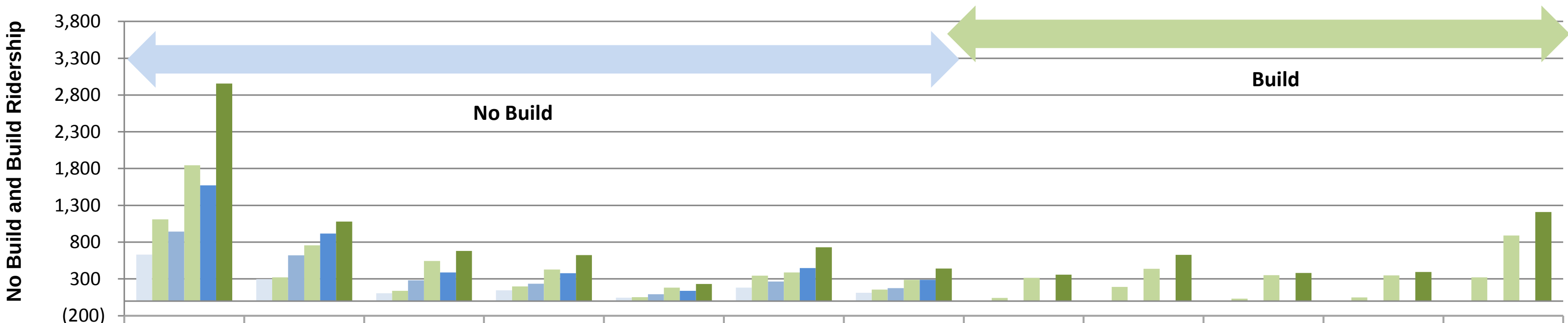
Table 4-9 summarizes the 2040 streetcar ridership under the No Build (terminating at Oklahoma Avenue) and the Build (includes extension to Benning Road Metrorail Station) scenarios. **Figure 4-13** compares the No Build and Build ridership by station in 2040. The MWCOG regional model can only place transit stops at network nodes and because the MWCOG model does not have a node on 5th Street, the streetcar stop at 5th Street and H Street, NE was not modeled. However, the zone connectors providing access to the adjacent stations are considered adequate for transit access to all trips generated in the adjacent zones and it is unlikely this stop would have increased total streetcar ridership.

Table 4-9: No Build and Build Streetcar Ridership in 2040

Stop	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
Union Station	629	1110	942	1845	1571	2955
3rd Street and H Street, NE	298	322	619	758	917	1079
8th Street and H Street, NE	105	138	282	543	387	681
13th Street and H Street, NE	145	198	234	426	378	623
15th Street and Benning Road, NE	45	52	92	180	137	231
19th Street and Benning Road, NE	183	343	266	387	448	729
Oklahoma Avenue and Benning Road, NE	113	155	174	287	287	442
Kingman Island and Benning Road, NE	-	43	-	316	-	359
34th Street and Benning Road, NE	-	193	-	436	-	629
Minnesota Avenue and Benning Road, NE	-	32	-	351	-	383
42nd Street and Benning Road, NE	-	47	-	347	-	393
Benning Road Metrorail Station	-	321	-	890	-	1211
Total	1,518	2,954	2,609	6,766	4,125	9,712

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-13: No Build and Build Street Ridership by Station in 2040



	Union Station	3rd Street and H Street, NE	8th Street and H Street, NE	13th Street and H Street, NE	15th Street and Benning Road, NE	19th Street and Benning Road, NE	Oklahoma Avenue and Benning Road, NE	Kingman Island and Benning Road, NE	34th Street and Benning Road, NE	Minnesota Avenue and Benning Road, NE	42nd Street and Benning Road, NE	Benning Road Metrorail Station
Peak No Build	629	298	105	145	45	183	113	-	-	-	-	-
Peak Build	1,110	322	138	198	52	343	155	43	193	32	47	321
Off-Peak No Build	942	619	282	234	92	266	174	-	-	-	-	-
Off-Peak Build	1,845	758	543	426	180	387	287	316	436	351	347	890
Daily No Build	1,571	917	387	378	137	448	287	-	-	-	-	-
Daily Build	2,955	1,079	681	623	231	729	442	359	629	383	393	1,211

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The Benning Road Extension is projected to carry approximately 5,600 daily riders in 2040. These values are in addition to the projected initial Oklahoma Avenue to Union Station H/Benning Streetcar segment daily ridership of 4,125.

Table 4-10 provides the total daily bus ridership by bus route (for the entire route) serving the study area under the No Build and the Build scenarios. **Table 4-11** shows daily ridership by route within the study area.

Table 4-10: No Build and Build Route Level Daily Bus Ridership

Bus Route	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
X1,X3	1,941	1,911	0	0	1,941	1,911
X2	7,799	7,482	6,685	5,169	14,484	12,651
X9	2,688	2,622	2,351	2,122	5,039	4,744
U2	475	472	490	486	965	958
U4	37	33	6	5	43	38
U5,U6	578	579	1,069	998	1,647	1,577
U8	146	118	661	462	807	580
96,97	7,353	7,207	2,093	1,973	9,446	9,180
V7,V8,V9	3,368	3,364	2,193	2,223	5,561	5,587
W4	5,989	6,164	5,498	5,782	11,487	11,946
Total	30,374	29,952	21,046	19,220	51,420	49,172
Percent Change from No Build	**-**	**-1%**	**-**	**-9%**	**-**	**-4%**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

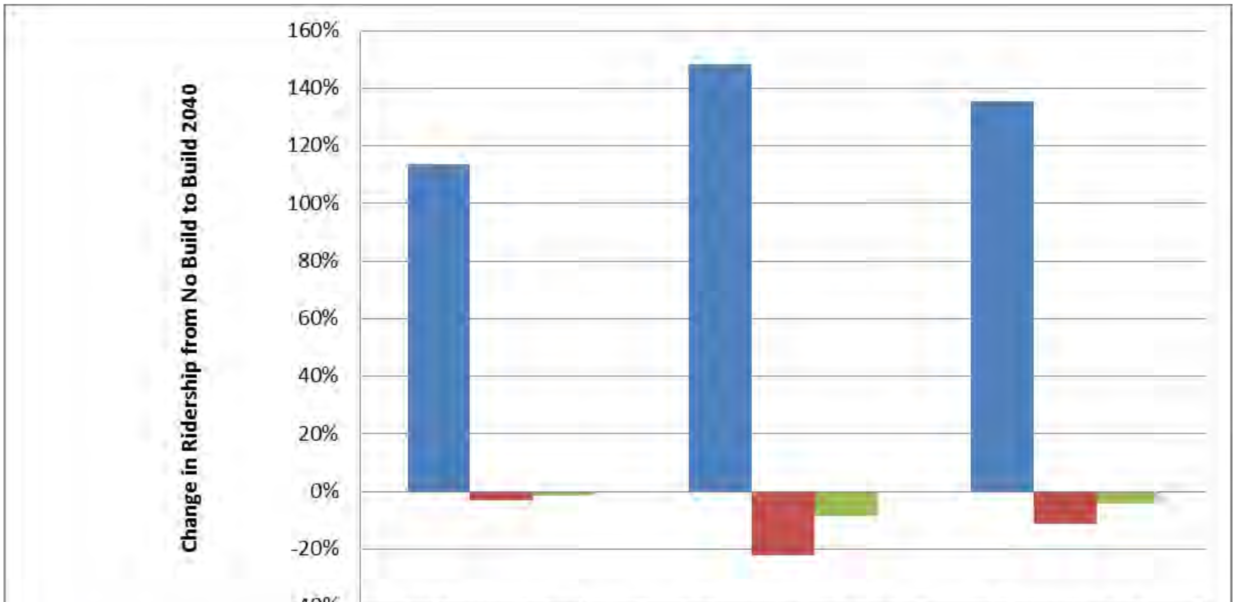
Table 4-11: 2040 No Build and Build Daily Bus Ridership that Occurs within the Study Area

Bus Route	Peak		Off-Peak		Daily	
	No Build	Build	No Build	Build	No Build	Build
X1,X3	929	898	0	0	929	898
X2	4,431	4,186	4,596	3,032	9,027	7,218
X9	463	423	528	423	991	846
U2	291	291	164	154	455	445
U4	10	15	2	3	12	18
U5,U6	390	387	446	392	836	779
U8	19	13	59	32	78	45
96,97	805	735	221	180	1,026	915
V7,V8,V9	656	655	355	379	1,011	1,034
W4	1,176	1,297	794	991	1,970	2,288
Total	9,170	8,900	7,165	5,586	16,335	14,486
Percent Change from No Build	**-**	**3%**	**-**	**-22%**	**-**	**-11%**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Compared to the 2040 No Build scenario, the total daily bus ridership in the study area would decrease by approximately 11 percent in the Build scenario (**Table 4-11**). This decrease may be explained by the introduction of the streetcar service, which offers faster service and higher frequency, in particular during the off-peak periods because the streetcar would operate with the same 10-minute headway both during the peak and off-peak, thereby reducing passenger waiting time between the Benning Road Metrorail Station and Union Station (see **Figure 4-14**).

Figure 4-14: Change in Streetcar and Bus Ridership from No Build to Build 2040



	Difference in Peak Ridership	Difference in Off-Peak Ridership	Difference in Daily Ridership
Streetcar	114%	148%	136%
Study Area Bus Ridership	-3%	-22%	-11%
Total Ridership on Bus Routes	-1%	-9%	-4%

Source: Benning Road and Bridges Transportation Improvements EA Project Team

VISSIM Simulation Modeling

The Build scenario assumes the same transportation network as in the 2018 Build. The changes compared to the 2040 No Build are: (1) Proposed lane configuration changes at the Benning Road and Minnesota Avenue intersection; and (2) Extension of the streetcar to Benning Road Metrorail Station. The same transitions and special transit-only signals described for the 2018 scenario (**Section 4.2.13**) are considered in the 2040 traffic analysis.

The regional model forecasts indicated that the reduction in automobile trips due to people switching from automobiles to transit with the introduction of streetcar is not substantial. To perform the most conservative traffic analysis, the same traffic volume projections developed for the 2040 No Build model were used in the Build VISSIM model.

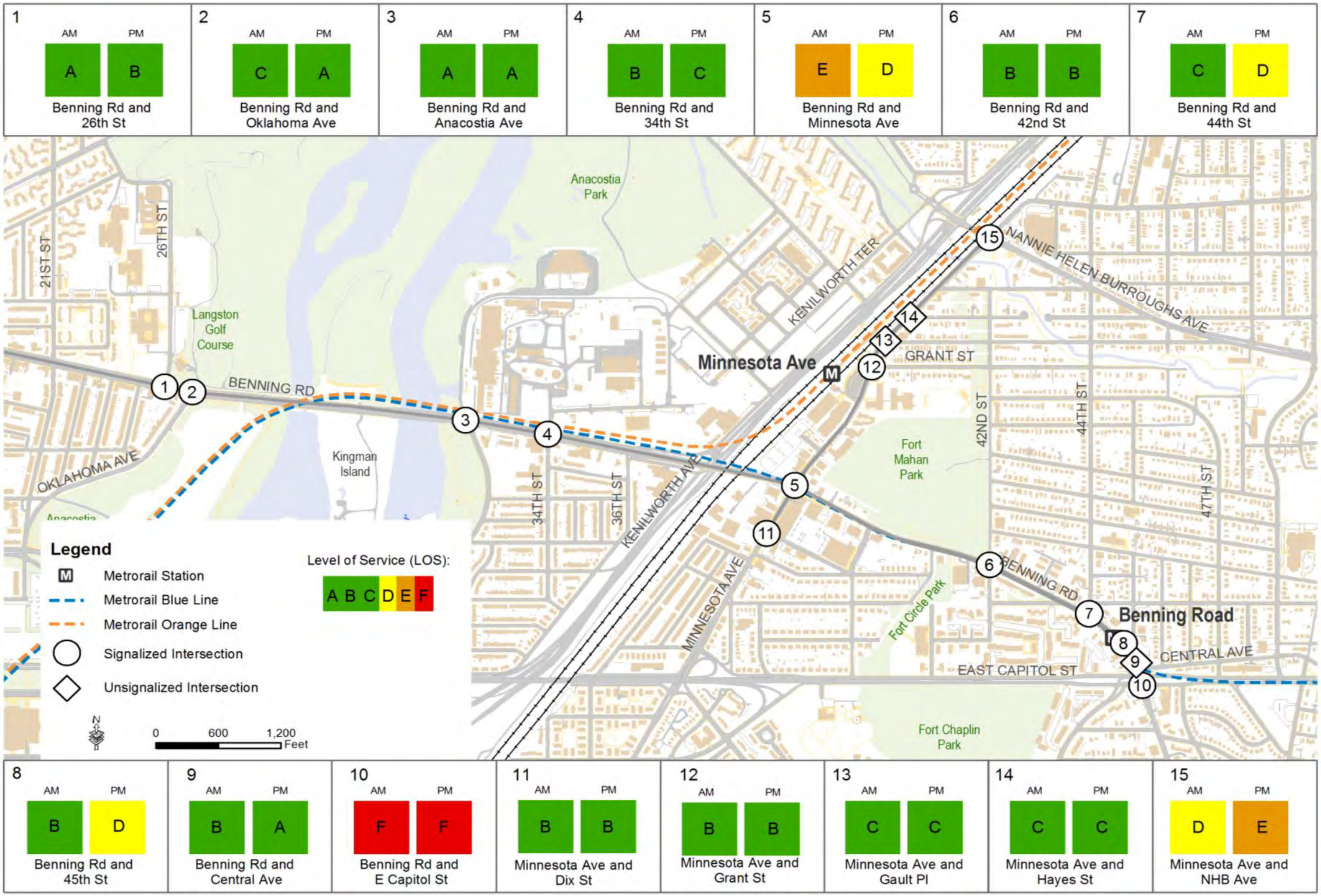
Figure 4-15 and **Figure 4-16** provide 2040 Build intersection LOS at the study intersections during the morning and evening peak hours with the curbside running and median running alignment, respectively. Similar to the 2018 traffic analysis, the traffic control type at Benning Road and 45th Street intersection was changed from unsignalized to signalized control to accommodate the transition of the streetcar at Benning Road Metrorail Station.

Intersection Level of Service (LOS)

The findings of the 2040 Build traffic analysis are summarized below:

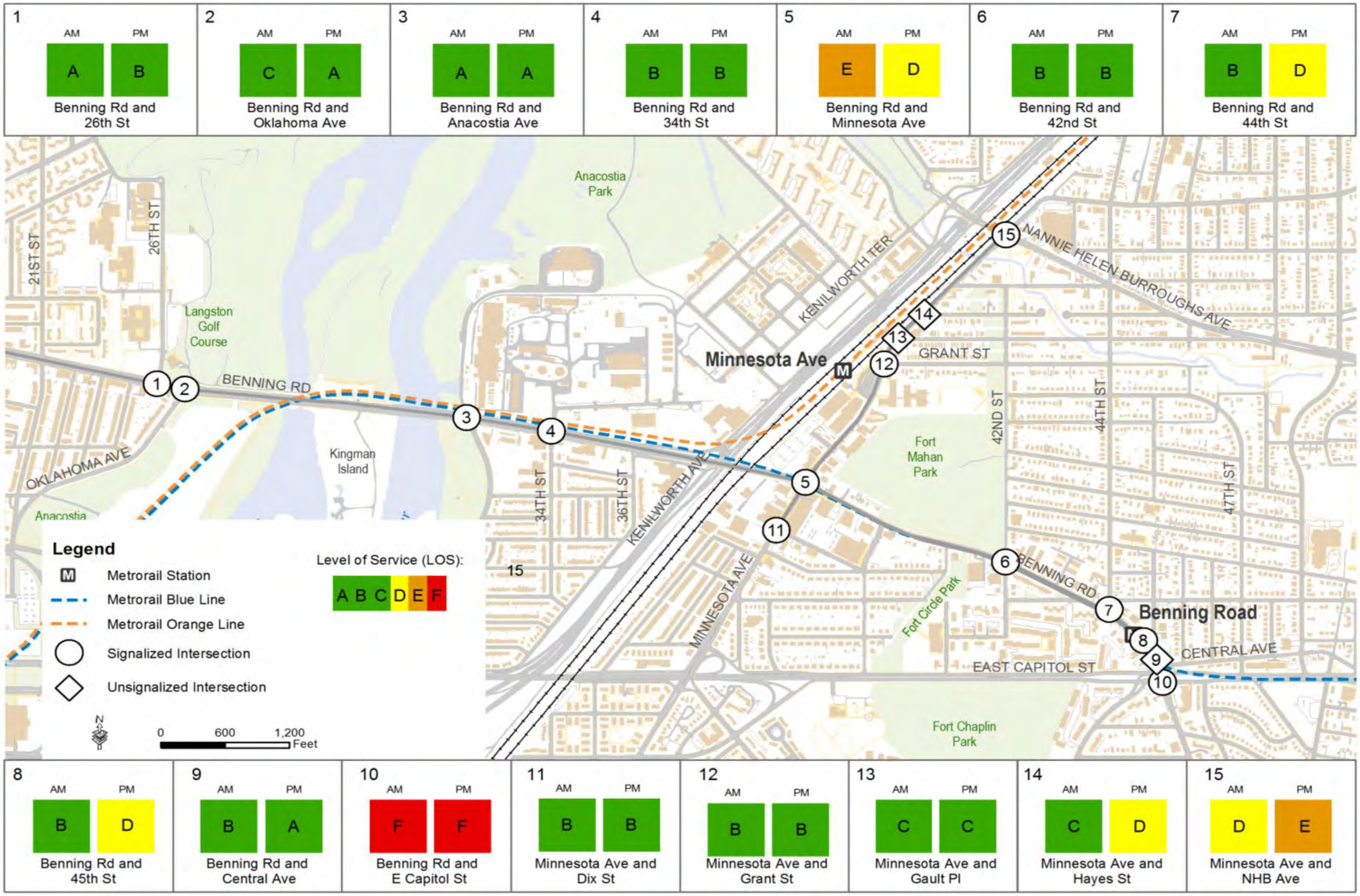
- Benning Road and East Capitol Street intersection would operate with LOS F in the morning and evening peak hour under both streetcar alignments.
- Compared to the 2040 No Build scenario, intersection LOS at Benning Road at 44th Street would improve from LOS E to LOS D in the evening peak hour under both the curbside running and median running alternatives. This improvement is explained by the signal timing changes at the Benning Road and East Capitol Street intersection to favor the operation of the southbound approach of the streetcar and limit the congestion on Benning Road.
- Signal timing modifications at Benning Road and East Capitol Street intersection to improve streetcar operation, in particular in the evening peak, would cause higher delay at this intersection (see **Table 4-12** and **Table 4-14** below).
- The LOS improvement at the Benning Road and 45th Street intersection from LOS F to LOS D in the evening peak can be attributed to the change in intersection control type from unsignalized to signalized and signal timing changes at the Benning Road and East Capitol Street intersection, which limit the extent of queue spillback to upstream intersections.
- The operation of streetcar and transitions at most intersections would result in very little impact on vehicular delay.

Figure 4-15: 2040 Build Curb Running Alignment Morning and Evening Peak Hour Intersection LOS



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-16: 2040 Build Median Running Alignment Morning and Evening Peak Hour Intersection LOS



Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-12 provides delay and LOS by movement for the critical intersections for the 2040 Build Alternative 1. **Table 4-13** displays the associated queue lengths by movement. **Tables 4-14** and **4-15** provide delay and queuing results for Build Alternative 2, respectively. **Appendix E** provides delay and queuing results for all study intersections for both the curbside running and median running alternative.

Table 4-12: 2040 Build Alternative 1 – Curbside Running Peak Hour (AM and PM) Delay and LOS at Critical Intersections

Intersection	Traffic Control	Peak Hour	Intersection		Northbound		Southbound		Westbound		Eastbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Benning Rd and Minnesota Ave	Signalized	AM	73	E	63	E	105	F	70	E	51	D
Benning Rd and East Capitol St	Signalized	AM	189	F	256	F	75	E	198	F	287	F
Benning Rd and East Capitol St	Signalized	PM	214	F	384	F	54	D	424	F	158	F
Minnesota and NHB Ave	Signalized	PM	66	E	68	E	32	C	27	C	93	F

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-13: 2040 Build Alternative 1 – Curbside Running Peak Hour (AM and PM) Maximum Queue Length (feet) by Movement at Critical Intersections

Intersection	Peak Hour	Northbound			Southbound			Westbound			Eastbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Benning Rd and Minnesota Ave	AM	545	265	265	1345	1345	1345	-	745	745	480	325	325
Benning Rd and East Capitol St	AM	1075	1075	1075	350	350	360	1675	1675	1675	1465	1465	1465
Benning Rd and East Capitol St	PM	1070	1070	1070	365	365	375	1675	1675	1675	1465	1465	1465
Minnesota Ave and NHB Ave	PM	810	810	810	-	190	210	205	205	225	950	950	950

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-14: 2040 Build Alternative 2 – Median Running Peak hour (AM and PM) Delay and LOS at Critical Intersections

Intersection	Traffic Control	Peak Hour	Intersection		Northbound		Southbound		Westbound		Eastbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Benning Rd & Minnesota Ave	Signalized	AM	72	E	59	E	110	F	67	E	49	D
Benning Rd & E Capitol St	Signalized	AM	191	F	256	F	71	E	198	F	299	F
Benning Rd & E Capitol St	Signalized	PM	218	F	442	F	57	E	427	F	167	F
Minnesota & NHB Ave	Signalized	PM	67	E	68	E	33	C	28	C	96	F

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-15: 2040 Build Alternative 2 – Median Running Peak hour (AM and PM) Maximum Queue Length (feet) by Movement at Critical Intersections

Intersection	Peak Hour	Northbound			Southbound			Westbound			Eastbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Benning Rd and Minnesota Ave	AM	525	335	335	1355	1355	1360	-	705	705	470	310	310
Benning Rd and East Capitol St	AM	1075	1075	1075	345	345	355	1675	1675	1675	1470	1470	1470
Benning Rd and East Capitol St	PM	1075	1075	1075	350	350	360	1675	1675	1675	1465	1465	1465
Minnesota Ave and NHB Ave	PM	775	775	775	-	205	225	210	210	230	975	975	975

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Streetcar Operations

The operation of the streetcar alignments was evaluated based on the average travel speeds which were obtained from the VISSIM simulation model. VISSIM travel time segments were defined from 20th Street to Benning Road Metrorail Station in the eastbound direction and from Benning Road Metrorail Station to 26th Street in the westbound direction. **Table 4-16** provides average travel time and speed for Build Alternatives 1 and 2 in 2040 during the morning and evening peak hours.

Table 4-16: 2040 Average Travel Time and Speed for the Streetcar Alignments in the Morning and Evening Peak hour

Direction	Peak Hour	Travel Time (min)	Speed (mph)
Build Alternative 1 – Curbside Running			
Eastbound	AM	10.2	12.6
Westbound*	AM	11.3	9.9
Eastbound*	PM	13.0	9.8
Westbound	PM	9.9	11.3
Build Alternative 2 – Median Running			
Eastbound	AM	9.4	13.6
Westbound*	AM	10.2	11.0
Eastbound*	PM	11.3	11.3
Westbound	PM	8.1	13.8

**indicates the peak (critical) direction during that peak hour.*

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Similar findings, as reported in the 2018 Build section, were obtained from the analysis. Build Alternative 1 would operate with relatively slower speeds compared to Build Alternative 2 during the both peak hours due to the higher number of transitions for the curbside running alignment. Moreover, results suggest that with the increase in background traffic in 2040, streetcar travel times would generally increase with the exception of eastbound travel times during the evening peak hour, where this can be attributed to the 2040 MWCOG projections. The MWCOG model projected lower traffic volumes in 2040 on East Capitol Street compared to 2018 projections due to the through lane reduction on East Capitol Street. As a result, more green time could be allocated to the Benning Road approach at the Benning Road and East Capitol Street intersection in 2040 (due to lower East Capitol volumes), limiting congestion and queue spillback on the Benning Road approach, thereby improving travel times.

Table 4-17 shows station to station travel times for both Build Alternatives in 2040 based on the VISSIM output. Vehicle travel times obtained from VISSIM along Benning Road for the same travel segments were also included in **Table 4-18** for comparison purposes.

Table 4-17: 2040 Station to Station VISSIM Travel Time Results for Build Alternatives 1 and 2

	Build Alternative 1		Build Alternative 2	
Segment	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour
Eastbound Direction				
20th Street to Oklahoma Avenue	0.7	0.8	0.7	0.8
Oklahoma Avenue to Kingman Island	2.0	2.1	1.5	1.2
Kingman Island to 34th Street	1.0	1.3	1.1	1.2
34th Street to Minnesota Avenue	3.3	3.8	2.5	2.7
Minnesota Avenue to 42nd Street	1.0	1.2	1.0	1.3
42nd Street to Benning Road Metrorail Station	2.2	3.9	2.3	4.4
TOTAL	**10.3**	**13.2**	**9.2**	**11.6**
Westbound Direction				
Benning Road Metrorail Station to 42nd Street	2.1	1.7	2.1	1.5
42nd Street to Minnesota Avenue	2.3	1.3	1.7	1.2
Minnesota Avenue to 34th Street	2.4	3.0	2.2	2.4
34th Street to Kingman Island	1.4	1.2	1.1	1.1
Kingman Island to Oklahoma Avenue	2.8	2.2	2.6	1.4
Oklahoma Avenue to 26th Street	0.5	0.4	0.6	0.8
TOTAL	**11.5**	**9.8**	**10.3**	**8.3**

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Table 4-18: 2040 Corridor Vehicle Travel Times under Build Alternatives 1 and 2

	Curb Running Streetcar		Median Running Streetcar	
Segment	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour	Travel Time (min) – AM Peak Hour	Travel Time (min) – PM Peak Hour
Eastbound Direction				
20th Street to Benning Road Metrorail Station	6.8	9.3	6.7	9.3
Westbound Direction				
Benning Road Metrorail Station to 26th Street	6.4	5.3	6.2	5.3

Source: Benning Road and Bridges Transportation Improvements EA Project Team

4.2.1.6 FHWA-Designated Truck Route

Benning Road is currently an FHWA-designated truck route. No changes are proposed to this designation or route under the No Build Alternative, or Build Alternatives 1 and 2.

4.2.1.7 Minimization and Mitigation Measures

Figure 4-8 shows the physical improvements proposed at the Benning Road and Minnesota Avenue intersection to help mitigate traffic congestion and improve LOS at numerous intersections. Intersections with improved LOS in the morning peak hour compared to the 2040 No Build Alternative include Benning Road and 45th Street; Minnesota Avenue and Gault Place; Minnesota Avenue and Hayes Street, and Benning Road and Minnesota Avenue which improves from LOS F to LOS E. Intersections with improved LOS in the evening peak hour compared to the 2040 No Build Alternative include Benning Road and 44th Street and Benning Road and 45th Street. None of these intersections would operate at an LOS of E or worse. Further, the operation of the streetcar and transitions would result in marginal increases in intersection delay at the study intersections.

No impact on mass transit has been identified for any of the alternatives; therefore no minimization or mitigation measure is proposed.

4.2.2 PARKING AND PRIVATE PROPERTY ACCESS

4.2.2.1 Introduction

This section assesses the potential effects on parking and access to adjacent lots at or near the project alternatives.

4.2.2.2 Environmental Consequences

No Build Alternative

No impacts to parking or private property access are anticipated under the No Build Alternative.

Build Alternative 1 – Curbside Running

The improvements associated with Build Alternative 1 would result in the loss of all existing on-street parking along the entire length of Benning Road. Off-street parking along the remaining corridor would remain unchanged. No impact to private property access is anticipated.

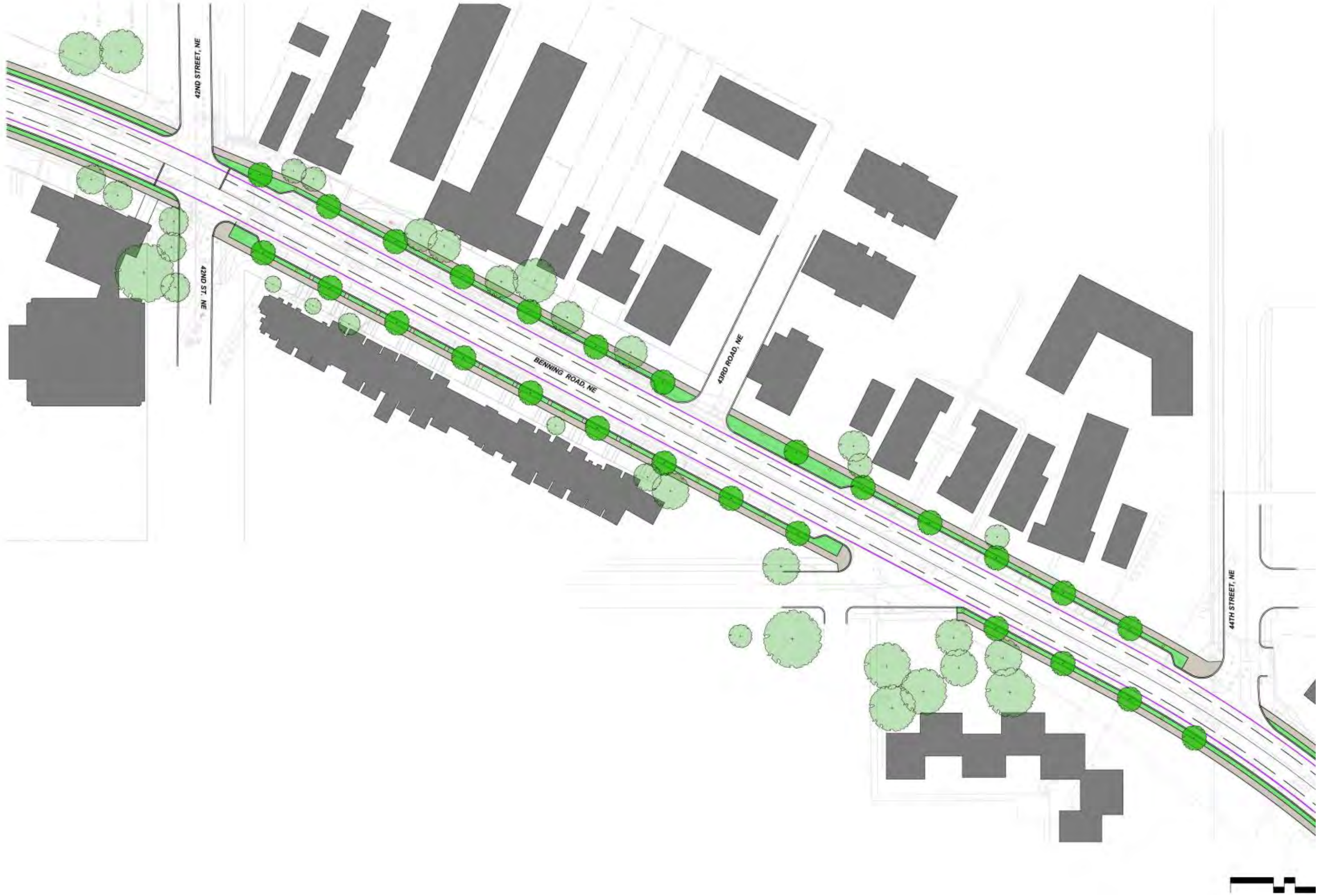
Build Alternative 2 – Median Running

No impact to parking or private property access is anticipated as a result of Build Alternative 2.

4.2.2.3 Minimization and Mitigation Measures

On-street parking impacts associated with Build Alternative 1 can be minimized between 42nd and 44th Street with the design improvements proposed and shown in **Figure 4-17**. This bump out parking option can be constructed within existing DDOT right-of-way and would enhance the existing condition by providing parking at all times, whereas currently on-street parking is limited to off-peak hours only.

Figure 4-17: Build Alternative 1 Parking Impact Minimization between 42nd and 44th Streets



Source: Benning Road and Bridges Transportation Improvements EA Project Team

4.2.3 PEDESTRIAN AND BICYCLE NETWORK

4.2.3.1 Introduction

This section assesses the potential effects on the pedestrian and bicycle network near the project alternatives.

4.2.3.2 Environmental Consequences

No Build Alternative

No changes or impacts to the pedestrian and bicycle network are anticipated under the No Build Alternative.

Build Alternative 1 – Curbside Running

The improvements proposed under Build Alternative 1 would result in the following benefits to the pedestrian network:

- A 10-foot continuous shared-use path would be provided on the southern side of Benning Road between Oklahoma and Minnesota Avenues.
- A pedestrian crossing with a traffic signal would be provided at the Kingman Island streetcar platform location to provide a safe crossing between the westbound and eastbound platforms.
- An enhanced, high-visibility pedestrian crossing would be provided at Benning Road and 36th Street to accommodate high pedestrian volumes and safety needs at this intersection.
- Sidewalks between 42nd Street and the Benning Road Metrorail Station that currently do not meet ADA specifications would be brought up to ADA standards.

While the shared-use path would provide bicycle connectivity across the Anacostia River up to Minnesota Avenue, no bicycle improvements are proposed as part of this alternative on Benning Road between Minnesota Avenue and East Capitol Street.

Build Alternative 2 – Median Running

The same pedestrian and bicycle improvements proposed as part of Build Alternative 1 would be provided as part of the Build Alternative 2 improvements. In addition, with the streetcar platforms located within the constrained right-of-way of the median, there would be a reduction of conflict between bicycle riders and pedestrians and the streetcar operations, in particular the boarding and alighting of passengers.

4.2.3.3 Minimization and Mitigation Measures

Build Alternative 1 and Build Alternative 2 result in beneficial impacts to pedestrian and bicycle facilities. No impact on the pedestrian and bicycle network has been identified for any of the alternatives; therefore no minimization or mitigation measure is proposed.

4.2.4 FREIGHT RAIL SERVICE

4.2.4.1 Introduction

This section assesses the potential effects on freight rail service at or near the project alternatives.

4.2.4.2 Environmental Consequences

No Build Alternative

No changes or impacts to the existing CSX railroad tracks that operate within the study area are anticipated under the No Build Alternative.

Build Alternative 1 – Curbside Running

The new Viaduct Bridge that would be constructed over the CSX railroad tracks as part of Build Alternative 1 would bring the clearance of the existing CSX railroad tracks to 23 feet in conformance with Federal Railroad Administration (FRA) regulations. This would allow double-stacked freight trains to pass through and increase the capacity of freight traffic along the corridor. In addition, the new piers supporting the bridge would have a smaller footprint than the existing piers freeing up space on the CSX property for future use.

Build Alternative 2 – Median Running

The Viaduct Bridge would be reconstructed as part of Build Alternative 2 and would result in the same benefits as Build Alternative 1.

4.2.4.3 Minimization and Mitigation Measures

No permanent impacts were identified under any of the project alternatives. Coordination with CSX would be an integral part of the Viaduct Bridge construction to avoid and minimize temporary disruptions to freight traffic.

4.3 SECTION 4(F) RESOURCES

4.3.1 Introduction

This section describes the effects of the alternatives described in **Chapter 2** on Section 4(f) resources in the study area. Section 4(f) resources are identified in **Sections 3.2 (Trails), 3.4 (Parklands)** and **3.5 (Cultural Resources)** of this EA.

4.3.2 Environmental Consequences

It was determined through the review of these resources and potential uses, that no Section 4(f) evaluation was needed for this project as no uses were identified to Section 4(f) properties.

The evaluation included the following steps:

- **Identification of Section 4(f) Properties.** DDOT reviewed existing mapping, conducted field investigations/site reconnaissance, searched property records, and consulted with officials with jurisdiction to identify the properties other than historic sites that qualify for protection by Section 4(f).
- To identify historic sites, an Area of Potential Effect (APE) was defined in consultation with and approved by the DC SHPO. The DC SHPO is the official with jurisdiction over historic properties in this evaluation.
- **Assessment of Potential for Section 4(f) Uses.** FHWA and DDOT identified and quantified potential uses of Section 4(f) properties associated with the Build Alternative. This assessment considered the potential for permanent uses (23 CFR 774.17), constructive uses (23 CFR 774.15) and temporary uses (23 CFR 774.13(d)).
- **Determination of Temporary Occupancy Exceptions.** In evaluating potential uses of Section 4(f) properties, FHWA and DDOT considered the exception for temporary occupancy in 23 CFR 774.13(d). If the criteria for a temporary occupancy exception are met, there is no use.

Definition of Section 4(f) Uses

A Section 4(f) use is defined and addressed in 23 CFR 774.17. Three types of Section 4(f) use can occur as described below: a permanent use, a temporary use, or a constructive use.

- **Permanent use** – When land from a Section 4(f) property is permanently incorporated into a transportation facility (23 CFR 774.17);
- **Temporary use** – When there is a temporary occupancy of Section 4(f) land that is adverse in terms of the statute's preservation purpose as determined by the criteria in §774.13(d); if the criteria in 23 CFR 774.13(d) are met, the “temporary use exception” applies in which there is no “use” of the Section 4(f) property. If the criteria in 23 CFR 774.13(d) are not met, the use is evaluated as permanent.
- **Constructive use** – When there is a constructive use of a Section 4(f) property as determined by the criteria in §774.15.

4.3.3 Minimization and Mitigation Measures

No permanent, temporary, or constructive uses of Section 4(f) resources are anticipated as a result of this project; therefore no minimization or mitigation measures are proposed.

4.4 PARKLANDS

4.4.1 INTRODUCTION

This section assesses the potential effects of the proposed alternatives on publicly-owned parklands and recreational resources identified in **Section 3.4** and includes those resources protected under Section 4(f) of the U.S. Department of Transportation Act.

4.4.2 ENVIRONMENTAL CONSEQUENCES

4.4.2.1 No Build Alternative

The No Build Alternative would have no effect on parklands identified adjacent to the project alignment.

4.4.2.2 Build Alternative 1 – Curbside Running

Build Alternative 1 would have no impacts on or use of parklands identified adjacent to the project alignment. The proposed streetcar stop at Kingman Island is expected to provide increased access and visibility to Kingman and Heritage Islands Park and the Anacostia Riverwalk Trail. The proposed streetcar stop at 42nd Street is expected to provide increased access and visibility to Fort Mahan, Fort Circle Park, and the Fort Circle Trail.

A potential TPSS facility may be located adjacent to Fort Mahan Park; however, if this option is chosen, the facility would be constructed and located within existing DDOT right-of-way and would have no impact to or use of Fort Mahan Park. Similarly, a platform location is proposed at 42nd Street; however, the platform would be constructed and located within existing DDOT right-of-way and would have no impact to or use of Fort Mahan Park.

The installation of the Kingman Island streetcar platform under Build Alternative 1 may result in temporary use of the Anacostia Riverwalk Trail adjacent to Benning Road during construction. Enhancing the shared-use path to accommodate the platform for streetcar users would require a temporary use during the construction period. The Anacostia Riverwalk Trail is a shared-use path owned and maintained by DDOT as a transportation facility for pedestrians and bicyclists. This trail is primarily used for transportation and is an integral part of the local transportation system and is therefore not considered to be a 4(f) property. Alterations to the trail at the platform location may include raising the profile of the trail in the platform area to allow easy access onto and off of the streetcars. DDOT is the jurisdiction with authority over the trail. The platform and the trail will remain under DDOT's ownership.

4.4.2.3 Build Alternative 2 – Median Running

Build Alternative 2 would result in similar impacts as described for Build Alternative 1. The proposed platform location at 42nd Street would be constructed and located within existing DDOT right-of-way and would have no impact to Fort Mahan Park.

4.4.3 MINIMIZATION AND MITIGATION MEASURES

No permanent adverse effect on parklands is anticipated as a result of the proposed alternatives; therefore no minimization or mitigation measure is proposed. There are no permanent, temporary, or constructive uses of Section 4(f) parkland or recreational properties anticipated as a result of this project.

4.5 CULTURAL RESOURCES

4.5.1 INTRODUCTION

In accordance with the Advisory Council on Historic Preservation (ACHP) regulations implementing Section 106 (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by (1) determining the Area of Potential Effects (APE); (2) identifying cultural resources present in the APE that are either listed in or eligible to be listed in the National Register of Historic Places (NRHP); (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the NRHP; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the ACHP's regulations, a determination of either adverse effect or no adverse effect must be made for affected NRHP listed or eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the NRHP (e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects caused by the build alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). Adverse effects on historic properties would include, but not be limited to:

1. Physical destruction, damage, or alteration of all or part of the property;
2. Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the NRHP;
3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
4. Neglect of a property resulting in its deterioration or destruction; and
5. Transfer, lease, or sale of the property (36 CFR 800.9[b]).

A determination of no adverse effect means that historic properties are present, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

A separate Cultural Resources Assessment has been prepared for the proposed Benning Road and Bridges Transportation Improvement project (see **Appendix F**) and this EA summarizes the findings of that document. The Cultural Resources Assessment is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternatives) on cultural resources, based upon the criteria of adverse effect found in the ACHP's regulations.

This section describes the effects of the proposed alternatives on above-ground (buildings, structures, cultural landscapes or objects) or below-ground (archaeological) historic properties in the APE. As stated above, an adverse effect on a historic property would result if an alternative impacts the integrity or character of that property. Construction activities may cause impacts on cultural resources and can include excavation, staging, heavy equipment usage and movement, drilling, demolition, or relocation, as well as increases in noise or vibration levels, or introduction of new visual elements.

Common adverse effects or changes to a historic structure are visual intrusions, construction and operational noise and vibration. A change in the visual setting of an above-ground historic property through the introduction of new features to the landscape or removal of existing ones, can impact the significance of that property. Vibration from impact pile-driving during construction could cause the physical destruction, damage, or alteration of historic properties or historical resources if the pile-driving is within 25 to 50 feet of the building. Construction noise also has the potential to cause adverse effects or substantial adverse change to historic properties and historical resources. Historic properties and historical resources that are sensitive to noise include resources like residences, parks, libraries, museums, and schools.

These types of resources have an inherent quiet nature that is part of their identification as well as their significance.

Soil excavation or compaction resulting from the use of heavy machinery on the construction site or in staging areas may affect the integrity of artifact-bearing deposits associated with known or as-yet undiscovered archaeological sites. Unrecorded archaeological resources may exist in portions of the APE for archaeology. Disturbance and removal of archaeological resources could result in effects on archaeological resources under Section 106.

4.5.2 ENVIRONMENTAL CONSEQUENCES

4.5.2.1 No Build Alternative

Under the No Build Alternative, existing conditions would remain unchanged. Therefore, no direct impacts to above or below-ground historic properties would occur.

4.5.2.2 Build Alternative 1 – Curbside Running

Above-Ground Historic Properties

Build Alternative 1 would result in no adverse effect to historic properties in the APE (see **Table 4-19**) and no uses under Section 4(f). This is a preliminary assessment, subject to consultation with Consulting Parties and the DC SHPO.

Table 4-19: Project Effects to Listed or Eligible Historic Resources, Build Alternative 1*

Resource Name	Status	Potential Adverse Effect	No Adverse Effect
Fort Mahan/Civil War Sites (Defenses of Washington) District	NRHP Listed		X
Langston Golf Course Historic District	NRHP Listed		X
Anacostia Park	NRHP Eligible		X
Senator Theater Entrance Pavilion	DCIHS Listed		X
Spingarn School	DCIHS Listed		X
Browne, Phelps, Spingarn, and Young Schools Historic District	NRHP Eligible		X
3300 Benning Road – PEPCO Bldg. 32	NRHP Eligible		X
4201-4243 Benning Road	NRHP Eligible		X
4208 Benning Road	NRHP Eligible		X
Fire and Police Call Boxes	NRHP Eligible		X
4001 Benning Road	NRHP Eligible		X
Baltimore & Potomac Railroad	NRHP Eligible		X
3938 Benning Road	NRHP Eligible		X
4228 Benning Road	NRHP Eligible		X
4236 Benning Road	NRHP Eligible		X
4270 Benning Road	NRHP Eligible		X
4274 Benning Road	NRHP Eligible		X
Totals		**0**	**17**

Source: NRHP, DCIHS, and Benning Road and Bridges Transportation Improvements EA Project Team

** Note that this is a preliminary assessment, subject to consultation with Consulting Parties and the DC SHPO.*

A streetcar historically ran along the segment of Benning Road in the project area from the west side of the Anacostia River to Kenilworth Avenue. The presence of this line was a positive selling point for the developers of Riverside Terrace, and provided transit access to the area around Benning Road and north to the Deanwood neighborhood. Currently, an elevated section of the Metro line runs along this segment. Introduction of a new streetcar would be consistent with the historical presence of streetcar transit and modern day light rail in the neighborhood, and would not adversely affect the setting of historic resources in this area.

Figures 4-18 through **4-20** are renderings of Build Alternative 1 showing both wired and wireless streetcar propulsion systems, respectively. These figures show that Build Alternative 1 would not adversely affect the setting of historic resources in the project study area.

Figure 4-18: Oklahoma Avenue to Kingman Island, Build Alternative 1 (looking East)

Figure 4-19: Kingman Island to 36th Street, Build Alternative 1 (looking West)

Figure 4-20: Minnesota Avenue to 45th Street, Build Alternative 1 (looking East)

Existing noise from automobile traffic and Metrorail trains is already present within the corridor. With the commitment to the use of noise dampening technology, the project would not introduce significant noise impacts throughout the project corridor. Therefore, it is anticipated that there would be no adverse effects due to noise for historic resources throughout the corridor.

Station stops would be designed to match those of the recently installed stops along the H Street section of the Benning Road streetcar. The design is simple and consists of an integral wall, shed roof, and short bench. Stops would be located in the vicinity of Fort Mahan Park, Langston Golf Course, and Anacostia Park. The introduction of the proposed station stops is not anticipated to affect the historic character of these NRHP listed and eligible resources.

The proposed reconfiguration of the intersection of Benning Road and Minnesota Avenue would require the removal of the NRHP eligible fire call box at the southeast corner of the intersection. If the callbox can be relocated as close as possible to the existing location, there would be no adverse effect to this resource.

The boundaries of NRHP apartment buildings in the 4200 block of Benning Road are recommended to correspond to the fences that surround the properties. The need to widen the roadway and sidewalks may require the removal or relocation of the metal fences, which may be considered as contributing elements of these properties. If removal or relocation is required, further consultation with DCSHPO would be required.

Below-Ground Historic Properties

Build Alternative 1 would not affect any recorded archaeological resources. Curbside streetcar construction has little to no potential to impact undocumented archaeological resources in the APE. Construction of the WMATA Blue Line in the 1970s would have compromised the integrity of any intact archaeological deposits within the limits of disturbance (LOD) of Build Alternative 1 east of 42nd Street. West of 42nd Street, the LOD does not extend significantly beyond the limits of the existing roadway or sidewalks. Build Alternative 1 would also require traction power that would be provided by an underground TPSS facility located along the corridor. Eight potential locations have been identified as displayed in **Figure 4-1**. TPSS facilities outside an area documented to have been previously disturbed by construction (i.e., WMATA Blue Line, subsurface utilities) have the potential to impact undocumented archaeological resources. However, the TPSS locations are within DDOT right-of-way or within previously disturbed areas, therefore the potential of impacting any undisturbed archeological resources is very low. Nonetheless, a full assessment of the potential for Alternative 1 to impact undocumented archaeological resources will be deferred until project design has advanced sufficiently to better understand the location and extent of all earth-moving activities related to construction and use.

4.5.2.3 Build Alternative 2 – Median Running

Above-Ground Historic Properties

Build Alternative 2 would result in no adverse effect to historic properties in the APE (see **Table 4-20**) and no uses under Section 4(f). This is a preliminary assessment, subject to consultation with Consulting Parties and the DC SHPO.

The difference between Build Alternative 1 and 2 would be the location of catenary and streetcars within the roadway (median versus curbside), and the addition of some medians in Build Alternative 2 to accommodate new platform locations for the streetcar. The proposed roadway dimensions would be the same. As such, the assessment of effects would be similar to those provided for Build Alternative 1. **Figures 4-21** through **4-23** are renderings of Build Alternative 2 showing both wired and wireless streetcar propulsion systems, respectively. These figures show that Build Alternative 2 would not adversely affect the setting of historic resources in the project study area.

The introduction of a median platform in the vicinity of the National Register eligible Fort Mahan Park and Stewart Funeral Home would not alter the characteristics of these properties that make them eligible for the National Register.

Table 4-20: Project Effects to Listed or Eligible Historic Resources, Build Alternative 2*

Resource Name	Status	Potential Adverse Effect	No Adverse Effect
Fort Mahan/Civil War Sites (Defenses of Washington) District	NRHP Listed		X
Langston Golf Course Historic District	NRHP Listed		X
Anacostia Park	NRHP Eligible		X
Senator Theater Entrance Pavilion	DCIHS Listed		X
Spingarn School	DCIHS Listed		X
Browne, Phelps, Spingarn, and Young Schools Historic District	NRHP Eligible		X
3300 Benning Road – PEPCO Bldg. 32	NRHP Eligible		X
4201-4243 Benning Road	NRHP Eligible		X
4208 Benning Road	NRHP Eligible		X
Fire and Police Call Boxes	NRHP Eligible		X
4001 Benning Road	NRHP Eligible		X
Baltimore & Potomac Railroad	NRHP Eligible		X
3938 Benning Road	NRHP Eligible		X
4228 Benning Road	NRHP Eligible		X
4236 Benning Road	NRHP Eligible		X
4270 Benning Road	NRHP Eligible		X
4274 Benning Road	NRHP Eligible		X
Totals		**0**	**17**

Source: NRHP, DCIHS, and Benning Road and Bridges Transportation Improvements EA Project Team
Note that this is a preliminary assessment, subject to consultation with Consulting Parties and the DC SHPO.

Figure 4-21: Oklahoma Avenue to Kingman Island, Build Alternative 2 (looking East)

Figure 4-22: Kingman Island to 36th Street, Build Alternative 2 (looking West)

Figure 4-23: Minnesota Avenue to 45th Street, Build Alternative 2 (looking East)

Below-Ground Historic Properties

Build Alternative 2 would not affect any recorded archaeological resources. Median rail construction has little potential to impact undocumented archaeological resources in the APE. Construction of the WMATA Blue Line in the 1970s would have compromised the integrity of any intact archaeological deposits within the LOD of Build Alternative 2 east of 42nd Street. West of 42nd Street, the LOD extends no more than six feet beyond the limits of the existing roadway or sidewalks in the area of Fort Mahan Park. Build Alternative 2 would also require traction power that would be provided by a TPSS facility located along the corridor. Eight potential locations have been identified as displayed in **Figure 4-1**. TPSS facilities outside an area documented to have been previously disturbed by construction (i.e., WMATA Blue Line, subsurface utilities) have the potential to impact undocumented archaeological resources. However, the TPSS locations are within DDOT right-of-way or within previously disturbed areas, therefore the potential of impacting any undisturbed archeological resources is very low. Nonetheless, a full assessment of the potential for Alternative 2 to impact undocumented archaeological resources will be deferred until project design has advanced sufficiently to better understand the location and extent of all earth-moving activities related to construction and use.

4.5.2.4 MINIMIZATION AND MITIGATION MEASURES

No adverse effect on historic properties has been identified for the No Build Alternative. To minimize or mitigate the potential effects of Build Alternative 1 and 2, the following measures are recommended.

Above-Ground Historic Properties

- Maintain fences at National Register eligible apartment buildings. If they must be moved, consult with DCSHPO.
- Move fire call box to a location near the existing.

Below-Ground Historic Properties

In the event that below-ground historic properties are identified in the APE for archaeology under Build Alternative 1 or 2 and project engineering concludes that avoidance is not feasible, measures would be taken to minimize and mitigate adverse impacts to the effected archaeological resource(s). Measures may include (but are not limited to) one or more of the following:

Preservation In-Place. If avoidance is not feasible, the first option to be considered is intentional site burial, or preservation-in-place. Preservation in-place is the preferred form of mitigation for archaeological resources because it retains the relationships between artifact and context, and may avoid conflicts with groups associated with the site. The decision to adopt this mitigation measure and the specific means by which it would be achieved, would be developed on a site-by- site basis in consultation with the DCSHPO. The site preservation plan would be prepared and designed according to the recommendations discussed in the National Park Service's *Technical Brief Number 5, Intentional Site Burial: A Technique to Protect Against National or Mechanical Loss* (Thorne 1991).

Among the requirements of an effective capping, the mechanical process of burying the site must be designed in a manner that the site matrix is protected during the placement process and during the operation of the Benning Road Streetcar. Project engineers can determine the construction equipment and fill material load limits that are allowable without causing compression or warpage of the artifact and feature components of the site.

If the project engineering determines that compression or warpage of the site is probable and the mitigation will not effectively mitigate adverse effects to the resource, additional mitigation, such as data recovery, would be necessary. Furthermore, if it is determined that the engineering requirements of the construction and operation of the Benning Road Streetcar at the location of the site prohibit the effective avoidance of the site, or if the surrounding conditions prohibit the protection or preservation of the archaeological components, the mitigation of data recovery is the other mitigation option available.

Performance tracking of this mitigation measure would be based upon successful implementation and the approval of the documentation by the SHPO and appropriate consulting parties.

Archaeological Monitoring of Construction. Ground-disturbing activities that have the potential to affect archaeological remains may occur in areas identified as sensitive for the presence of below-ground cultural resources. In areas where it would not be feasible to conduct identification

(Phase I) or evaluation-level (Phase II) archaeological testing, archaeological monitoring of construction would be a measure to minimize and mitigate adverse impacts to archaeological deposits.

If required, an archaeological monitoring plan would be developed prior to construction and submitted to the DCSHPO for review and concurrence. Appropriate details of the plan would be included in construction bid documents for contractors to be aware and anticipate the presence of archaeological monitors at specified locations on the construction site. Archaeological monitors would be professional archaeologists who would be present during all ground- disturbing construction activities occurring in native sediments/soils in the identified areas. The process for archaeological monitoring, presented in overview below, would be specified in detail in the ATP, developed in coordination with all consulting parties (noted above).

In the event that cultural resources are exposed during construction, following guidelines presented in the archaeological monitoring plan, the archaeological monitors would be empowered to temporarily halt activities in the immediate vicinity of the discovery while it is evaluated for significance. If, in consultation with the DCSHPO, it is determined that the archaeological resources is eligible for NRHP listing under Criterion D, a data recovery plan would be developed and implemented prior to the resumption of construction activities in the site area. If the resources are not NRHP eligible, then no further mitigation would be required.

Performance tracking of this mitigation measure would be based upon successful implementation and approval of the documentation by DCSHPO and appropriate consulting parties.

Data Recovery. If one or more NRHP-eligible below-ground historic properties are found in the APE for archaeology and cannot be avoided, a data recovery investigation would be the appropriate mitigation measure. A data recovery plan would be developed and submitted to the DCSHPO prior to implementation. The plan would describe in detail the excavation and analytical methodologies to be employed and the research issues to be addressed by the investigation, which would meet the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (NPS 1983). Construction activities within the effected site area would not begin until the data recovery field investigation is completed according to the data recovery plan and upon approval by DDOT and DCSHPO.

4.6 AESTHETICS AND VISUAL QUALITY

4.6.1 INTRODUCTION

The visual impacts assessment for the proposed project addresses potential changes to visual resources due to the proposed action and the anticipated viewer response. The visual impacts of a project are determined by assessing the visual resource change due to the project and predicting viewer response to that change. Visual resource change is the sum of the change in visual character and change in visual quality. The first step in determining visual resource change is to assess the compatibility of the proposed project with the visual character of the existing landscape. The second step is to compare the visual quality of the existing resources with projected visual quality after the project is constructed. The resulting level of visual impact is determined by combining the severity of resource change with the degree to which people are likely to oppose the change.

4.6.2 ENVIRONMENTAL CONSEQUENCES

Impacts to the visual resources identified in **Section 3.6** are summarized in **Table 4-21** below.

Table 4-21: Summary of Visual Impacts

Viewshed	Visual Character	Existing Visual Quality	Project Changes to Visual Quality	Resulting Visual Impact	
				Build Alternative 1	Build Alternative 2
1. Western Benning Road	Urban transportation features: roadway, streetlights, fencing, Metrorail bridge, buses.	Moderately Low	New power poles, streetcars & shelters	Low	Low
2. Kingman Park	Some park amenities coupled with urban transportation features: Kingman Lake bridge, Metrorail bridge, Pepco smoke stakes, and utility poles.	Moderate	New power poles, streetcars & shelters	Low	Low
3. Benning/ Minnesota Intersection	Urban transportation features: Benning Road Bridge, new mixed-use housing development, traffic signals, power poles.	Low	New power poles, streetcars & shelters	Low	Low
4. Minnesota Avenue Metrorail Station	Four-lane roadway, on-street parking, sidewalks, Minnesota Metrorail Station, mid-rise commercial buildings.	Moderately Low	New power poles, streetcars & shelters	No Change	No Change
5. Eastern Benning Road	Residential setting, tree-lines, four-lane Benning Road. Utilities are masked by mature trees lining the roadway.	Moderately High	New power poles, streetcars, shelters, loss of mature trees	Moderate	Moderate

Viewshed	Visual Character	Existing Visual Quality	Project Changes to Visual Quality	Resulting Visual Impact	
				Build Alternative 1	Build Alternative 2
6. Benning Road Metrorail Station	Commercial setting adjacent to four-lane roadway facility. View punctuated by telephone poles with vegetated Fort Mahan Park in the distance.	Low	New power poles, streetcars, shelters	Low	Low

Source: Benning Road and Bridges Transportation Improvements EA Project Team

4.6.2.1 No Build Alternative

Under the No Build Alternative, no changes would be made to the existing Benning Road and adjacent streetscape. Therefore, no change to visual resources and no impact on visual resources are anticipated.

4.6.2.2 Build Alternative 1 – Curbside Running

As shown in **Table 4-22**, the reconstruction of Benning Road and inclusion of streetcar and its associated propulsion system (wired or wireless) would result in some impacts to the existing viewsheds noted along the project corridor. Both Build Alternatives would induce the most change to the Eastern Benning Road viewshed. Through much of this portion of the study area, the curb face to curb face width of Benning Road is approximately 42-feet. In order to install appropriate lane widths for the streetcar and city buses, the curbs would need to be reconstructed approximately three feet back from their current location, thereby necessitating the removal of all existing mature trees along this portion of Benning Road.

As noted in **Section 3.6.3**, these trees currently help mask the existing overhead utilities along this section of the corridor. The loss of the tree canopy and the addition of new overhead utilities to provide streetcar propulsion would result in a change to the Eastern Benning Road viewshed until newly planted trees mature.

4.6.2.3 Build Alternative 2 – Median Running

The installation of Build Alternative 2 would result in the same impacts to visual resources as Build Alternative 1.

4.6.3 4.5.3 MINIMIZATION AND MITIGATION MEASURES

As appropriate, a Public Space Tree Permit required to plant, prune, or remove a tree within the DDOT right-of-way would be obtained from DDOT's Urban Forestry Administration (UFA) for any tree needed to be protected, removed, or relocated as part of the improvements proposed under Build Alternative 1 or 2. When trees must be removed, as identified for the Eastern Benning Road viewshed, they would be replaced in coordination with the UFA's Tree Planting Map.

4.7 NATURAL RESOURCES

4.7.1 GEOLOGY, TOPOGRAPHY AND SOILS

4.7.1.1 Introduction

This section assesses the potential effects of geology, topography, and soils at or near the project alternatives that were identified in **Section 3.7.1**.

4.7.1.2 Environmental Consequences

No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no impact to the existing geology, topography and soils is anticipated.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way. There would be no impact to the geology of Coastal Plain sediments, topography, or Urban Land soil complexes by the construction of Build Alternative 1. Further, the topography within the DDOT right-of-way of 0 to 6 percent would not impede the construction of the streetcar or the other improvements proposed as part of Build Alternative 1.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way. No impact to the existing geology, topography, and soils is anticipated.

4.7.1.3 Minimization and Mitigation Measures

No impact has been identified for any of the alternatives; therefore no minimization or mitigation measures are proposed.

4.7.2 SURFACE WATER RESOURCES

4.7.2.1 Introduction

This section assesses the potential effects to Waters of the U.S. (WOUS), including wetlands as defined in 40 CFR 230.3(s), Navigable Waters of the United States as defined in 33 CFR 2.36, and regulated floodplains at or near the project alternatives identified in **Section 3.7.2**.

4.7.2.2 Environmental Consequences

No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no impact to WOUS and wetlands, navigable waterways, and 100- and 500-year floodplains is anticipated.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way. Therefore, no impact to WOUS and wetlands, navigable waterways, and 100- and 500-year floodplains are anticipated.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way. No impact to WOUS and wetlands, navigable waterways, and 100- and 500- year floodplains is anticipated.

4.7.2.3 Minimization and Mitigation Measures

No impact has been identified for any of the alternatives; therefore no minimization or mitigation measure is proposed.

4.7.3 WILDLIFE INCLUDING THREATENED AND ENDANGERED SPECIES

4.7.3.1 Introduction

This section assesses the potential effects to terrestrial species observed at or near the project alternatives identified in **Section 3.7.3**.

4.7.3.2 Environmental Consequences

No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no impact to wildlife habitat, including the Anacostia Watershed's remaining forested area in the study area, is anticipated. No federally-listed threatened or endangered species or habitat exists within the study area. The U.S. Fish and Wildlife Service (USFWS) was consulted and has confirmed that no other proposed or federally listed endangered or threatened species are known to exist within the project area (LaRouche, 2014). Therefore, it is not expected that this project would have any impact on protected species and no further coordination under Section 7 of the Endangered Species Act is required.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way. The USFWS was consulted and has confirmed that no other proposed or federally listed endangered or threatened species are known to exist within the project area (LaRouche, 2014). Therefore, it is not expected that this project would have any impact on protected species and no further coordination under Section 7 of the Endangered Species Act is required. Therefore, no impact to wildlife habitat or species is anticipated.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way. The USFWS was consulted and has confirmed that no other proposed or federally listed endangered or threatened species are known to exist within the project area (LaRouche, 2014). Therefore, it is not expected that this project would have any impact on protected species and no further coordination under Section 7 of the Endangered Species Act is required. Therefore, no impact to wildlife habitat or species is anticipated.

4.7.3.3 Minimization and Mitigation Measures

No impacts to wildlife habitat or species have been identified for any of the alternatives; therefore no minimization or mitigation measure is proposed.

4.7.4 VEGETATION

4.7.4.1 Introduction

This section assesses the potential effects to native and planted vegetation, and invasive species, observed at or near the project alternatives identified in **Section 3.7.4**.

4.7.4.2 Environmental Consequences

No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no impact to native and planted vegetation, and invasive species is anticipated.

Build Alternative 1 – Curbside Running

Improvements included in Build Alternative 1 would not extend outside the DDOT right-of-way. However, some or all of approximately 175 street trees within the Benning Road right-of-way would need to be removed or relocated due to design and construction activities related to Build Alternative 1. No impact to the tracts of natural vegetation that occur along the banks of the Anacostia River and Fort Mahan Park is anticipated.

Build Alternative 2 – Median Running

Similar to Build Alternative 1, improvements included in Build Alternative 2 would not extend outside the DDOT right-of-way, but approximately 175 street trees along Benning Road would need to be removed or relocated due to design and construction activities. No impact to the tracts of natural vegetation that occur along the banks of the Anacostia River and Fort Mahan Park is anticipated.

4.7.4.3 Minimization and Mitigation Measures

As appropriate, a Public Space Tree Permit required to plant, prune, or remove a tree within the DDOT right-of-way would be obtained from UFA for any tree needed to be protected, removed or relocated as part of the improvements proposed under Build Alternative 1 and 2. Where possible, tree protection zones would be created during construction to avoid impacts and protect street trees along Benning Road; when trees must be removed, they would be replaced in coordination with UFA's Tree Planting Map.

4.8 UTILITIES

4.8.1 INTRODUCTION

This section assesses the potential effects to utilities at or near the project alternatives identified in **Section 3.8**.

4.8.2 ENVIRONMENTAL CONSEQUENCES

4.8.2.1 No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no impact to utilities is anticipated.

4.8.2.2 Build Alternative 1 – Curbside Running

Construction of any new track for a proposed streetcar along Benning Road would affect existing utilities in the project corridor. In an effort to minimize future disruptions to existing utilities and the proposed streetcar line, an inventory was taken to identify potential conflicts between existing utilities and the proposed streetcar alignments. An existing utility is considered to be in conflict with the streetcar alignment if the utility runs parallel to and beneath the streetcar alignment or if the utility traverses (i.e., runs perpendicular to) the streetcar alignment within a nominal depth of 30 inches of the track. For utilities that do not meet these two conditions yet fall within a three-foot buffer of the edge of the track slab, protection measures may be required. To consider both direct conflicts with utilities and instances when protection measures are required, all utilities falling within a "buffer" centered along the center line of each proposed inbound and outbound streetcar alignment were identified. The width of the buffer is equal to the width of the track slab plus three feet on each side of the track slab, as seen in **Figure 4-24**.

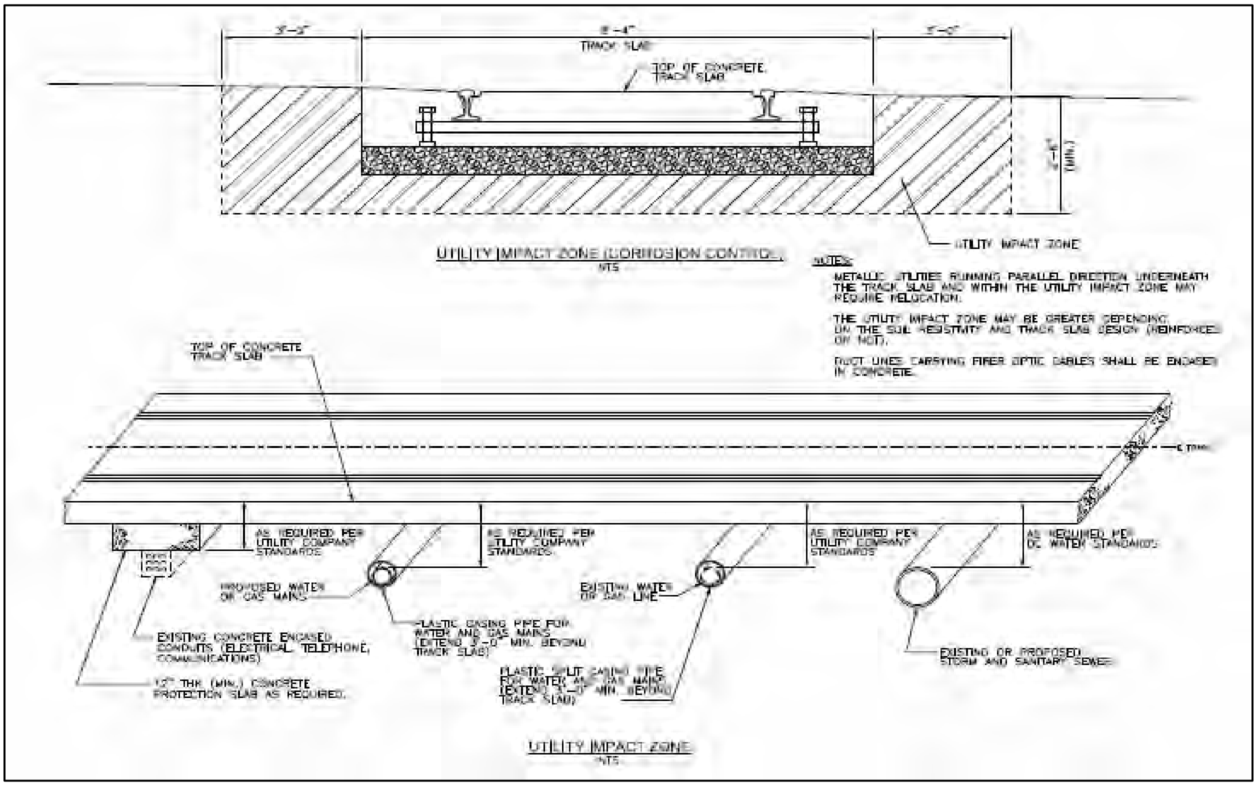
Build Alternative 1 would require relocating underground gas, electric, water, telephone, and sewer lines that run beneath the track slab. Existing utilities on the Kingman Island Bridge and the Anacostia River Bridge would require temporary support and reattachment as the deck is replaced to accommodate embedded track. Reconstruction of the Viaduct Bridge would impact utilities carried along the existing structure. In addition, utility poles with aerial facilities, street lights, and traffic signals would require relocation or replacement.

4.8.2.3 Build Alternative 2 – Median Running

Utility impacts for the median running alignment are similar to Build Alternative 1. Build Alternative 2 would also require relocating underground gas, electric, water, telephone, and sewer lines that run beneath the track slab. Existing utilities on the Kingman Island Bridge and the Anacostia River Bridge would require temporary support and reattachment as the deck is replaced to accommodate embedded track. Reconstruction of the Viaduct Bridge would impact utilities carried along the existing structure. However, the median alignment would have fewer overhead utility impacts.

In addition to relocating existing utilities to make room for streetcar tracks, new utilities would be needed to support streetcar system operations. To facilitate the new streetcar utilities, existing utilities may be in conflict or would require connection to proposed streetcar infrastructure. Utilities ranging from train control, signals, communication, power, drainage, and lighting are necessary regardless of alignment.

Figure 4-24: Utility Impact Zone



Source: DDOT Streetcar Standards

4.8.3 MINIMIZATION AND MITIGATION MEASURES

Care would be taken during construction activities so as to avoid all underground utilities that do not require relocation. Each of the respective utility agencies would be consulted early in design to determine exactly where, and to what depth the utilities are buried. Areas would then be marked off and carefully excavated to ensure utilities are not accidentally damaged during construction. DDOT would consult with all utility companies to determine how utility poles and other above-ground utilities in the study area would be impacted during construction or with project implementation. Utilities determined to be damaged would be repaired prior to construction.

4.9 HAZARDOUS MATERIALS

4.9.1 INTRODUCTION

This section identifies and assesses the potential effects on hazardous waste and contaminated material sites at or near the project alternatives.

4.9.2 ENVIRONMENTAL CONSEQUENCES

A total of 97 properties with suspected hazardous or contaminated material were identified as Recognized Environmental Concerns (RECs) within the study corridor. **Appendix I** provides detailed information of each REC: name, physical address, regulatory database reference, description of suspected contamination, and map identification number.

RECs within the limits of disturbance for the Build Alternatives are of the greatest concern. RECs located further away from the limits of disturbance with no documentation of a contaminant release may be considered areas of moderate risk, low risk, or no concern. In addition, REC sites where contamination has been documented but is no longer a high concern because of past site cleanup activities may also be considered low risk or no concern.

High-risk RECs within the limits of disturbance, with documented contaminant releases and undergoing current site clean-up activities are listed in **Table 4-22** and shown on **Figure 4-25**. These RECs are considered areas of high risk for potential impact due to the project.

In accordance with the DDOT *Design and Engineering Manual*, subsurface disturbance of the existing road and infrastructure alignment (e.g., underground utilities) at all REC sites should be evaluated during design and monitored during construction to further assess potential impacts from contaminated or hazardous materials.

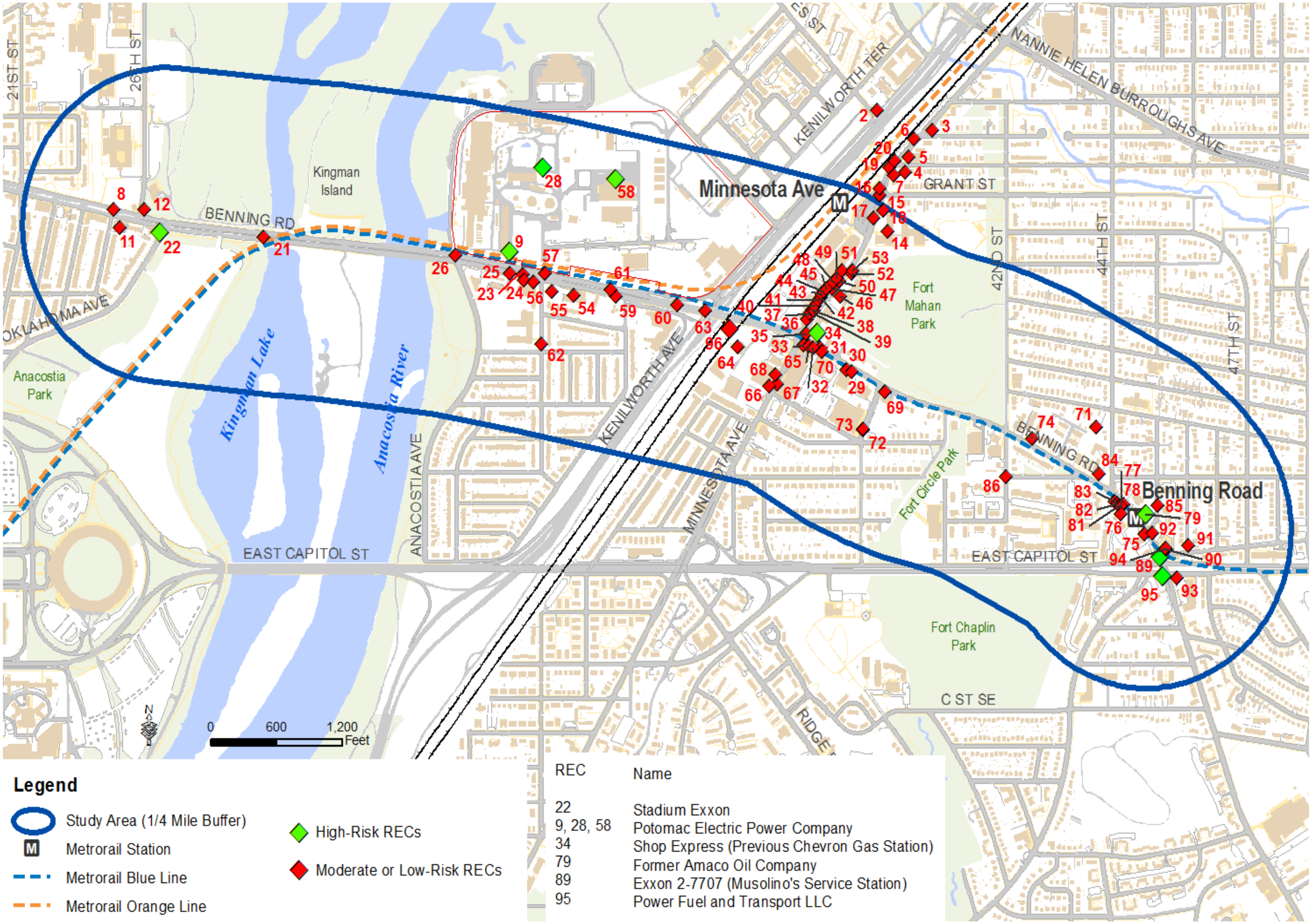
By utilizing the existing roadways and infrastructure, less intrusive subsurface construction activities are anticipated for both Build Alternatives. Piers for the new Viaduct Bridge would be located in the CSX Benning Rail Yard and DC-295 right-of-way. Environmental concerns within railroad right-of-way, particularly rail yards, often include contamination from wood treatment chemicals, application of pesticides and herbicides, and releases from hazardous substances and petroleum products transported by rail. A Phase II ESA for this moderate-risk REC should be completed prior to construction and should include soil and groundwater sampling and analysis.

Table 4-22: RECs with Potential High-Risk for Project Impacts

REC ID	REC Name	REC Address	Summary of Contamination
22	Stadium Exxon	2651 Benning Road	An open and former Leaking Underground Storage Tank (LUST) case exists at this site. A release reported in 1994 indicates antifreeze (ethylene glycol) was continually dumped on this property and in the street for over a year.
9, 28, 58	Potomac Electric Power Company	3400 Benning Road	Between 1985 and 2003, six documented releases of polychlorinated biphenyls into the environment were reported at Pepco's facility. PEPCO is conducting site investigation under a Consent Decree with the District of Columbia. USTs and historic contaminant releases have been documented at the property as detailed in **Appendix I**.
34	Shop Express (Previous Chevron Gas station)	3900 & 3908 Benning Road	An open LUST case exists at this site as a result of a gasoline release in 2008.
79	Former Amoco Oil Company (also listed as Jessie's Service Station)	4430 Benning Road	An open LUST case exists at this site resulting from a gasoline UST closure. One-500 gallon gasoline and five-1,000 gallon gasoline USTs were reported as permanently out of use at the site. The property was used as a gasoline/service station from at least 1940 through 1964.
89	Exxon Mobil Gas Station	4501 Benning Road	An open and former LUST case exists at this site. Records indicate two-8,000 gallon gasoline and one-10,000 gallon gasoline USTs currently in use on the property. One 1,000 gallon waste oil UST was identified on the property. The property was reported as a gasoline/service station from at least 1940 through the present time. A closed LUST case for soil and groundwater contamination from a gasoline UST.
95	Power Fuel & Transport LLC	4519 Benning Road	An open LUST case exists at this site. Records indicate one LUST exists with soil and groundwater impacts.

Sources: 2013 List of District Open LUST-Voluntary Remediation Action Program (VRAP) Cases; 2012 List of Federally Regulated Open LUST Cases (Petroleum Contaminated Sites-Not Heating Oil); and 2011 List of District Regulated Open LUST Cases (Heating Oil Contaminated Sites).

Figure 4-25: REC Sites



Source: Benning Road and Bridges Transportation Improvements EA Project Team

4.9.2.1 No Build Alternative

The No Build Alternative would have no impact on and would not exacerbate any areas of potential or known hazardous or contaminated materials concerns identified during this assessment, or areas of concern that may not currently be known to exist.

4.9.2.2 Build Alternative 1 – Curbside Running

Build Alternative 1 is not anticipated to result in long-term or permanent impacts related to RECs due to risk mitigation and engineering controls and measures that would be undertaken, if necessary, during construction. Construction impacts from REC sites are most likely to be encountered during construction activities where documented or undocumented hazardous materials could be uncovered.

Less intrusive subsurface construction activities would include the construction of new shelters and platforms built at-grade or above-grade within existing roadway right-of-way. More intrusive subsurface excavations would include the potential relocation of underground utilities, construction of vaults for traction power, and the replacement of bridge piers at the Viaduct Bridge.

4.9.2.3 Build Alternative 2 – Median Running

Build Alternative 2 is not anticipated to result in long-term or permanent impacts related to RECs due to risk mitigation and engineering controls and measures that would be undertaken, if necessary, during construction. Construction impacts from REC sites are most likely to be encountered during construction activities where documented or undocumented hazardous materials could be uncovered.

Less intrusive subsurface construction activities would include the construction of new shelters and platforms built at-grade or above-grade within existing roadway right-of-way. More intrusive subsurface excavations would include the potential relocation of underground utilities, construction of vaults for traction power, and the replacement of bridge piers at the Viaduct Bridge.

4.9.3 MINIMIZATION AND MITIGATION MEASURES

A Phase II ESA for high-risk to moderate-risk RECs should be completed prior to construction where substantial soil disturbance is planned. The investigation should include soil and groundwater sampling and analysis.

4.10 NOISE AND VIBRATION

4.10.1 INTRODUCTION

This section describes noise and vibration impacts resulting from the project. Long-term operational impacts were evaluated using characteristics of the proposed transit service, such as headway times, speeds and warning bells. The FHWA developed the noise regulations as required by the Federal-Aid Highway Act of 1970 (Public Law 91-605, 84 Stat. 1713). The regulation, 23 CFR 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise, applies to highway construction projects where a State department of transportation has requested Federal funding for participation in the project. The regulation requires the highway agency to investigate traffic noise impacts in areas adjacent to federally-aided highways for proposed construction of a highway on a new location or the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. If the highway agency identifies impacts, it must consider abatement. The highway agency must incorporate all feasible and reasonable noise abatement into the project design. FHWA Noise regulations, classify projects in three Types:

4.10.1.1 Type I Project.

1. The construction of a highway on new location; or,
2. The physical alteration of an existing highway where there is either:
   i. Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
   ii. Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,
3. The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
4. The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
6. Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
7. The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.
8. If a project is determined to be a Type I project per § 772.5 then the entire project area as defined in the environmental document as a Type I project.

Type II Project. A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e).

Type III Project. A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

None of the alternatives (No Build or the two Build Alternatives) include construction of a highway on a new location or the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. Therefore, the Benning Road and Bridges Transportations Improvements project meets the requirements of a Type III project per FHWA Traffic Noise regulations and does not require a noise analysis per FHWA requirements. However, in order to provide a comprehensive analysis of noise, DDOT and FHWA decided to use FTA noise analysis guidelines to analyze any noise related issues.

A noise and vibration assessment was prepared in accordance with NEPA and the guidelines set forth by FTA's *Transit Noise and Vibration Impact Assessment* (FTA, May 2006). The noise analysis based on FTA regulations determined that project noise levels from streetcar operations under the Build Alternatives are predicted to be well below the existing ambient noise levels due to the slower travel speeds. The details of the analysis are provided in **Appendix J**.

4.10.2 ENVIRONMENTAL CONSEQUENCES

The No Build Alternative would not introduce new sources of noise or vibration from the project, and as a result, no noise or vibration impacts are expected under the No Build Alternative. In most cases, project noise levels from streetcar operations under Build Alternative 1 are predicted to be well below the existing ambient noise levels due to the slower travel speeds. Similarly, project noise levels from streetcar operations under Build Alternative 2 are predicted to be lower than Build Alternative 1 due to the greater distance between the source and the receptors.

4.10.2.1 No Build Alternative

The No Build Alternative would not introduce new sources of noise or vibration. As a result, no noise impacts or vibration impacts are expected under the No Build Alternative.

4.10.2.2 Build Alternative 1 – Curbside Running

Under Build Alternative 1, exceedances of the FTA *severe* criteria are predicted at four residences (Category 2 land uses) due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA *moderate* criteria are also predicted at nine other residences under Build Alternative 1. Exceedances of the FTA *frequent* vibration criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 1 alignment. Noise and vibration impacts would also be associated with the construction of the project. Project noise levels from streetcar operations under Build Alternative 1 are predicted to be well below the existing ambient noise levels due to the slower travel speeds.

Since many of the noise-sensitive sites for the project are residences and apartments, the Ldn descriptor was used to reflect the particularly heightened sensitivity to nighttime noise. Predicted noise levels under Build Alternative 1 are shown in **Table 4-23**. The table compares the existing noise levels of representative receptor locations to the noise levels predicted for Build Alternative 1. The Ldn day-night noise levels at residences along the proposed Build Alternative 1 alignment are predicted to range from 53 dBA at Receptor M1 (residences along 34th Street) to 59 dBA at Receptor M2 (residences along Benning Road). Neither of these noise levels is predicted to exceed the FTA impact criteria.

Table 4-23: Predicted Noise Levels at Select Receptors for Build Alternative 1 (dBA)

ID	Receptor Description	FTA Cat.	Noise		FTA Criteria		
			Existing	Build	Moderate	Severe	Impact
M1	Residences adjacent to the River Terrace Elementary School, 34th Street	3	65	53	61	66	No
M2	Residences, Benning Road at 41st Street opposite Fort Mahan Park	2	71	59	65	70	No

Source: Benning Road and Bridges Transportation Improvements EA Project Team, October 2014

As shown in **Table 4-24**, the maximum vibration levels using the H Street study information along the proposed Build Alternative 1 are predicted to range from 58 VdB at Receptor M1 to 75 VdB at Receptor M2. The default FTA ground-surface vibration levels are predicted to range from 67 VdB at Receptor M2 to 68 VdB at Receptor M1. The project vibration level at Receptor M2 is predicted to exceed the FTA impact criterion of 72 VdB using the H Street study data.

Table 4-24: Predicted Vibration Levels at Select Receptors for Build Alternative 1 (VdB)

ID	Receptor Description	FTA Cat.	Build Alternative 1		FTA Criteria	
			H St Report	Default FTA	Frequent	Impact
M1	Residences adjacent to the River Terrace Elementary School, 34th Street NE	3	58	68	72	No
M2	Residences, Benning Road at 41st Street opposite Fort Mahan Park	2	75	67	72	Yes (H St)

Source: Benning Road and Bridges Transportation Improvements EA Project Team, October 2014

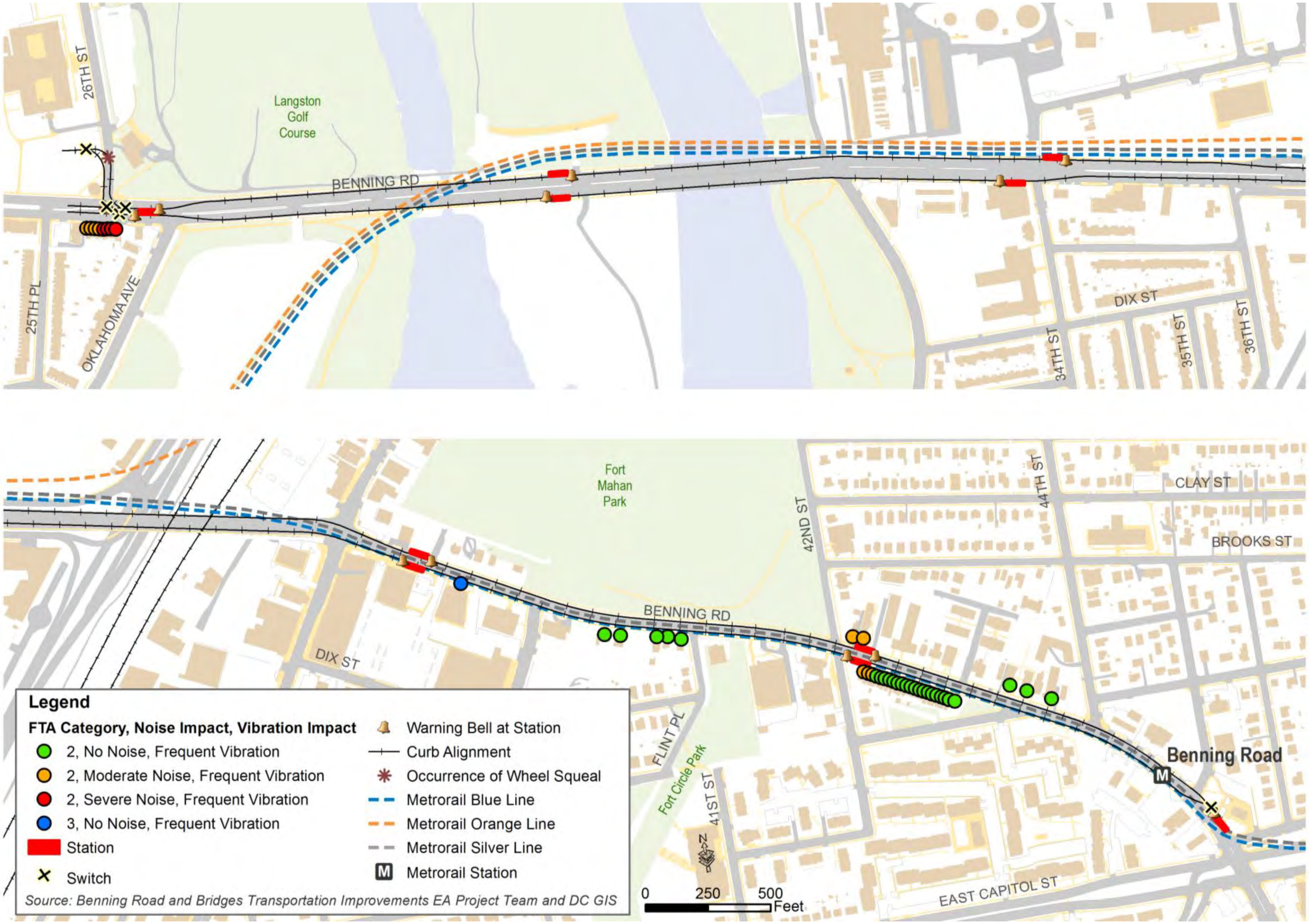
As shown in **Table 4-25**, corridor wide, however, exceedances of the FTA *severe* impact criteria are predicted at four residences (or FTA Category 2 land uses) in the vicinity of the track switches at the curve for the 26th Street Car Barn. Additionally, exceedances of the FTA moderate impact criteria are also predicted at nine other residences under Build Alternative 1 (four at the Car Barn track switches and five near the 42nd Street station due to rail transit idling). No exceedances of the FTA noise impact criteria are predicted at any Category 3 land uses. Corridor wide exceedances of the FTA *frequent* impact criteria are predicted at 40 residences and one institutional receptor (Dorothy I. Height/Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 1 alignment, as shown in **Table 4-25**. The predicted noise and vibration impacts for receptors along the Build Alternative 1 alignment are shown in **Figure 4-26**.

Table 4-25: Total Number of Noise and Vibration Impacts Predicted for Build Alternative 1

Metric Cat.	Noise Impacts			Vibration Impacts	
	No Impact	Moderate	Severe	Per H St Report	Per Default FTA
2	164	9	4	40	6
3	12	0	0	1	0

Source: Benning Road and Bridges Transportation Improvements EA Project Team

Figure 4-26: Build Alternative 1 Noise and Vibration Modeling Results



Source: DCGIS, Benning Road and Bridges Transportation Improvements EA Project Team

4.10.2.3 Build Alternative 2 – Median Running

Under Build Alternative 2, exceedances of the FTA *severe* criteria are predicted at four residences (Category 2 land uses) due to track switches for the 26th Street track to the Car Barn. Additionally, exceedances of the FTA *moderat*e impact criteria are also predicted at five other residences under Build Alternative 2 (four at the Car Barn track switches and one near the 42nd Street station due to rail transit idling). Exceedances of the FTA *frequent* vibration criteria are also predicted at 20 residences and one institutional receptor (Dorothy I. Height/ Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 2 alignment. Noise and vibration impacts would also be associated with the construction of the project. Project noise levels from streetcar operations under Build Alternative 2 are predicted to be lower than Build Alternative 1 due to the greater distance between the source and the receptors.

Since many of the noise-sensitive sites for this project are residences and apartments, the Ldn descriptor was used to reflect the particularly heightened sensitivity to nighttime noise. Predicted noise levels for Build Alternative 2 are shown in **Table 4-26**. The table provides noise levels for representative receptor locations along the proposed Build Alternative 2 alignment in comparison to existing conditions. As shown in **Table 4-26**, the Ldn day-night noise levels at residences for Build Alternative 2 are predicted to range from 53 dBA at Receptor M1 (residences along 34th Street) to 58 dBA at Receptor M2 (residences along Benning Road). Neither of these noise levels is predicted to exceed the FTA impact criteria.

Table 4-26: Predicted Noise Levels at Select Receptors for Build Alternative 2 (dBA)

ID	Receptor Description	FTA Cat.	Noise		FTA Criteria		
			Existing	Build	Moderate	Severe	Impact
M1	Residences adjacent to the River Terrace Elementary School, 34th Street	3	65	53	61	66	No
M2	Residences, Benning Road at 41st Street opposite Fort Mahan Park	2	71	58	65	70	No

Source: Benning Road and Bridges Transportation Improvements EA Project Team, October 2014

As shown in **Table 4-27**, the maximum vibration levels using the H Street study information along Build Alternative 2 are predicted to range from 57 VdB at Receptor M1 to 72 VdB at Receptor M2. The default FTA ground-surface vibration levels are predicted to range from 67 VdB at Receptor M2 to 68 VdB at Receptor M1. The project vibration level at Receptor M2 is predicted to exceed the FTA impact criterion of 72 VdB using the H Street study data.

Table 4-27: Predicted Vibration Levels at Select Receptors for Build Alternative 2 (VdB)

ID	Receptor Description	FTA Cat.	Build Alternative		FTA Criteria	
			H St Report	Default FTA	Frequent	Impact
M1	Residences adjacent to the River Terrace Elementary School, 34th Street	3	57	68	72	No
M2	Residences, Benning Road at 41st Street opposite Fort Mahan Park	2	72	67	72	Yes (H St)

Source: Benning Road and Bridges Transportation Improvements EA Project Team, October 2014

As shown in **Table 4-28**, corridor wide, however, exceedances of the FTA *severe* noise impact criteria under are predicted at four residences (or FTA Category 2 land uses) in the vicinity of the track switches at the curve for the 26th Street Car Barn. Additionally, exceedances of the FTA *moderate* impact criteria are also predicted at five other residences under Build Alternative 2 (four at the Car Barn track switches and one near the 42nd Street station due to bell ringing). No exceedances of the FTA noise impact criteria are predicted at any Category 3 land uses under Build Alternative 2. Exceedances of the FTA *frequent* vibration criteria are also predicted at 20 residences and one institutional receptor (Dorothy I. Height/ Benning Neighborhood Library) along Benning Road less than 50 feet from the proposed Build Alternative 2 alignment, as shown in **Table 4-28**. The predicted noise and vibration impacts for Build Alternative 2 are shown graphically in **Figure 4-27**.

Table 4-28: Total Number of Noise and Vibration Impacts Predicted for Build Alternative 2

Metric Cat.	Noise Impacts			Vibration Impacts	
	No Impact	Moderate	Severe	Per H St Report	Per Default FTA
2	168	5	4	20	6
3	12	0	0	1	0

Source: Benning Road and Bridges Transportation Improvements EA Project Team, October 2014

4.10.3 MINIMIZATION AND MITIGATION MEASURES

Since operational noise and vibration impacts are predicted under both Build Alternatives, an evaluation of potential mitigation measures is required. However, before any noise or vibration control measures are committed to, additional evaluations are recommended to verify or dismiss the predicted impacts. For example, vibration measurements could be conducted along the recently constructed initial operating segment (specifically at track switches) to document the actual levels. This empirically collected data could then be used to validate the current FTA prediction model to verify or dismiss the predicted impacts.

Noise impacts due to track switches may be eliminated or reduced in severity by installing “spring frogs”, pointless switches or other controls (such as a “well-designed flange-bearing frog” as recommended in the H Street study) that would eliminate the gap in the rail and thereby the impulsive or impact noise from the steel wheel striking the rail gap. These control measures would reduce noise levels due to this source approximately 6 dBA.

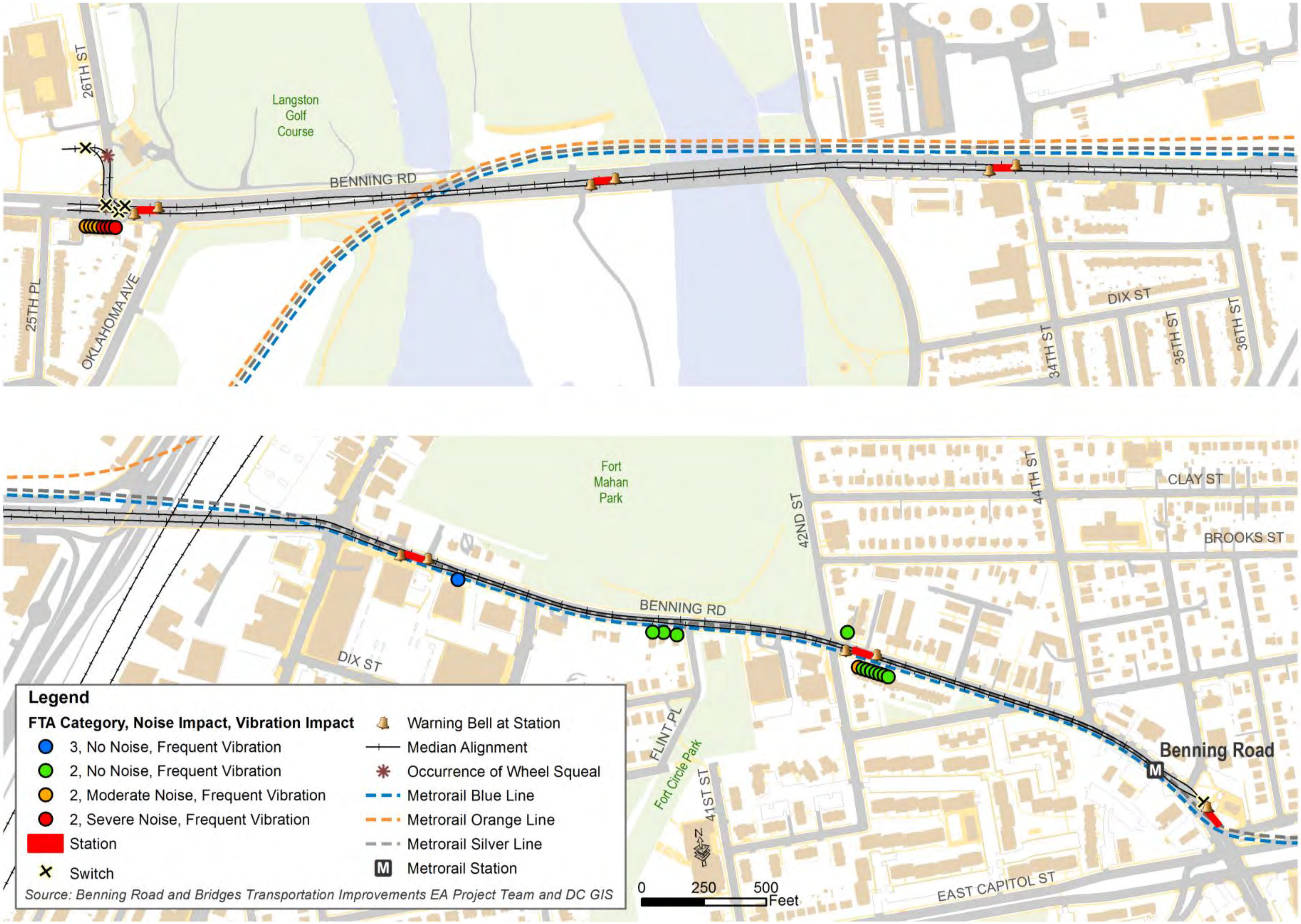
Noise impacts due to potential wheel squeal may be eliminated or reduced in severity by increasing the radius of the track curves, applying slip-stick modifiers to “grease” the contact points between the steel wheels and the steel rail heads or to procure streetcar vehicles that can operate effectively along tracks with radii less than 100 feet without causing wheel squeal to occur. These control measures would reduce noise levels due to this source approximately 10 dBA.

Vibration impacts due to streetcar passbys may be eliminated by applying slower train speeds (e.g., less than 25 mph) particularly in the vicinity of residences less than 50 feet from the proposed track alignment. Other vibration control measures include ballast mats (or other resilient material that would “decouple” the embedded track from the underlying track bed) as well as the aforementioned noise control measures at switches (e.g., installation of spring frogs, pointless switches, and flange-bearing frogs). These control measures would reduce vibration levels due to this source approximately 10 VdB.

Noise impacts due to rail transit idling at stations may be eliminated or reduced in severity by integrating noise barriers or shrouds into the station structure. Alternative measures where source controls are not practical or feasible include wayside treatments such as residential sound insulation, including acoustical windows and doors. These control measures would reduce noise levels due to this source approximately 7-10 dBA.

Similarly, appropriate noise and vibration control measures would be implemented by DDOT's contractors to minimize any potential impacts during construction activities. Proposed mitigation measures could include substituting equipment with lower noise and vibration levels or conducting a pre-construction survey of any buildings potentially susceptible to construction vibration. Implementation of proposed mitigation measures would ensure that potential impacts to sensitive resources would be reduced to a less than significant level.

Figure 4-27: Build Alternative 2 Noise and Vibration Modeling Results



Source: DCGIS, Benning Road and Bridges Transportation Improvements EA Project Team

4.11 AIR QUALITY

4.11.1 INTRODUCTION

This section assesses the potential effects to air quality as a result of the project (see **Appendix K** for a detailed air quality analysis).

4.11.2 ENVIRONMENTAL CONSEQUENCES

4.11.2.1 No Build Alternative

The No Build Alternative is anticipated to have the same conditions described in existing conditions.

4.11.2.2 Build Alternative 1 – Curbside Running

Regional Conformity

Since the project is not considered to be of local air quality concern under 40 CFR 93.123(b)(1), no potential effects are expected on regional air quality. The project is included in the MWCOG 2014 CLRP and the 2015-2020 TIP. The project meets statutory and regulatory transportation conformity requirements without a hot-spot analysis and is not anticipated to add any additional emissions expected beyond the opening year conditions.

CO and PM2.5 Hot Spot Analysis

A hot spot screening analysis was conducted to demonstrate compliance with the NAAQS at the two most-congested intersections in the study area. Based on the hot spot analysis, 1-hour and 8-hour maximum concentrations of CO are provided in **Table 4-29.**

Under Build Alternative 1, traffic volumes in the study area would be expected to remain the same as under the No Build Alternative. Although congestion is expected to increase slightly due to the addition of the streetcar corridor through the intersections, the average intersection delay times are also only expected to increase slightly between the No Build and Build Alternatives. For example, the average AM peak-hour delay at the most congested intersection (Benning Road and East Capitol Street) is predicted to increase less than two percent between the No Build and Build Alternative. Therefore, the concentrations under Build Alternative 1 are expected to be essentially the same as under the No Build Alternative.

Table 4-29: 1-hour and 8-hour CO Concentrations at Key Congested Intersections

Site #	Location	1-Hour Maximum CO Concentration (in ppm)	8-Hour Maximum CO Concentration (in ppm)
Site 1	Benning Road and East Capitol Street	5.8	4.4
Site 2	Benning Road and Minnesota Avenue	4.9	3.7

Source: Benning Road and Bridges Transportation Improvements EA Project Team

No exceedances of the NAAQS of 35 ppm for one-hour CO or 9 ppm for 8-hour CO are predicted at any of the selected intersections. The reported concentrations for each intersection were predicted for the worst-case or most congested Build Alternative (Curbside or Median alternative) for each intersection.

Neither a qualitative nor a quantitative $PM_{2.5}$ hotspot analysis is required for this project since it is not a project of local air quality concern under 40 CFR 93.123(b)(1). The CAA Amendments and the transportation conformity requirements are met without a hotspot analysis since this project has been found not to be of air quality concern under 40 CFR 93.123(b)(1). Therefore, the project meets statutory and regulatory transportation conformity requirements for $PM_{2.5}$ without a hot-spot analysis.

4.11.2.3 Build Alternative 2 – Median Running

The air quality effects of Build Alternative 2 would be the same as Build Alternative 1, and no impact is anticipated.

4.11.3 MINIMIZATION AND MITIGATION MEASURES

No impact has been identified for any of the alternatives; therefore no minimization or mitigation measure is proposed.

4.12 ENERGY USE AND CLIMATE CHANGE

4.12.1 INTRODUCTION

This section assesses the potential effects of the proposed action on greenhouse gas emissions and the risks to transportation systems and services from climate change.

4.12.2 ENVIRONMENTAL CONSEQUENCES

4.12.2.1 No Build Alternative

The No Build Alternative would not result in reduced VMT, lower energy use, or reduction in greenhouse gas emissions.

4.12.2.2 Build Alternatives 1 and 2

Because climate change is a global issue and the emission changes due to the proposed action would be very small compared to global totals, greenhouse gas emissions were not estimated for individual alternatives.

According to initial projections in the *FTA Urban Circulator Grant Applicatio*n (DDOT, 2010) for this project, the proposed action would result in a reduction of approximately 640,000 VMT per year. Based on the estimated reduction in VMT, the resulting passenger vehicle emissions reductions as a result of the proposed action were estimated. **Table 4-30** lists the potential reductions in annual vehicle emissions of Carbon Monoxide (CO), Nitrous Oxide (NO_X), Volatile Organic Compounds (VOC), Particulate Matter (PM_{10}), and Carbon Dioxide (CO_2).

Table 4-30: Estimated Reductions in Vehicle Emissions (Tons Per Year)

Pollutant	Benning Road Streetcar Extension
CO	0.82
NO_X	0.79
VOC	0.04
PM_{10}	0.07
CO_2	305.00

Source: DDOT, FTA Urban Circulator Grant Application, 2010

One of the District's primary strategies to reduce greenhouse gas emissions is to provide choices for travel so that options other than single-occupant vehicle travel are available. Either of the alignment options for the proposed action would provide a transit travel-option that does not currently exist in the Benning Road corridor. The District identifies the Streetcar Program, including the Benning Road Streetcar Extension, as one of the transportation measures to be taken to address climate change. The District has the benefit of dense development, availability of mass transit, and walkable neighborhoods, which support efforts to reduce greenhouse gas emissions. Addition of streetcar and related improvements to the transportation options within the study area would support both national and District missions to reduce greenhouse gas emissions and VMT.

The proposed action would support existing and planned development, thereby encouraging higher-density land uses that would reduce VMT, and as a result, greenhouse gas emissions.

4.12.3 MINIMIZATION AND MITIGATION MEASURES

No impacts to energy use or climate change would occur as a result of the No Build Alternative, Build Alternative 1, or Build Alternative 2; therefore no minimization or mitigation measures are proposed.

4.13 CONSTRUCTION IMPACTS

4.13.1 INTRODUCTION

This section identifies and assesses the potential construction impacts of the proposed project alternatives.

4.13.2 ENVIRONMENTAL CONSEQUENCES

4.13.2.1 No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no construction impacts are anticipated.

4.13.2.2 Build Alternative 1 – Curbside Running

Neighborhoods and Community Resources

Neighborhood residents and commuters through the area would experience a temporary impact due to lane closures and delays during construction of the physical improvements associated with Build Alternative 1. Impacts due to construction are not expected to eliminate access to any residences, businesses, or community facilities.

Construction of the TPSS vaults along Benning Road would occur within DDOT right-of-way and allow the placement of public utilities on them. Installation of these facilities would not result in impacts to neighborhoods or community facilities.

Transportation and Traffic Operations

Traffic impacts due to the project's construction include extended travel times, reduced speed limits, and temporary elimination of on-street parking. Lane closures are also anticipated due to the reconstruction of the Viaduct Bridges over DC-295/CSX railroad tracks, streetcar track installation, and intersection improvements. As the project is constructed, one lane of traffic would be maintained on Benning Road in each direction, whether for roadway or bridge work. The roadway work would be constructed in three major stages to accommodate two-way traffic at all times. Pedestrian access and safe mobility would also be accounted for throughout construction. See **Appendix D** for a Maintenance of Traffic (MOT) concept plan. As the design of the project is advanced, a more detailed MOT plan and Maintenance of Access (MOA) plan would be developed based on the construction phasing for the project, which would be sequenced in a manner that maintains services of major transportation facilities while preserving access to adjacent bus stops, residences, businesses, and community facilities.

Parklands

The installation of the Kingman Island streetcar platform under Build Alternative 1 may result in temporary use of the Anacostia Riverwalk Trail adjacent to Benning Road during construction. Enhancing the shared-use path to accommodate the platform for streetcar users would require a temporary use during the construction period. The Anacostia Riverwalk Trail is a shared-use path owned and maintained by DDOT as a transportation facility for pedestrians and bicyclists. This trail is primarily used for transportation and is an integral part of the local transportation system and is therefore not considered a 4(f) property according to DDOT, the official with jurisdiction over this property.. Alterations to the trail at the platform location may include raising the profile of the trail in the platform area to allow easy access onto and off of the streetcars. DDOT is the jurisdiction with authority over the trail. The platform and the trail will remain under DDOT's ownership.

Utilities

Construction of any new track for a proposed streetcar along Benning Road would affect existing utilities in the project corridor. Build Alternative 1 would require relocating underground gas, electric, water, telephone, and sewer lines that run beneath the track slab. Existing utilities on the Kingman Island Bridge and the Anacostia River Bridge would require temporary support and reattachment as the deck is replaced to accommodate embedded track. Reconstruction of the

Viaduct Bridge would impact utilities carried along the existing structure. In addition, utility poles with aerial facilities, street lights, and traffic signals would require relocation or replacement.

Hazardous Materials

Construction impacts from potential hazardous or petroleum materials are likely where new roadway and infrastructure needs to be constructed. Documented or undocumented hazardous materials at REC sites at these locations may impact Build Alternative 1 where avoidance of the sites is not possible. Any significant subsurface disturbance of the existing road and infrastructure alignment (e.g., underground utilities) at REC sites should be evaluated during design and monitored during construction to further assess potential impacts from contaminated or hazardous materials. A more thorough review of RECs, where significant subsurface disturbance is planned, could be completed prior to construction, including investigating the soils and groundwater at the proposed areas of work.

Noise and Vibration

Noise levels from construction activities, although temporary, could be a nuisance at nearby sensitive receptors such as residences and schools. Noise levels during construction would vary depending on the types of construction activity and equipment used for each stage of work. Heavy machinery, the major source of noise in construction, would be constantly moving and not usually at one location for very long. For example, project construction activities would include embedding track, reconstructing bridges, relocating utilities, improving street intersections, constructing stations stops, and other ancillary facilities (i.e., overhead contact system [OCS] poles, TPSS, etc.).

Activities associated with construction staging and/or material lay down areas could result in adverse noise impacts if located in noise-sensitive areas. For that reason, noise-sensitive areas should be avoided to the maximum extent possible. Similarly, there would also be the potential for noise increases along detour routes and truck haul routes.

This analysis makes conservative assumptions regarding construction noise and vibration in order to ensure that potential maximum adverse impacts are analyzed and disclosed consistent with NEPA requirements. However, temporary noise and vibration impacts associated with construction would be refined in later stages of project design when a detailed construction plan is more fully developed.

The bulk of the construction would normally occur during daylight hours when some residents are not at home, when residents who are at home are less sensitive to construction activities, and when other community noise sources contribute to higher ambient noise levels. However, some construction activities may also occur during the nighttime and on weekends to complete the project sooner and reduce the overall duration of impact on the community.

Most construction activities are generally expected to last less than 6 months at any one location, depending on the type of activity, and the overall project construction period is expected to last approximately 36 months. During this timeframe, noise impacts are expected along the project, particularly at sensitive receptors adjacent to the alignment and facilities. Therefore, DDOT is committed to minimizing impacts by requiring construction contractors to implement appropriate noise control measures that would eliminate impacts and minimize extended disruption of normal activities.

Air Quality

Air quality impacts from equipment exhaust emissions and fugitive dust due to construction activities are possible, particularly on dry and windy days. Direct emissions from construction equipment are not expected to impact local air quality provided that all equipment is properly operated and maintained. If required, traffic management techniques are available during the construction period that would mitigate increased emissions from traffic congestion due to lane closures, detours, and construction vehicles accessing sites.

Potential fugitive dust impacts could be minimized through good "housekeeping" practices such as water sprays during demolition; wetting, paving, or landscaping exposed earth areas; covering dust-producing materials during transport; limiting dust-producing construction activities during high wind conditions; and providing street sweeping and tire washes for trucks leaving the site.

4.13.2.3 Build Alternative 2 – Median Running

Build Alternative 2 would have the same construction-related impacts as Build Alternative 1. However, Build Alternative 2 would have fewer overhead utility impacts.

4.13.3 MINIMIZATION AND MITIGATION MEASURES

Care would be taken during construction activities so as to avoid all underground utilities that do not require relocation. Each of the respective utility agencies would be consulted early in design to determine exactly where, and to what depth the utilities are buried. Areas would then be marked off and carefully excavated to ensure utilities are not accidentally damaged during construction. DDOT would consult with all utility companies to determine how utility poles and other above-ground utilities in the study area would be impacted during construction or with project implementation. Utilities determined to be damaged would be repaired prior to construction.

A Construction Management Plan would be prepared in compliance with the *DC Construction Management Manual* (DDOT, 2010) to minimize and mitigate the impacts of construction activity and would include the following:

- Identification of construction staging areas with ingress and egress points;
- Management of Traffic Plan, including alternate pedestrian routes and emergency vehicle movements;
- Transportation Management Plan;
- Hours of construction;
- Noise and Air Quality Management; and
- Hazardous Materials Management Plan.

4.14 INDIRECT EFFECTS

4.14.1 INTRODUCTION

This section identifies and assesses the indirect effects of the project alternatives. Indirect effects are those that may be caused by the proposed action but occur later in time or farther in distance, but are still reasonably foreseeable than the direct impacts discussed in previous sections of Chapter 4.

4.14.2 ENVIRONMENTAL CONSEQUENCES

4.14.2.1 No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no indirect effects are anticipated.

4.14.2.2 Build Alternatives 1 and 2

Socioeconomic Resources

The primary sources of potential indirect effects on socioeconomic resources would be from the development and redevelopment in the study area. However, redevelopment is already occurring along the corridor without the proposed action and would likely continue as a result of its proximity to employment centers and the Metrorail system, as evidenced by the new Minnesota-Benning Government Center which houses 450 employees of the DOES and the affordable mixed-use Park 7 development, and by other development projects currently planned or underway such as the Parkside development. Furthermore, the Benning Road corridor serves an area that the District has targeted for commercial and residential development. Districtwide and neighborhood plans have identified the need for investment in higher-capacity fixed-guideway transit along this corridor to support medium- to high-density mixed-use development within the core commercial areas.

The *FTA Urban Circulator Grant Application* for this project (DDOT, 2010) found that economic impacts of the project include the short-term increases in jobs and wages associated with project construction and the long-term jobs and income from on-going streetcar operations. The economic impacts analysis considers the direct impacts of employment for streetcar construction and operations as well as the indirect impacts on the economy and local jobs as the streetcar related wages are spent in the local economy. **Table 4-31** summarizes direct and indirect employment (expressed in jobs of one-year duration) sustained by the addition of the streetcar and resulting corridor development over a 50-year time span.

Table 4-31: Summary of Direct and Indirect Employment Sustained by Project

Type	Project Construction 2011-2012 (one-year duration)	Development Construction 2013-2029 (one-year duration)	Project Operations 2013-2062 (one-year duration)
Streetcar Construction-direct jobs	448		
Streetcar Construction-indirect jobs	408		
Streetcar Operation personnel-direct jobs			1,100
Streetcar Operation personnel-indirect jobs			350
Streetcar Operation non-personnel expenditures			700
Development Construction-direct jobs		556	
Development Construction-indirect jobs		1,207	
Increase in Occupied Commercial Development-direct jobs			8,508
Increase in Occupied Commercial Development-indirect jobs			14,120
TOTAL	856	1,763	17,128

Source: DDOT, FTA Urban Circulator Grant Application, 2010

Continued development and redevelopment of the Benning Road corridor may result in indirect effects associated with increased assessed land value and property premiums along the corridor. According to the District of Columbia's *Streetcar Land Use Study* (2012), the streetcar is projected to raise housing values and rents in neighborhoods along each line by roughly 5 percent to 12 percent. However, the size of the increase appears unlikely to cause widespread displacement or in other ways dramatically transform neighborhood character. In addition to the streetcar project however; the Office of the Deputy Mayor for Planning and Economic Development is developing many projects in Ward 7 that may also contribute to changes in land use and property values. Over time, property values could continue to increase as the corridor gains in attractiveness, and could result in a beneficial indirect effect on the local tax base.

Existing affordability measures in place by the District include an Assessment Cap Credit that caps assessed property value each year at a 10 percent increase to limit the increase of real property taxes for homeowners. This credit does not reduce the assessed value of the property on the tax roll or the assessment notice, but appears as an automatic credit against the real property tax bill. Further, pursuant to "Inclusionary Zoning Implementation" of Title 14 (Housing) of the District of Columbia Municipal Regulations, it is required that a certain percentage of units in a new development or a substantial rehabilitation that expands an existing building is set aside for affordable units in exchange for a bonus density. The District housing programs will continue to include policies and programs to support diversity and affordability for diverse populations.

Transportation

Mass Transit

The extension of streetcar included in Build Alternative 1 and Build Alternative 2 would provide high-capacity, high-quality and low cost transit service to District residents, workers, and visitors.

The Benning Road corridor is in need of additional transportation investment. Metrobus currently serves 18,000 passengers a day and is experiencing severe overcrowding in the corridor. The additional transit option proposed under Build Alternatives 1 and 2 would relieve crowding on Metrobus and Metrorail, connect activity centers, and facilitate transfers between modes. The corridor also serves an area that the District has targeted for commercial and residential redevelopment. District-wide and neighborhood plans have identified the need for investment in higher-capacity fixed-guideway transit in this area to support dense, mixed-use development and at the two emerging commercial nodes at Minnesota Avenue and East Capitol Street.

Pedestrian and Bicycle Network

The improvements proposed as part of Build Alternatives 1 and 2 would connect neighborhoods on the east side of the Anacostia with neighborhoods on the west by providing an attractive, walkable alternative for travelling short distances, and resulting in health benefits for the community.

Freight Rail Service

Bringing the existing freight corridor to current FRA standards would allow more freight traffic to pass through the region.

Additional Resources

Based on information provided in **Chapters 2** and **3**, no indirect effects were identified for any of the proposed alternatives for the following resources:

- Traffic;
- Parking and Private Driveway Access;
- Parklands;
- Cultural Resources;
- Aesthetics and Visual Resources;
- Geology, topography and soils;
- Surface water resources;
- Wildlife including threatened and endangered species;
- Vegetation;
- Utilities;
- Hazardous Materials;
- Air Quality; and
- Noise and Vibration.

4.14.3 MINIMIZATION AND MITIGATION MEASURES

To mitigate potential indirect and cumulative effects related to assessed land value and property premiums, the District of Columbia Office of Tax and Revenue provides an Assessment Cap Credit that caps assessed property value each year at a 10 percent increase to limit the increase of real property taxes for homeowners. This credit does not reduce the assessed value of the property on the tax roll or the assessment notice, but appears as an automatic credit against the real property tax bill.

Further, pursuant to "Inclusionary Zoning Implementation" of Title 14 (Housing) of the District of Columbia Municipal Regulations, it is required that a certain percentage of units in a new development or a substantial rehabilitation that expands an existing building is set aside affordable units in exchange for a bonus density.

4.15 CUMULATIVE EFFECTS

4.15.1 INTRODUCTION

This section identifies and assesses the cumulative effects of the project alternatives. A cumulative effect is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

4.15.2 ENVIRONMENTAL CONSEQUENCES

4.15.2.1 No Build Alternative

No changes are proposed as part of the No Build Alternative. Therefore, no cumulative effects are anticipated.

4.15.2.2 Build Alternatives 1 and 2

Socioeconomic Resources

The extension of streetcar service included in Build Alternatives 1 and 2 would create a permanent fixed-guideway transit investment that would enhance connectivity and mobility for the surrounding community, many of which are transit-dependent. This investment would support planned development and redevelopment along the corridor, while also potentially increasing the economic competitiveness of the existing activity center located around the intersection of Benning Road and Minnesota Avenue.

Residents in these corridors would benefit from reduced transportation costs and greater access to jobs. This could offset increased housing costs for some households. However, the District should continue working to ensure that affordable housing options and tax-exception programs are available to protect low income residents of the community from increased land values when appropriate.

While the proposed action may cause cumulative effects through improvements to transit service and mobility, it is important to note that transportation improvements are but one of the many factors that influence land use decisions and development patterns. Other factors that influence land use include the supply and demand for developable property (a fixed resource), institutional factors such as land-use controls (zoning and development regulations for example), and the economic health of the community. For development and redevelopment to occur, demand and supply for developable property, and institutional requirements must be compatible and present at the same time and place.

Transportation

Mass Transit

According to the *DC Streetcar System Plan* (DDOT, 2010), Metrorail will reach or exceed capacity in the near future. The proposed transit improvements included in Build Alternative 1 and Build Alternative 2, implemented in conjunction with the other streetcar lines of DDOT's proposed 37-mile Streetcar System, would provide core capacity relief to the Metrorail system.

Pedestrian and Bicycle Network

The pedestrian and bicycle improvements proposed as part of Build Alternatives 1 and 2 would provide a seamless connection for the neighborhoods on the east side of the Anacostia with an extensive pedestrian and bicycle network within the District. These improvements, in conjunction with the *moveDC Multimodal Long Range Plan* (DDOT, October 2014), would offer beneficial effects such as enhanced pedestrian and bicycle facilities and improved connectivity and mobility for the surrounding community.

Noise and Vibration

Noise levels within the study area would be somewhat increased by the presence of the project due to the operation of transit vehicles. Any other planned projects in the study area would also increase noise because they would more than likely result in increased travel and construction activities. However, no exceedances of the FTA's severe noise criteria are predicted using worst-case modeling assumptions. Since the project would provide an alternative source of transportation for many other planned projects as well as to other destinations in the area, the project should reduce the number of auto trips and the noise levels associated with those foregone auto trips. Therefore, the Benning Road and Bridges Transportation Improvements project would not contribute to adverse cumulative impacts and may provide a beneficial overall effect.

Air Quality

In accordance with the guidelines established to assess greenhouse gas emissions, such as the Council on Environmental Quality (CEQ), the project would be reasonably expected to slightly reduce greenhouse gas emissions. This reduction is due to several factors, such as the diversion of drivers to transit riders that would reduce the number of commuting passenger vehicles, reduced congestion along the project corridor due to the diversion of drivers to transit as well as car pool and other ride-sharing activities.

Additional Resources

Based on information provided in **Chapters 2** and **3**, no cumulative effects were identified for any of the proposed alternatives for the following resources:

- Traffic;
- Parking and Private Driveway Access;
- Freight Rail Service;
- Parklands;
- Cultural Resources;
- Aesthetics and Visual Resources;
- Geology, topography and soils;
- Surface water resources;
- Wildlife including threatened and endangered species;
- Vegetation;
- Utilities; and
- Hazardous Materials.

5 PUBLIC & AGENCY COORDINATION

Public and agency coordination for the Benning Road and Bridges Transportation Improvements Environmental Assessment (EA) was conducted for the project in accordance with the National Environmental Policy Act of 1969 (NEPA) and Section 106 of the National Historic Preservation Act (54 U.S.C. 300101 et seq.). This coordination served to help identify and resolve issues related to the proposed project. Federal and local agencies and the public were invited to review and comment on the project alternatives.

5.1 PUBLIC OUTREACH

The public was involved in an extensive public involvement process in 2012 as part of the *Benning Road Streetcar Extension Feasibility Study* (DDOT, 2013) and again in 2014 as part of the EA as described below.

5.1.1 PROJECT WEBSITE

In April 2014, a project website (http://www.benningproject.com) was launched to provide information on the project, NEPA and EA process, schedule, and to encourage interested parties to sign up for electronic updates and comment on the project. Following public meetings, meeting materials were posted online.

5.1.2 PROJECT NEWSLETTER

In September 2014, the project team distributed newsletters to Advisory Neighborhood Commissioners for ANCs 5D, 7C, 7D, 7E, and 7F, as well as Deanwood Civic Association, Deanwood Heights Main Streets, and Central Northeast Civic Association. The newsletter provided updates on the NEPA and Section 106 process, as well as information for upcoming public meeting milestones.

5.1.3 PUBLIC MEETING 1: PROJECT SCOPING

DDOT held the first public meeting from 6:30 pm to 8:00 pm on April 22, 2014 at the Department of Employment Services (DOES) Building located at 4058 Minnesota Avenue, NE. The DOES Building is an accessible and centrally located facility within the project study area. The purpose of the meeting was to:

- Introduce the Benning Road and Bridges Transportation Improvements project to the public;
- Discuss the NEPA and Section 106 process;
- Review findings on existing conditions (and alignments analyzed in the *Benning Road Streetcar Extension Feasibility Study*);
- Discuss and gather feedback on transportation issues and opportunities; and
- Gather input on the draft Purpose and Need.

During this 90 minute open house, attendees were given a four-page fold-over agenda that introduced the project, the project area, and provided a timeline for the NEPA Process and Section 106 Process.

There were 61 attendees who participated in the meeting. Written comment forms were available and representatives of the project team were available to answer questions at display boards. Public comments were recorded following the public meeting. Attendees communicated that there is a need for safety improvements at the intersection of Benning Road and Minnesota Avenue for all modes, suitable river crossings for pedestrians and bikes, congestion relief, commercial access, and neighborhood branding and conservation.

The meeting was advertised in the Washington Post Express and the Afro News, and flyers were distributed to community centers, churches, businesses, and at Minnesota Avenue and Benning Road Metrorail Stations. Email notifications were sent to Advisory Neighborhood Commissioners for ANCs 5D, 7C, 7D, 7E, and 7F, as well as Deanwood Civic Association, Deanwood Heights Main Streets, and Central Northeast Civic Association. Email notifications were also sent to 700 email addresses gathered from former DC Streetcar projects. Lastly, 5,000 postcard invitations were sent to residences and businesses in proximity to the project area by USPS Every Door Direct Mailing (EDDM) service, and 5,035 local phone numbers were contacted via Switch Board Communication Services to share the announcement.

Following the public meeting, DDOT prepared 15 preliminary alternatives to address issues and opportunities identified by the public.

5.1.3.1 Title VI Statistics for Public Meeting 1

Title VI questionnaires were distributed at the sign-in table. Of the 61 attendees that attended the public meeting, 37 people completed the form. Below is a brief summary of Title VI questions and responses.

Ward:

83% Seven

10% Five

3% Three

3% One

Gender:

38% Male

62% Female

General Race/ Ethnic Identification Categories (*Please circle as many may apply*):

76% African American

17% Caucasian

3% Asian/Pacific Islander

3% Hispanic

Age:

59% Above 50 years

25% 36-50

16% 26-35

Primary language spoken at home:

92% English

8% Spanish

How did you find out about this meeting? (Please circle all that apply):

50% Flyer

19% Listserv/Blog

8% Project Website

8% Advisory Neighborhood Commission (ANC)

5% Other/Word of Mouth, Neighbor, Robocall

2% DDOT Website

2% Newspaper

Other: Project representatives

How did you travel to this meeting? (Please circle all that apply):

50% Car

28% Walked

11% Metrorail

5% Bus

5% Bicycle

Did you find the meeting location to be accessible? (For purposes of location or disability):

97% Yes

3% No (If no, please explain): “Need more posters to remind people.”

5.1.4 PUBLIC MEETING 2: ALTERNATIVES DEVELOPMENT

DDOT held a second public meeting from 6:00 pm to 7:30 pm on May 28, 2014 at the DOES Building located at 4058 Minnesota Avenue, NE. The purpose of the meeting was to:

- Provide information about the NEPA and Section 106 process;
- Receive feedback on the 2040 No Build Alternative (review 3D simulation video);
- Receive feedback on strengths and weaknesses of 15 preliminary alternatives; and
- Receive feedback on Benning Road and Minnesota Avenue Intersection Improvements.

During this 90-minute open house, attendees were given a four-page fold-over agenda that described the project, and provided a timeline for the NEPA and Section 106 process.

There were 45 attendees who participated in the meeting. Written comment forms were available and representatives of the project team were available to answer questions by display boards. Public comments were recorded following the public meeting. Participants discussed transportation improvement concepts with DDOT staff on large roll-out maps and communicated a need for continuous multi-use paths where feasible, safe and efficient streetcar operations with other modes, alternatives that have a minimal impact on adjacent land uses, and pedestrian safety improvements along Benning Road at Minnesota Avenue and East Capitol Street.

The meeting was advertised in the Washington Post Express and the Afro News, and flyers were distributed to community centers, churches, businesses, and at Minnesota Avenue and Benning Road Metrorail Stations. Email notifications were sent to Advisory Neighborhood Commissioners for ANCs 5D, 7C, 7D, 7E, and 7F, as well as Deanwood Civic Association, Deanwood Heights Main Streets, and Central Northeast Civic Association. Email notifications were also sent to 770 email addresses gathered from former DC Streetcar projects and the first public meeting. Lastly, 6,200 postcard invitations were sent to residences and businesses in proximity to the project area by USPS Every Door Direct Mailing service, and 5,154 local phone numbers were contacted via Switch Board Communication Services.

Following the public meeting and agency coordination, DDOT prepared two Build Alternatives, in addition to the No Build Alternative, to be carried forward for additional detailed analysis in the EA. The Build Alternatives would include the extension of streetcar service from the eastern terminus of the H/Benning Streetcar Line to the Benning Road Metrorail Station.

5.1.4.1 Title VI Statistics for Public Meeting 2

Title VI questionnaires were distributed at the sign-in table. Of the 45 attendees that attended the meeting, 34 completed the form. Below is a brief summary of Title VI questions and responses.

Ward:

83% Seven

10% Five

3% Four

3% One

Gender:

47% Male

53% Female

General Race/ Ethnic Identification Categories:

71% African American

15% Caucasian

7% Other, All of the above

3% Asian/Pacific Islander

3% Other

Age:

59% Above 50 years

22% 36-50

16% 26-35

9% 18-25

Primary language spoken at home: 100% English

How did you find out about this meeting? (Please circle all that apply):

32% Flyer/Postcard Mailer

21% Listserv/Blog

12% Phone call/Robocall

12% Other/Word of Mouth

9% Project Website

9% Mail Chimp/Email

9% Advisory Neighborhood Commission (ANC)

9% DDOT Website

6% Television

How did you travel to this meeting? (Please circle all that apply):

56% Car

31% Walked

12% Metrorail

6% Bus

Did you find the meeting location to be accessible? (For purposes of location or disability):

94% Yes

6% No

5.1.5 PUBLIC HEARING

DDOT will hold a public hearing for the project in May 2016 when the EA is published for public review and comment.

5.2 AGENCY COORDINATION

Beginning in February 2014, FHWA and DDOT contacted District, regional and federal agencies to introduce the project to agency staff. Contact and meetings with agencies took place during the scoping of the project, the development of alternatives, the analyses for the EA, and the Section 106 process.

The scoping letter requesting comments on the proposed action was sent on February 18, 2014. An example of the scoping letter is provided in **Appendix L**. **Table 5-1** summarizes agency correspondence.

5.2.1 AGENCY MEETING 1: PROJECT SCOPING

The first agency meeting was held on March 4, 2014 at DDOT. The purpose of the meeting was to introduce the project to agency stakeholders and to review the federal laws and regulations that apply to the project. The Purpose and Need was presented, the project timeline was discussed, and an overview of the historic features and historic context of Benning Road and Bridges Transportation Improvements was provided.

The National Park Service (NPS) indicated a desire to protect Fort Mahan Park.

5.2.2 SECTION 106 CONSULTATION

Agency officials must provide the public with information about the project and its effect on historic properties and seek public comment. Agency officials may follow NEPA procedures for public involvement in order to comply with this aspect of Section 106 of the National Historic Preservation Act.

Table 5-1: Agency Coordination Summary

Agency	Date and Purpose	Response
Department of Parks and Recreation	2/18/14 Scoping Letter from DDOT	None
Department of Public Works	2/18/14 Scoping Letter from DDOT	None
District Department of the Environment	2/18/14 Scoping Letter from DDOT	None
District of Columbia Housing Authority	2/18/14 Scoping and Section 106 Initiation Letter from DDOT	None
District of Columbia Historic Preservation Office	2/18/14 Scoping Letter from DDOT	3/25/14 response from C. Andrew Lewis accepting invitation (see Appendix L)
Department of Housing and Community Development	2/18/14 Scoping Letter from DDOT	3/11/14 response from Paul Walker (see Appendix L)
District of Columbia Office of Planning	2/18/14 Scoping Letter from DDOT	None

Agency	Date and Purpose	Response
DC Water and Sewer Authority	2/18/14 Scoping Letter from DDOT	None
DC Fire and EMS Department	2/18/14 Scoping Letter from DDOT	None
Office of United Communications	2/18/14 Scoping Letter from DDOT	None
Metropolitan Washington Council of Governments	2/18/14 Scoping Letter from DDOT	None
National Capital Planning Commission	2/18/14 Scoping Letter from DDOT 5/4/14 Invitation from DDOT to become a cooperating agency to the project	None
National Oceanic and Atmospheric Administration	2/18/14 Scoping Letter from DDOT	None
U.S. Department of Agriculture	2/18/14 Scoping Letter from DDOT	None
U.S. Department of the Army, Corp of Engineers	2/18/14 Scoping Letter from DDOT	None
U.S. Department of Transportation, Federal Transit Administration	2/18/14 Scoping Letter from DDOT 5/4/14 Invitation from DDOT to become a cooperating agency to the project	None
U.S. Commission of Fine Arts	2/18/14 Scoping Letter from DDOT	None
U.S. Department of the Interior –National Park Service, National Capital Region	2/18/14 Scoping Letter from DDOT 5/4/14 Invitation from DDOT to become a cooperating agency to the project	None
U.S. Department of the Interior –National Park Service, National Capital Parks (East)	2/18/14 Scoping Letter from DDOT	None
U.S. Fish and Wildlife Service –Northeast (Region 5)	2/18/14 Scoping Letter from DDOT	None
U.S. Environmental Protection Agency –Office of Environmental Programs (Region 3)	2/18/14 Scoping Letter from DDOT	None
Washington Metropolitan Area Transit Authority	2/18/14 Scoping Letter from DDOT	None

Source: Benning Road and Bridges Transportation Improvements EA Project Team

The Section 106 process provides a procedure to seek comment on and to discuss potential issues surrounding the historic buildings, structures, districts, landscapes, and potential archeological sites within and immediately adjacent to the study area. During the Section 106 consultation, the public must be involved as historic properties are identified and evaluated, adverse effects are assessed, and alternatives and modifications that could avoid or minimize adverse effects are being developed and discussed. **Table 5-2** summarizes Section 106 consultations and correspondence to date.

Table 5-2: Section 106 Consultation Summary

Date	From	To	Purpose
2/18/14	DDOT	DCSHPO	Informal Section 106 initiation letter and invitation from Clarence Dickerson.
3/25/14	DCSHPO	DDOT	Response from C. Andrew Lewis accepting invitation.
8/20/14	DCSHPO	DDOT	Comments on the Area of Potential Effect (APE) and potentially eligible historic properties for survey. Request to develop Determination of Eligibility (DOE) forms for historic properties.
3/16/15	FHWA	DCSHPO	Formal Section 106 initiation letter from Mike Hicks.
4/8/15	DCSHPO	DDOT	DCSHPO recommendations regarding the DOE forms.

Date	From	To	Purpose
8/25/15	FHWA	Consulting Parties	Invitation to participate as a Consulting Party.
In progress	FHWA	DCSHPO	Determination of "No Adverse Effect."

Source: Benning Road and Bridges Transportation Improvements EA Project Team

An invitation to participate in the project as a consulting party was sent to the following organizations (see **Appendix F** for copies of the correspondence):

- Groundwork Anacostia;
- Hillbrook Community Association;
- Friends of Kingman Park Civic Association;
- Langston Terrace Resident Council;
- Langston Terrace Housing Authority;
- Carver-Langston Terrace Civic Association;
- Washington East Foundation;
- Ward 7 Business Partnership;
- Capitol View Citizens Association;
- Central Northeast Civic Association;
- Marshall Heights Community Development Corporation;
- New Mt. Calvary Baptist Church;
- Ward Memorial AME Church;
- Benning Ridge Civic Association;
- Central Northeast Civic Association;
- The Committee of 100 on the Federal City;
- District of Columbia Preservation League;
- Advisory Neighborhood Commissioners for ANC 5D;
- Advisory Neighborhood Commissioners for ANC 7B;
- Advisory Neighborhood Commissioners for ANC 7C;
- Advisory Neighborhood Commissioners for ANC 7D;
- Advisory Neighborhood Commissioners for ANC 7E; and
- Advisory Neighborhood Commissioners for ANC 7F.

6 LIST OF PREPARERS

In support to DDOT, AECOM and its subconsultants, Nelson/Nygard, MS Consultants, CDDI and CSMI provided environmental and design support information to prepare the technical studies for the document and public involvement activities.

The members of the technical team who have played key roles in the preparation of this environmental document are listed in **Table 6-1**.

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PUBLIC REVIEW COPIES

The document will be available at the following locations for public review between May 4, 2016 and June 2, 2016:

Benning (Dorothy I. Height) Neighborhood Library
3935 Benning Road, NE
Washington, DC 20019

Deanwood Library
1350 49th Street, NE
Washington, DC 20019

District Department of Transportation
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55 M St SE, 4th Floor
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9 ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
AIRS	Aerometric Information Retrieval System
ANC	Advisory Neighborhood Commission APE Area of Potential Effect
APTA	American Public Transportation Association
ARWP	Anacostia River Watershed Partnership
BMP	Best Management Practices
CBTC	Car Barn Training Center
CEQ	Council on Environmental Quality
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulation
CLRP	Constrained Long Range Transportation Plan
CMI	Construction/Management Inspection
CNECA	Central Northeast Civic Association
CSX	CSX Transportation/CSX Railroad
CFR	Code of Federal Regulations
DC	District of Columbia
DCSHPO	District of Columbia Historic Preservation Office
DCIHS	District of Columbia Inventory of Historic Sites
DCPCA	District of Columbia Primary Care Association
DDOT	District Department of Transportation
DFIRM	Digital Flood Insurance Rate Maps
DHHS	Department of Health and Human Services
DOES	District of Columbia Department of Employment Services
DTM	Digital Terrain Model
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EJ	Environmental Justice
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment

ESS	Energy Storage System FAR Floor Area Ratio
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FINDS	Facility Index System
FR	Federal Register
FTA	Federal Transit Administration
GIS	Geographic Information Systems
GLCPSS	Ground Level Continuous Power Supply System
HMIRS	Hazardous Materials Incident Report System
ICIS	Integrated Compliance Information System
IPaC	USFWS Information, Planning, and Consultation system
LOD	Limits of Disturbance
LOS	Level of Service
LQG	Large Quantity Generator
LUST	Leaking Underground Storage Tank
MOT	Maintenance of Traffic
MPDF	Multiple Property Documentation Form
MWCOG	Metropolitan Washington Council of Governments
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NonGen/NLR	Non-Generators
NPS	National Park Service
NRCS	USDA Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory O&M Operations and Maintenance
OCS	Overhead Contact System
OCTO	District of Columbia Office of the Chief Technology Officer
PCB	Polychlorinated Biphenyl
PCN	Priority Corridor Network PADS PCB Activity Database
PEPCO	Potomac Electric and Power Company
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition RGA Recovered Government Archive
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SOME	So Others Might Eat
SWF/LF	Solid Waste Facility Listing
TAZ	Transportation Analysis Zone

TIP	Transportation Improvement Program
TPSS	Traction Power Substation
USACE	US Army Corps of Engineers
UFA	District of Columbia Urban Forestry Administration
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
USPS	United States Postal Service
UST	Underground Storage Tank
WASA	District of Columbia Water and Sewer Authority
WMATA	Washington Metropolitan Area Transit Authority
WOUS	Waters of the United States

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10 GLOSSARY

100-year floodplain – An area with a 1% chance of being inundated in any single year.

access, accessibility – The opportunity to easily reach a destination without being impeded by physical, social, or economic barriers. Typically, accessibility is the extent to which transportation improvements make connections between geographic areas or portions of the region that were not previously well connection.

adverse effect – Defined in Section 106 of the National Historic Preservation Act (NHPA) (35 CFR 800.5(a)(1)). An adverse effect to a historic property occurs when the project under consideration alters any characteristic that qualifies the property for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of the property.

Affected Environment – The physical features, land, area or areas to be influenced, affected or created by a transportation improvement under consideration; also includes various social and environmental factors and conditions pertinent to an area.

Agency Coordination – Refers to the process whereby the Department of Transportation contacts, consults and maintains communication with various public and environmental resource agencies, affording such agencies an opportunity to review and comment upon specific transportation proposals.

Area of Potential Effect (APE) – The geographical area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Best Management Practices (BMPs) – Specific standards utilized during construction and design to minimize the impact on surrounding resources.

Build Alternative – Build Alternatives are alternatives that are developed at the concept level for analysis purposes that meet the project purpose and need and have the potential to be constructed.

Census Tract – A small statistical subdivision of a county defined by a local committee of census data users for the purpose of presenting census information every ten years. The primary purpose of census tracts is to provide a stable set of geographic units for the presentation of statistical data.

Code of Federal Regulations (CFR) – The Code of Federal Regulations (CFR) annual edition is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation.

Clean Air Act of 1970 (CAA) – Legislation mandating the U.S. Environmental Protection Agency (EPA) to set national air quality standards to protect the public against common pollutants. State governments are required to devise clean-up plans to meet these EPA standards.

Clean Air Act Amendments of 1990 (CAAA) – Legislation requires states and the Federal government to reduce emissions from automobiles, trucks, buses, ships, barges, and consumer products, and to meet air quality standards. The legislation particularly addresses ozone, carbon monoxide (CO), and particulate matter. The legislation defines how areas are designated "attainment" and allows the EPA to classify "non-attainment" areas as those that do not meet the federal air quality standards.

Clean Water Act (CWA) - The Clean Water Act (33 U.S.C. §1251 et seq.) is a law enacted by the United States Congress in 1972 which establishes the basic structure for regulating discharges of pollutants into Waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly re- organized and expanded in 1972.

coastal plain – An area of flat, low-lying land adjacent to a seacoast and separated from the interior by other features.

Comprehensive Plan – The general, inclusive long-range state of the future development of a community. The plan is typically a map accompanied by description and supplemented by policy statements that direct future capital improvement in an area.

Conformity – Process to assess the compliance of any transportation plan, program, or project with air quality implementation plans. The conformity process is defined by the Clean Air Act.

Council on Environmental Quality (CEQ) – Established as part of the National Environmental Policy Act of 1969 (NEPA), the council coordinates federal environmental efforts, policies, and initiatives, and ensures that federal agencies meet NEPA requirements.

CSX Transportation (CSX) - CSX is a Class I Freight Railroad which operates on the east coast of the United States from Florida to New England, as far west as Chicago, Illinois and as far north as Montreal, Canada

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

decibel – A unit of measure of sound pressure used to describe the loudness of sound on the A-weighted scale.

Determination of Effect – A finding made by Departments of Transportation for federal actions, in consultation with the State Historic Preservation Office and the Advisory Council for Historic

Preservation, which determines whether a proposed project affects a property included on or eligible for the National Register of Historic Places.

Determination of Eligibility – The decision made by the State Historic Preservation Office regarding whether historic buildings or districts are eligible for or listed in the National Register of Historic Places.

direct effect - Effect that occurs as a direct result of the project.

Digital Terrain Model (DTM): A topographic model of the bare earth.

effect – Synonymous with impact, includes the result from actions that may have a beneficial or detrimental outcome.

endangered species – A species whose prospects for survival are in immediate danger based on a loss of habitat, over-exploitation, predation, competition, or disease. An endangered species requires immediate attention or extinction will likely follow.

Energy Storage System (ESS) – ESS is a form of "wireless" propulsion technologies which use power sources installed on the vehicle to allow for catenary-free operations. These technologies are also referred at times as On-Board/On-Tram technologies. Vehicles using this technology are powered by batteries, super capacitors, flywheels, fuel cells, diesel and/or alternative fuel sources or a combination of these power de vices. (Source: District Department of Transportation, *Union Station to Georgetown, Alternatives Analysis for Premium Transit Service Propulsion Study*, September 2013).

Environmental Assessment (EA) – When the significance of impacts of a transportation project proposal is uncertain, an EA is prepared to assist in making this determination. If it is found that significant impacts will result, the preparation of an environmental impact statement (EIS) should commence immediately.

Environmental Justice (EJ) – Efforts to avoid disproportionately high and adverse impacts on minority and low-income populations with respect to human health and the environment.

Environmental Protection Agency (EPA) – EPA is the federal source agency of air quality control regulations affecting transportation.

Environmental Site Assessment (ESA) – An analysis which identifies potential or existing environmental contamination liabilities and which may conform to American Society of Testing and Materials (ASTM) reporting requirements and methods.

Federal Emergency Management Agency (FEMA) – FEMA is a federal agency under the US Department of Homeland Security, established under Presidential Executive Order Executive Order 12127, which coordinates the federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror.

Federal Highway Administration (FHWA) – FHWA is an agency under the US Department of Transportation (USDOT) which provides stewardship over the construction, maintenance and preservation of the Nation's highways, bridges and tunnels. FHWA serves as the lead federal agency for the project in accordance with NEPA.

Federal Transit Administration (FTA) – A branch of the USDOT that is the principal source of federal financial assistance to America's communities for planning, development, and improvement of public or mass transportation systems. FTA provides leadership, technical assistance, and financial resources for safe, technologically advanced public transportation to enhance mobility and accessibility, to improve the Nation's communities and natural environment, and to strengthen the national economy.

final design – The development of detailed working drawings, specifications, and estimates for transportation projects.

Finding of No Significant Impact (FONSI) – A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded (40 CFR 1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared.

Geographic Information System (GIS) – A system of computer software and hardware, data, and personnel to manipulate, analyze and present geographically referenced information or data that is identified according to their locations.

ground-borne vibration – The vibration-induced levels that propagate through ground between the source and a receptor such as a building; typically assessed indoors.

Ground Level Continuous Power Supply System (GLCPSS): GLCPSS are "wireless" propulsion technologies which use ground level power sources (instead of Overhead Contact Systems (OCS)) to allow for catenary-free operations. These technologies are also referred to as Infrastructure/Wayside and/or Off-Tram technologies. These systems distribute power to the vehicle via induction. (Source: District Department of Transportation, *Union Station to Georgetown, Alternatives Analysis for Premium Transit Service Propulsion Study*, September 2013)

habitat - The area or environment where an organism or ecological community normally lives or occurs.

human environment – Human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment.

impacts – Positive or negative effects upon the natural or human environment resulting from transportation projects.

indirect effects – Impacts that can be expected to result from a given action that occurs later in time or further removed in distance; for example, induced changes to land use patterns, population density or growth rate.

Integrated Compliance Information System (ICIS): The Integrated Compliance Information

System (ICIS) is a database maintained by the EPA for national enforcement and compliance program as well as National Pollutant Discharge Elimination System (NPDES) program.

land use – Classification providing information on land cover and the types of human activity occurring on a parcel of land, such as "commercial," "industrial," "residential," or "open space."

Level of Service (LOS) – A letter grade designation used to describe given roadway conditions with "A" being at or close to free-flow conditions and "F" being at or close to over-saturation of the roadway; usually based on the progression of vehicles through the green phase of a signal, driver discomfort/frustration, lost travel time, and fuel consumption.

logical termini – Connecting points with known features (land uses, economic areas, population concentrations, cross route locations, etc.) at either end of a proposed transportation route that enhances good planning and which serve to make the route usable. Logical termini are considered rational end points for a transportation improvement.

Low-Income Populations: Any readily identifiable group of low-income persons whose household in- come is at or below the U.S. Department of Health and Human Services (DHHS) poverty guidelines. For low-income populations, FTA encourages the use of a locally developed threshold, such as that used for FTA's grant program (Public Law 112-141), which defines "low-income individual" to mean "an individual whose family income is at or below 150 percent of the poverty line."

Minority Populations: The USDOT Order on Environmental Justice (5610.2a) and FTA Circular 4703.1 define minority populations as persons who are American Indian or Alaskan Native, Asian American, Na- tive Hawaiian or Other Pacific Islander, Black (not of Hispanic Origin), and Hispanic or Latino.

mitigation – 40 CFR 1508.20 defines "mitigation" as:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.
(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
(e) Compensating for the impact by replacing or providing substitute resources or environments.

mobility – The ability to move or be moved from place to place.

Mode, Intermodal, Multimodal – Form of transportation, such as automobile, transit, bicycle, and walking. Intermodal refers to the connections between modes and multimodal refers to the availability of transportation options within a system corridor.

National Environmental Policy Act (NEPA) – The National Environmental Policy Act (42 U.S.C.

4321 et seq.) is a law enacted by the United States Congress in 1969 which requires federal agencies to consider the environmental impacts of federal projects or decisions.

National Historic Preservation Act (NHPA) – The National Historic Preservation Act (16 U.S.C. 470 et seq.) is a law enacted by the United States Congress in 1966 which established a program for the preservation of historic properties in the United States. Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties.

National Register of Historic Places (NRHP) – A federal list of buildings, sites, districts and other properties that have a historic significance.

Navigable Waterway – Navigable waterways are surface waters under the jurisdiction of EPA and USACE which "are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide" as defined in 33 C.F.R. §328.3(a)(1); 40 C.F.R. § 230.3(s)(1).

No Build Alternative – A benchmark against which to compare other alternatives.

off-peak period – Used to describe times where travel is not at its peak, or highest level, during the day. Off-peak travel usually occurs in the midday and evenings in most cities.

Overhead Contact System (OCS) – OCS is a widespread form of "wired" streetcar propulsion technology which uses pantograph current collector and overhead catenary for the propulsion of streetcars. (Source: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_07-a.pdf)

Priority Corridor Network (PCN) – Priority Corridor Networks are transportation corridors in the Washington, DC region which WMATA has identified with sufficient current or future potential to warrant running way improvements to support faster and more reliable bus services. Corridors with daily transit ridership over 5,000 per day were considered as candidates. Other candidates were those in fast developing corridors, where greater than average transit growth is expected.

Recognized Environmental Condition (REC) – The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property.

Resource Conservation and Recovery Act (RCRA) – The Resource Conservation and Recovery Act (RCRA) of 1976, which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs). Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal.

right-of-way (ROW) – Land available for operation of transportation facilities (roadways or rail lines). The land is typically government-owned (local, state, or federal). A transportation facility may occupy all or a portion of the ROW.

Special Flood Hazard Areas (SFHAs) – The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on National Flood Insurance Program (NFIP) maps. The SFHA is the area where the NFIP floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

State Historic Preservation Office (SHPO) – A state administrative agency responsible for carrying out consultation in accordance with the National Historic Preservation Act of 1966, as amended and other state historic preservation regulations.

streetcar – Streetcars are a form of urban mass transit which use relatively lightweight passenger railcars operating singly or in short trains, or on fixed rails in rights-of-way in shared rights-of-way.

study area – A geographic area selected and defined at the outset of environmental evaluations that is sufficiently adequate in size to address all pertinent project matters occurring within it.

threatened species – A species that may become endangered if surrounding conditions begin or continue to deteriorate.

transit – Generally refers to passenger service provided to the general public along established routes with fixed or variable schedules at published fares. Related terms include public transit, mass transit, public transportation, or paratransit. Transit modes include commuter rail, heavy or light transit, bus, or other vehicles designated for commercial transportation of non-related persons.

topography – The surface features of a place or region.

Traffic Analysis Zone (TAZ) – a geographic area delineated by state and/or local transportation officials for tabulating traffic-related data.

Waters of the United States (WOUS) – The term "Waters of the United States" is defined in 40 CFR 230.3(s) as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
   (I) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
   (II) (From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
   (III) Which are used or could be used for industrial purposes by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
6. The territorial sea;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands – The Clean Water Act defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Washington Metro Area Transit Authority (WMATA): The Washington Metropolitan Area Transit Authority (WMATA), commonly referred to as Metro, is a tri-jurisdictional government agency that operates transit service in the Washington Metropolitan Area. WMATA was created by the United States Congress as an interstate compact between the District of Columbia, the State of Maryland, and the Commonwealth of Virginia.

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