SUMMARY

S.1 PREFACE

The District Department of Transportation (DDOT), in conjunction with the Federal Highway Administration (FHWA), and in cooperation with the National Park Service (NPS), are proposing the rehabilitation of the 1.5-mile segment of Broad Branch Road, NW, between Linnean Avenue, NW and Beach Drive, NW, a portion of which abuts the southwestern border of Rock Creek Park (see **Figure S-1**).

This Revised Draft Environmental Assessment (EA) and Section 4(f) Evaluation 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), FHWA's *Technical Advisory Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (T6640.8A), DDOT's *Environmental Policy and Process Manual*, NPS Director's Order #12: *Conservation Planning, Environmental Impact Analysis, and Decision-making and #87D: Non-NPS Roads*. The project also includes the evaluation of potential effects to cultural resources in accordance with Section 106 of the National Historic Preservation Act (NHPA).

The initial EA was completed and released for 30-day public comment on October 21, 2013 and a public hearing was held on November 5, 2013. The public and agencies were given the opportunity to review and comment on the EA until November 22, 2013. Given the extended period of time since the public comment period, DDOT and FHWA have decided to issue this Revised Draft EA. This Revised Draft EA expands upon the discussion presented in the initial EA as well as addresses comments submitted on the initial EA at the public hearing and during the associated public comment period. This EA also identifies Alternative 3-Modified as the Preferred Alternative including the reasons for its selection.

S.2 PURPOSE AND NEED

The purpose of the proposed action is to rehabilitate Broad Branch Road to satisfy operational and safety needs in a manner keeping with the setting of the project area. Context sensitive solutions took into account the adjoining land uses including residential, sovereign nation properties, institutional developments and wooded areas, including Rock Creek Park. Improvements to the corridor considered all modes of transportation including motorized vehicles, bicycles, and pedestrians.

The needs for improvements to Broad Branch Road relate primarily to deficiencies in the existing roadway infrastructure and stormwater management system; the safety of motorists, pedestrians, and bicyclists; and linkages to serve pedestrian and bicycle travel along the roadway itself as well as to the Rock Creek Park trail systems (i.e., Rock Creek Trail, Western Ridge Trail, and Soapstone Valley Trail).

Figure S-1. Project Location

S.3 PROJECT BACKGROUND

The rehabilitation of Broad Branch Road was originally placed on DDOT's schedule of planned improvements because of the apparent needs for roadway repair and the desire for a safer facility. The roadway is unsafe because of drainage issues, as well as poor lighting and the tendency for drivers to exceed the posted speed limit.

The uncontrolled runoff from elevated parcels to the north and west of the roadway has contributed in large part to the deterioration of this two-lane roadway. The large volume of stormwater has also had detrimental effects on the adjacent streambeds in Broad Branch and Soapstone Creek. Extensive erosion at outfalls as well as at streambeds of the receiving waterways has been attributed to the high, erosive powers of the stormwater. The need for a total solution involving improvements on National Park properties has resulted in the NPS serving as a Cooperating Agency in the development of this Revised Draft EA.

Aging infrastructure has contributed to the deficiencies in the roadway corridor. The culvert carrying Broad Branch Road over Soapstone Creek has been temporarily repaired after partial collapse and requires permanent replacement. Replacement of this culvert would be addressed as a part of the upgrades planned for Broad Branch Road.

The District Department of Energy and the Environment (DOEE) and NPS completed a stream restoration "daylighting" project to an unnamed tributary of Broad Branch in the northern end of the project corridor in 2014.

S.4 ALTERNATIVES

While the main purpose of the project is to rehabilitate Broad Branch Road and control stormwater runoff, other elements were also studied for inclusion within the roadway cross-section, including bicycle and pedestrian facilities. With regard to the latter, recent DC legislation has prompted the need for pedestrian accommodations within the corridor. Furnishing sidewalks along Broad Branch Road would also conform to the District's Complete Street Program, a policy document that encourages the provision of sidewalks along DC streets.

Alternatives development consisted of a multi-step collaborative process with the study team, stakeholders, and the public to develop a range of alternatives that incorporated elements to address each of the project's needs: roadway elements, stormwater and drainage elements, and bicyclist and pedestrian elements. The No Action Alternative, three Candidate Build Alternatives, and three options to complement the proposed improvements in the roadway corridor were assessed in the initial EA to determine which best met the project's stated purpose and need while minimizing environmental impacts. The options were incorporated into the Candidate Build Alternatives, as applicable, for the refined alternatives evaluated in this Revised Draft EA. Based on comments received and further coordination efforts since publication of the initial EA, a modified version of Candidate Build Alternative 3 has been developed which reduces the right-of-way requirements associated with the original Alternative 3. This refined alternative, hereafter referred to as Alternative 3 Modified, is DDOT's recommendation as the Preferred Alternative.

S.4.1 Alternative 1 – No Action Alternative

Under the No Action Alternative (Alternative 1), the improvements to Broad Branch Road would include short-term minor restoration activities (safety and routine maintenance) that maintain the continuing operation of the existing roadway.

The existing roadway is located within DDOT right-of-way, with minor exceptions. These exceptions occur in six short sections along the project corridor where the existing roadway was constructed outside DDOT-owned property. These small areas amount to a total area of 923 square feet. All but one location are located on the east side of the roadway where the northbound lane encroaches on NPS-administered property in Rock Creek Park. The single encroachment on the west side of the roadway occurs where a curve in the southbound lane enters private property owned by a Sovereign Nation (the Republic of Peru). The location of the roadway, outside of the DDOT-owned right-of-way, may be due to inconsistencies in survey bounds that existed when the current Broad Branch Road was constructed or may be the result of previous repaving projects. This Revised Draft EA would serve to provide the appropriate action needed to correct these inconsistencies, which may include an easement, land transfer, or permit.

It was determined in the initial EA that while the No Action Alternative does not meet the purpose and need of the project; it provides a basis for comparing the environmental consequences of the proposed action.

S.4.2 Proposed Action

The proposed action would address deficiencies in the existing roadway infrastructure and stormwater management systems; improve the safety of motorists, pedestrians, and bicyclists; and enhance linkages with respect to serving pedestrian and bicycle travel.

Prior to any land disturbance activities, tree protection measures, protective fencing, and other best management practices (BMPs) would be installed. The existing roadway infrastructure within the project area would be removed including pavement, curb and gutter, inadequate stormwater drainage systems, as well as debris and trees that present a hazard. DDOT would include in the contractor specifications that all removed materials be disposed of or recycled in accordance with the DDOT *Standard Specifications for Highways and Structures* (DDOT, 2013). Additional measures for the protection of cultural resources (e.g., historic retaining walls, culvert headwalls, stone boundary markers along the park boundary) would also be incorporated in the contractor specifications.

The proposed action would be designed to accommodate widths and weights of utility maintenance vehicles and emergency response vehicles. Grading and placement of clean fill would be necessary to prepare a stable bed for the roadway and to provide adequate drainage conveyance. Existing profile elevations would be raised or lowered in steeper areas to minimize blind crests and improve sight distances along the roadway.

Stormwater management would be accomplished through a closed, underground system, which would collect and treat the runoff and direct it to the existing outfall locations along the corridor. Inadequate stormwater inlets and culverts would be reconstructed and resized to appropriately

convey water. In addition, some existing culverts may need to be extended to accommodate a wider corridor with additional roadway elements. Replacement of stormwater pipes would require work at outfalls exiting through headwalls or retaining walls. Improvements to pipes and outfalls located within DDOT-owned right-of-way as well as those on NPS property would be conducted as part of the proposed drainage improvements. DDOT would obtain a Special Use Permit from NPS for all activities conducted on NPS property, including access, construction and site restoration. In addition, a new culvert is proposed for the roadway over Soapstone Creek located at the southern end of the project corridor. The emergency replacement of Soapstone Creek Culvert was performed as a separate action independent of the EA; however, design plans for the permanent replacement structure for the culvert are analyzed in this Revised Draft EA.

Both travel lanes of the roadway would be paved with a normal cross slope so that all roadway runoff would be directed to the curb and gutter on each side of the roadway. Stormwater management would be improved by providing bio-swales/rain gardens where space is available along with water quality catch basins.

Coping and retaining walls would be incorporated where feasible to minimize the limits of disturbance and footprint of the roadway. Retaining walls would be designed with context sensitive materials to complement the setting of Rock Creek Park and the surrounding area as well as incorporate construction methods to minimize intrusion into the Rock Creek Park properties. Because the majority of walls proposed on the east side of the roadway would be constructed within several feet of or partially overlapping the footprint of existing stone walls that are contributing resources to the Rock Creek Park Historic District, analysis of existing wall conditions, designs to restore and stabilize or replace existing walls, and construction methods would be developed in close coordination with NPS (as described above for pipes and outfalls).

Following construction, additional restoration along Broad Branch Road would include replanting of native tree species and vegetation including restoration of landscaped areas in front of adjacent property owners on the west side of the road with commensurate landscaping. Species would be selected in consideration of the natural and cultural landscapes, as well as the aesthetics of Rock Creek Park and residential and institutional areas.

Where feasible, sidewalk treatments would be in keeping with the context of the project setting. Treatments include trail-like designs or the use of colored concrete or pavers. The selection of treatment types would take place during final design.

The rehabilitated roadway would be properly signed and marked in accordance with standards of the American Association of State Highway and Transportation Officials (AASHTO), DDOT, and the *Manual on Uniform Traffic Control Devices* (MUTCD). Features such as signage and lighting would be incorporated into more detailed design plans.

S.4.2.1 Preferred Alternative/Alternative 3 Modified

To minimize encroachments outside of the existing right-of-way while still meeting the project's purpose and need, DDOT is recommending a modified version of Candidate Build Alternative 3. Five properties along Broad Branch Road right-of-way are owned by foreign countries for use as

residences for their ambassadors to the United States. In order to avoid any encroachment upon these sovereign nation's properties, all widening of the roadway between 27th Street and Beach Drive is proposed on the east side of the existing roadway. An estimated total of 236 square feet of new right-of-way would need to be acquired from NPS at seven locations for the permanent construction of the roadway, sidewalks, and associated retaining walls. Most of the encroachment areas are less than 1 foot in width (see **Figure S-2**).

Candidate Build Alternative 3 Modified would be identical to the original Candidate Build Alternative 3 with the exception of the width of sidewalks in front of the sovereign nation lands on the west side of the roadway. To minimize encroachments onto NPS lands on the east side of the roadway at these locations, the sidewalks along the embassy properties would be reduced to a 5-foot width. These reduced-width sidewalks are consistent with Americans with Disabilities Act (ADA) standards.

Candidate Build Alternative 3 Modified consists of two 10-foot travel lanes; a 6-foot-wide sidewalk on the west side of the roadway, with the exception of the seven locations in front of the sovereign nations; and standard curb and gutter. The alternative has a cross-section width ranging from approximately 35 to 44 feet. On the north end of the corridor, a 10-foot-wide linear rain garden would be provided between the sidewalk and the roadway for approximately 1,000 feet southward of Linnean Avenue where the curb and gutter would be located only along the east side of the roadway. South of that to 27th Street, a 4-foot-wide planting strip would separate the sidewalk and roadway for the length of the project and the curb and gutter would be located on both sides. Candidate Build Alternative 3 Modified also extends the proposed sidewalk from the end of DDOT right-of-way into a 6-foot-wide sidewalk that reaches the Rock Creek Park parking lot entrance just north of Beach Drive.

As part of Candidate Build Alternative 3 Modified, the intersection of Broad Branch Road and 27th Street would be modified to split the right and left turn lanes for southbound motorists on Broad Branch Road, allowing for improved turning movements at the intersection. Further south, a new T-intersection is proposed at Brandywine Street to replace the existing forked Y-intersection. The reconfiguration of this intersection is being proposed to reduce the paved area and incorporate additional Low Impact Development (LID) techniques in the roadway design with rain gardens in the interior corners of the new intersection. The reconfigured intersection would also improve roadway safety by minimizing crash risk for northbound drivers on Broad Branch Road turning left onto Brandywine Street. Requiring drivers to stop at a stop sign at the T-intersection, instead of yielding as with the existing Y-intersection, would also reduce speeds at the intersection. Sidewalks would be added on both sides of Brandywine Street to connect to the sidewalks proposed for the western side of Broad Branch Road. The design also includes wheelchair accessible ramps/aprons and a crosswalk.

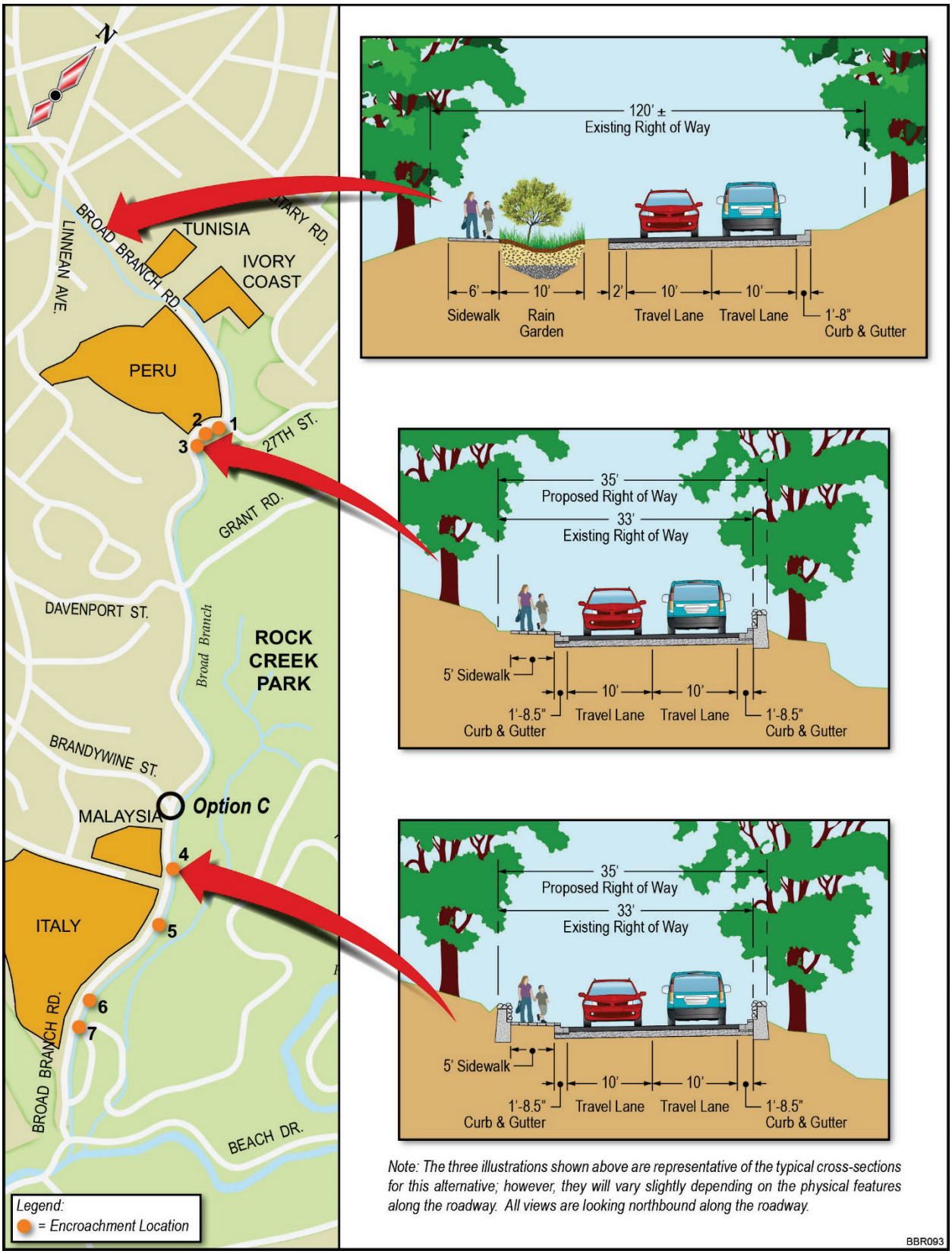

Figure S-2. Preferred Alternative 3 Modified

Some sections of roadway would require retaining walls (or coping walls) to minimize right-of-way requirements and stabilize slopes. Runoff from uphill areas behind the walls would be collected in concrete ditches behind the retaining walls and conveyed to existing outfalls via channels or storm sewers. On the east side of the roadway along the banks of Broad Branch, 13 segments of retaining walls, totaling over 1,700 feet, would be required. The walls would be designed to extend 3.5 feet above the top of the curb, as viewed from within the roadway, to meet DDOT safety standards. The total wall height would range from 8 to 16 feet due to the slope down to Broad Branch. Much of this height would occur below ground surface so the portion of the wall visible from the stream side would be limited to 4.5 to 6.5 feet high. The 16 retaining walls on the west side of the roadway would range from 3 to 13 feet high and total over 4,500 feet in length. Final wall heights would be determined during final design based on soil stability analysis. Walls may be eliminated or reduced in height based on this analysis.

In general, the roadway would have a normal cross slope and runoff would be directed toward the curbs and collected in water quality catch basins to be installed on the east and west sides of the roadway. These catch basins would screen debris and filter sediment before discharging runoff to the 21 existing outfall locations along the east side of the roadway. Cross culverts would be used where it is necessary and feasible to prevent the offsite runoff from entering the roadway and divert it to the existing outfalls. Although no new outfalls would be added, existing outfalls would be improved with the installation of new reinforced concrete pipe (RCP) in locations where there are existing pipes, some of which are collapsed or broken, or silted in. Replacement of stormwater pipes would require work at outfalls exiting through headwalls or retaining walls.

Several of the retaining walls and culvert outfalls occur on NPS property and many are contributing resources to the Rock Creek Park Historic District. DDOT would obtain a Special Use Permit to cover all construction activities on NPS properties. Walls surrounding existing pipes would be reconstructed after old pipes are removed, existing trenches are minimally excavated to accommodate new pipes, and new pipes are installed. Original stones or architecturally compatible materials would be used for the reconstruction of the walls, outfalls and associated structures. All construction activities would follow DDOT construction standards.

A major component of the stormwater management systems improvements to be accomplished in the rehabilitation of Broad Branch Road includes replacement of the Soapstone Creek Culvert. The existing Soapstone Creek Culvert, a six-foot-wide stone arch culvert constructed in 1898, would be replaced with a 16 feet by 9 feet high precast concrete arch culvert with an opening 16 feet wide by 4 feet high. The proposed structure would resemble the existing historic culvert in form and visible materials to the maximum extent possible. Finalization of form, patterns, materials, and color would be determined in consultation with the DC State Historic Preservation Office (SHPO) and the NPS cultural resources specialist during final design.

The total estimated project cost for Candidate Build Alternative 3 Modified is $56.3 million. The approximate construction duration is 30 months.

S.4.2.2 Candidate Build Alternatives Considered

Candidate Build Alternative 2

Candidate Build Alternative 2 is the minimum width alternative that generally meets the purpose and need of the project. It consists of two 10-foot travel lanes with standard curb and gutter on the east side with either a standard curb and gutter or a linear rain garden (bio-swale) to capture stormwater runoff on the west side. The 10-foot-wide linear rain garden would be provided for approximately 1,000 feet southward of Linnean Avenue. This alternative has a cross-section width ranging from approximately 23 to 37 feet. To maintain the minimal width of right-of-way, Candidate Build Alternative 2 does not include sidewalks or any other form of pedestrian improvements. As such, this alternative allows all elements of the rehabilitated roadway to be located within the existing DDOT right-of-way, with minor exceptions where the existing roadway extends outside of the existing right-of-way, described in S.4.1. Notwithstanding these exceptions, there are no physical components proposed under Candidate Build Alternative 2 which would require acquisition of additional right-of-way from the NPS or from private property. Areas requiring cut-and-fill activities outside the existing right-of-way are limited to nine discrete locations totaling 249 square feet (91 square feet on the east side and 157 on the west side) and would be accomplished through temporary construction easements.

The intersection of Broad Branch Road and 27th Street would be modified to improve turning movements. The locations of stop bars are set back from the roadway curve and the bar is parallel for both left and right turns for southbound motorists on Broad Branch Road. The triangular roadway paint and barriers would be removed. A new T-intersection at Brandywine Street would replace the existing forked Y-intersection. The intersection design is very similar to that described under Candidate Build Alternative 3 Modified; however, this alternative would not add sidewalks on both sides of Brandywine Street to connect to the sidewalks proposed for the western side of Broad Branch Road or the wheelchair accessible ramps/aprons and crosswalk.

Some segments of the roadway would require new or replacement retaining walls (or coping walls) to minimize cut-and-fill areas and to limit improvements to the DDOT-owned right-of-way. On the east side of the roadway along the banks of Broad Branch, nine segments of retaining walls totaling over 1,750 feet in length, are required. The walls are designed to extend 3.5 feet above the top of the curb, as viewed from within the roadway, to meet DDOT safety standards. To meet these standards and accommodate the steep slope along the edge of the roadway, the total wall height ranges from 8 to almost 15 feet. Much of this height would occur below ground surface so the portion of the wall visible from the stream side would be limited to 4.5 to 6.5 feet high. The 12 retaining walls on the west side of the roadway would range from 3 to 7 feet above the top of the curb and total nearly 3,000 feet in length.

Like Candidate Build Alternative 3 Modified, Candidate Build Alternative 2 includes replacement of the Soapstone Creek Culvert. The replacement of the Soapstone Creek culvert would be the same in form, pattern, materials, and color as identified for Candidate Build Alternative 3 Modified; however, the structure would be slightly narrower over Soapstone Creek.

The total estimated project cost for Alternative 2 is $37.4 million. The approximate construction duration is 24 months.

Candidate Build Alternative 3

Candidate Build Alternative 3 consists of two 10-foot travel lanes, a 6-foot wide sidewalk on the west side of the roadway for the entire length, and standard curb and gutter. A 10-foot-wide linear rain garden would be provided for approximately 1,000 feet on the west side of the roadway southward of Linnean Avenue, where the curb and gutter would be located only along the east side of the roadway. South of that, a 4-foot wide planting strip would separate the sidewalk and roadway for the length of the project and the curb and gutter would be located on both sides. Candidate Build Alternative 3 extends the proposed sidewalk from the end of the DDOT right-of-way into a 6-foot wide sidewalk that reaches the Rock Creek Park parking lot entrance just north of Beach Drive.

This alternative has a cross-section width ranging from approximately 33 to 43 feet from curb to outer edge of sidewalk. In addition to the areas where the current roadway exceeds existing right-of-way as noted in Section S.4.1, new right-of-way would be required on the west side along narrow portions of the roadway to accommodate the new sidewalk. Limited new right-of-way, approximately 39 square feet, may be required along the east side of the roadway on NPS land to accommodate the construction of proposed new retaining walls, pending completion of engineering studies to assess the condition of existing walls. Limited right-of-way, approximately 39 square feet, may be required along the east side of the roadway on NPS land to accommodate the construction of proposed new retaining walls; however, the final locations of new retaining walls and additional right-of-way, as needed, would be determined after completion of engineering studies to assess the condition of existing walls. In addition to the potential for right-of-way acquisition, narrow areas proposed for grading (fill) occur along the right-of way, the largest of which is approximately 2 feet wide by 50 feet long at the southern end of the project area south of Ridge Road. Any grading outside the existing DDOT right-of-way would require a temporary construction easement. Similar to Alternative 3 Modified, the intersection of Broad Branch Road and 27th Street would be modified to split the right and left turn lanes for southbound motorists on Broad Branch Road, allowing for improved turning movements at the intersection. A new T-intersection is proposed at Brandywine Street to replace the existing forked Y-intersection.

Some sections of roadway would require retaining walls (or coping walls) to minimize right-of-way requirements and stabilize slopes. The retaining wall requirements under Candidate Build Alternative 3 are the same as that described above for Candidate Build Alternative 3 Modified. Similar to Candidate Build Alternative 3 Modified, analysis of existing wall conditions, designs to restore and stabilize or replace existing walls, and construction methods would be developed in close coordination with NPS.

Stormwater management upgrades, including the replacement of the Soapstone Creek Culvert, are the same as those described for Candidate Build Alternative 3 Modified.

The total estimated project cost for Alternative 3 is $43.7 million. The approximate construction duration is 30 months.

Candidate Build Alternative 4

Candidate Build Alternative 4 is the widest of the project alternatives and consists of two 10-foot travel lanes, a 6-foot wide sidewalk on the west side, a 4-foot wide bike lane on east side, and standard curb and gutter. A 10-foot-wide linear rain garden would be provided along the west side of the roadway for approximately 1,000 feet southward of Linnean Avenue where the curb and gutter would be located only along the east side of the roadway. South of that, a 4-foot wide planting strip would separate the sidewalk and roadway for the length of the project and the curb and gutter would be located on both sides. Candidate Build Alternative 4 extends the proposed sidewalk from the end of the DDOT right-of-way into a 6-foot wide sidewalk that reaches the Rock Creek Park parking lot entrance just north of Beach Drive.

This alternative has a cross-section width ranging from approximately 37 to 47 feet from curb to outer edge of sidewalk. In addition to the areas where the current roadway exceeds existing right-of-way as noted in Section S.4.1, new right-of-way would be required on both sides of the roadway to accommodate the sidewalk and planting strip on the west side and retaining walls on the east side. Alternative 4 may also require additional right-of-way, approximately 2,200 square feet, along the east side of the roadway on NPS land to accommodate the construction of proposed new retaining walls (pending engineering studies to assess the condition of existing walls). Areas proposed for grading (fill) occur along both the east and west sides of the right-of way. Any grading outside the existing DDOT right-of-way would require a temporary construction easement.

The Broad Branch Road intersection with 27th Street would be modified to split the right and left turn lanes for southbound motorists on Broad Branch Road, allowing for improved turning movements at the intersection. The intersection would also be wider to accommodate the northbound bike lane. A new T-intersection is proposed at Brandywine Street to replace the existing forked Y-intersection. The intersection design is very similar to that described for the Preferred Alternative 3 Modified. Proposed sidewalks on both sides of Brandywine Street in this alternative would connect to the sidewalks proposed for the western side of Broad Branch Road. The design also includes wheelchair accessible ramps/aprons and a crosswalk.

Some sections of roadway would require retaining walls in order to minimize right-of-way requirements and stabilize slopes. On the east side of the roadway along the banks of Broad Branch, 21 segments of retaining walls, totaling over 2,300 feet in length, are required. Like Alternatives 2, 3, and 3 Modified, the walls are designed to extend 3.5 feet above the top of the curb, as viewed from within the roadway, to meet DDOT safety standards. The total wall height ranges from 3 to 17 feet. Much of this height would occur below ground surface so the portion of the wall visible from the stream side would be limited to 4.5 to 6.5 feet high. The 16 retaining walls on the west side of the roadway range from 3 to 16 feet high and total nearly 4,700 feet in length.

Stormwater management upgrades are similar to those identified in Candidate Build Alternatives 2, 3, and 3 Modified. The Soapstone Creek Culvert structure would be slightly wider over Soapstone Creek in order to accommodate the bike lane.

The total estimated project cost for Alternative 4 is $57.5 million. The approximate construction duration is 36 months.

S.5 AFFECTED ENVIRONMENT

Existing environmental conditions were identified and mapped within the project corridor, including natural, cultural, and socioeconomic, including community, resources (see **Figure S-**3 and **Figure S-**4). In addition, the existing conditions in the Broad Branch project corridor were assessed in terms of the condition of the transportation network, air quality, noise, hazardous waste and materials, and energy conservation.

Key natural resources within the project corridor include Broad Branch, a perennial stream with a mapped 100-year floodplain, and Rock Creek Park, the only large area of mostly contiguous deciduous forest habitat in the District metropolitan area. Several tributaries to Broad Branch are also crossed by the alignment, including Soapstone Creek.

The United States Fish and Wildlife Service (USFWS) IPaC system identified two federally-listed threatened or endangered species that may occur within the project vicinity: the endangered Hay's spring amphipod (*Stygobromus hayi*) and the threatened northern long-eared bat (*Myotis septentrionalis*). Communication with park officials indicate that the closest known population of Hay's spring amphipod is approximately three quarters of a mile northeast of the southern end of Broad Branch Road and is not in the Broad Branch tributary watershed (Yeaman, 2013; Ferebee, 2019). The northern long-eared bat was federally listed as threatened effective May 4, 2015 (80 FR 17974). Northern long-eared bat roosts have been observed in the vicinity of the southern end of the project. No known maternity roosts or hibernacula have been observed within the project vicinity (Ferebee, 2019).

A tree survey was conducted as part of this project to determine the number, size, and health (condition) of existing trees along the roadway corridor. The inventory was used to determine the potential impact (direct and indirect) to trees adjacent to the roadway and would help determine the level of replacement required to mitigate any loss.

In terms of cultural resources, archaeological sites, areas of archaeological potential, historic structures and cultural landscapes are located in the Broad Branch Road project area. The Rock Creek Park Historic District (RCPHD) and the Civil War Fort Sites and Fort Circle Park System Historic District are listed on the National Register of Historic Places (NRHP) and are immediately adjacent to Broad Branch Road. Contributing elements to the two historic districts are located within the Area of Potential Effects (APE) for the proposed project. These elements include one archaeological site (site 51NW169) for the Civil War Fort Sites and Fort Circle Park System Historic District; and multiple architectural features for the RCPHD. Architectural features associated with the RCPHD located with the project area include: Grant Road Bridge; Broad Branch Creek Bridge; Glover (Ridge) Road Bridge; Grant Road; Ridge (Glover) Road; Western Ridge Foot Trail and White Horse (Bridle) Trail on the north side of Broad Branch; Soapstone Creek culvert; storm water outfalls with stone headwalls; stone retaining walls; and stone boundary markers. In addition, the boundaries of the proposed RCPHD expansion include the Soapstone Creek Valley (Reservation 402) and the foot trail within the valley.

Figure S-3. Natural Resources

Figure S-4. Community Resources

Other architectural resources identified in the DDOT right-of way within the APE include a stone pedestrian bridge and architectural features associated with DC roadway and infrastructure which include Broad Branch Road, 27th Street, the 27th Street Bridge, roadway guard rails, and water control resources such as storm drain outfalls and inlets, retaining walls, culverts, stone channels, and circular features. Residential and institutional facilities adjacent to the roadway on private property, including the Gatehouse at La Villa Firenze, two buildings associated with the Carnegie Institution's Broad Branch campus, Ingleside Manor, and Hillwood Estate, Museum and Gardens are also located within the APE.

The NPS prepared the Historic Trails of Rock Creek Park Cultural Landscape Report in 2013. Portions of three historic trails, as identified in the report, are present along the southern end of the project area near the intersection of Broad Branch Road and Beach Drive: the Western Ridge foot trail, the Soapstone Creek Valley foot trail, and the White Horse bridle trail.

While Rock Creek Park, designated Park/Recreation/Open Space land use, dominates the eastern side of the roadway, land use on the western side is predominantly Low Density Residential, with Institutional land area (Carnegie Institution of Washington, Ingleside at Rock Creek) and some Park/Recreation/Open Space (Fort Circle Parks) at the northwestern end of the corridor. Rock Creek Park and an additional Institutional land area (Hillwood Estate, Museum and Gardens) occur at the southern end of the roadway. Five residences for foreign diplomats occur along Broad Branch Road on property owned by Sovereign Nations. Broad Branch Road provides access to these residences and facilities along the roadway. Existing traffic volumes suggest that there is adequate capacity and no need for capacity improvements on Broad Branch Road.

Broad Branch Road does not currently have sidewalk facilities, which poses a safety concern for pedestrians. Three trails, the Soapstone Valley foot trail, the Rock Creek Multi-Use Trail, and the Western Ridge Trail are accessible from the project corridor. There are no sidewalks or marked crossings on Broad Branch Road to connect pedestrians with these trails. Broad Branch Road is currently signed as an on-street bike route, however only the southern portion (south of Brandywine Street) is officially mapped as such. The 2011 DC bike map lists it as having poor biking conditions, with no on-street bike lanes. The northern and southern termini of the project are located near on-street signed bike routes.

The rehabilitation of Broad Branch Road is included in the Transportation Improvement Program (TIP) for the Metropolitan Washington Region (Fiscal Years 2017 to 2022), and the scope of the project is consistent with the regional analysis included in the TIP. The National Capital Region 2016 Constrained Long-Range Transportation Plan (CLRP) and the 2017-2022 TIP have been determined by the Metropolitan Washington Council of Governments (MWCOG) to conform to the intent of the State Implementation Plan (SIP).

The Broad Branch Road project is not a project of air quality concern and existing noise levels do not exceed federal noise abatement criteria.

S.6 ENVIRONMENTAL IMPACTS

The following briefly describes the principal environmental effects of the proposed project. **Table S-1**, located at the end of this section, is a matrix showing the comparative effects of the alternatives. Based on the evaluation included in the initial EA and this Revised Draft EA, as well as comments received from regulatory agencies and the public, it is anticipated that the project would not have a significant impact on the environment either in context or intensity as defined by the Council on Environmental Quality (CEQ).

This EA document complies, to the extent possible, with all applicable environmental laws and Executive Orders, or provides reasonable assurance that their requirements can be met.

S.6.1 NATURAL RESOURCES

Construction of the Preferred Alternative and each of the Candidate Build Alternatives would disturb land areas beyond the existing roadway infrastructure. The areas of disturbance range from 143,1692 square feet (3.3 acres) for the narrowest alternative (Alternative 2) to 219,176 square feet (5.0 acres) for Alternative 4. The revised designs for Preferred Alternative substantially reduced the total disturbed areas compared to the original Alternative 3 by incorporating reduced sidewalk widths in the segments adjacent to embassy properties and minor alignment refinements. To minimize off-site impacts, Erosion and Sediment Control and Stormwater Management Plans would be developed in accordance with DC Municipal Regulations.

The Preferred Alternative and each of the Candidate Build Alternatives would result in improvements to local water quality by incorporating effective stormwater management systems. The proposed systems would reduce the volume and velocity of stormwater runoff entering receiving surface waters by increasing retention and infiltration. The improved stormwater management systems would offset all additional runoff generated through increased impervious areas created by the alternatives.

In-stream work for this project would include replacement of the crossing at Soapstone Creek, reconstruction of culvert outfalls to Broad Branch, and restoration of existing or construction of new retaining walls along Broad Branch. Such in-stream work would require permits with the U.S. Army Corps of Engineers and District Department of the Environment in accordance with Sections 402 and 404 of the Clean Water Act.

A portion of the existing Broad Branch Road lies within the 10-year floodplain for Broad Branch stream, resulting in significant erosion damage to the roadway. The area of impervious surfaces within the floodplain would increase due to the addition of new pavement, curbs, gutters, sidewalk and/or bike lanes in each of the alternatives and the new sidewalk included as Option B. Additional floodplain encroachment would involve between 15,516 square feet (0.36 acres) for Candidate Build Alternative 2 and 27,429 square feet (0.63 acres) for Candidate Build Alternative 4 – the widest alternative. Design refinements incorporated into the Preferred Alternative result in a total additional floodplain encroachment of 19,434 square feet, which is 4,813 square feet less of additional floodplain encroachment than Candidate Build Alternative 3 (24,247 square feet). None of the encroachments are expected to cause any increase in backwater elevations. An

overall reduction in backwater flooding is expected with the increased floodwater capacity provided by the new culvert over Soapstone Creek.

No wetlands, navigable waters, or wild or scenic rivers have been identified in the immediate project area.

Expansion of the roadway footprint and disturbance of areas adjacent to the roadway during construction would remove vegetation, including some large trees. Work conducted may damage trees located beyond the limits of disturbance if their root systems stretch into areas where groundbreaking occurs. It is estimated that between 249 and 465 trees with diameters at breast height greater than 4 inches could be impacted. The revised designs under the Preferred Alternative reduced the number of trees that would be impacted (i.e., 382 trees compared to 465 trees under Candidate Build Alternative 3). Impacts to trees would be avoided to the maximum extent possible by minimizing cut/fill/pavement within the root zone. Trees would be protected to the extent practical during construction or replaced according to DDOT's Bluebook for Standard Specifications for Highways and Structures - Section 611 Trees, Shrubs, Vines, and Ground Covers.

In accordance with the 4(d) Rule for the Northern Long-Eared Bat (81 FR 1900), incidental take of northern long-eared bats resulting from tree removal is prohibited if it: (1) Occurs within a 0.25 mile radius of known northern long-eared bat hibernacula; or (2) cuts or destroys known occupied maternity roost trees during the pup season (June 1 through July 31). Prior to, and during construction, DDOT would continue to coordinate with USFWS and NPS to identify any known locations of northern long-eared bat hibernacula and/or maternity roost trees within the project vicinity. If required by the USFWS, tree removal would occur outside of the identified pup season.

S.6.2 Cultural and Paleontological Resources

Project effects to architectural resources include demolition, alteration of architectural traits, structural instability through vibration, short-term audio intrusions during construction, and visual intrusions to historic settings. Soapstone Creek Culvert, stormwater outfalls, segments of retaining walls, and boundary markers that are considered contributing elements to the RCPHD and the stone retaining walls associated with the gatehouse at La Villa Firenze would be impacted by improvements proposed for the Preferred Alternative. Similar impacts are associated with each of the other Candidate Build Alternatives.

The Soapstone Creek Culvert would be demolished and replaced with a larger arch culvert. Replacement of the Soapstone Creek Culvert involves lengthening the headwalls along Broad Branch Road beyond the original ca. 1898 footprint, which may result in an adverse impact to historic archaeological resources if remnants of the stone dam across Broad Branch are encountered and disturbed during the replacement of the Soapstone Creek Culvert. Demolition of the Soapstone Creek Culvert would have an adverse impact on this NRHP-eligible resource.

Portions of historic retaining wall segments that are contributing resources to the RCPHD may be affected by roadway construction if they are determined to require restoration or replacement as part of roadway rehabilitation. The use of context sensitive designs and architecturally compatible materials may result in no impact on these NRHP-listed resources. In addition, use of

heavy grading equipment could cause ground vibrations which may damage or topple adjacent historic walls, resulting in an adverse impact on these NRHP-listed resources.

Portions of existing stone headwalls or stone retaining walls with openings for stormwater outfalls that are contributing resources to the RCPHD may be removed and replaced during excavation for replacement of the outfall pipes. Replacement of these resources would have an adverse impact on these NRHP-listed resources.

Three Rock Creek Park stone and metal boundary markers may be disturbed by roadway cut-and-fill activities. These markers may be inadvertently moved during roadbed preparation near the DDOT ROW or covered with fill. The stone and metal boundary markers would be temporarily re-located during construction and re-installed in the original location in coordination with the NPS. Relocation of the stone and metal boundary markers would result in an adverse impact on these potentially NRHP-eligible resources.

Visual intrusions to the historic setting of RCPHD would be minimized with the use of architecturally compatible designs and materials for the replacement of Soapstone Creek Culvert, new retaining walls, new outfall headwalls, and repair of historic stone retaining walls during outfall replacement. With the use of context sensitive designs and architecturally compatible materials, no impact is anticipated to the historic setting and viewshed of the RCPHD.

Portions of the original stone retaining walls at the Gatehouse driveway entrance to La Villa Firenze located on the Government of Italy property and within DDOT right-of-way were impacted by designs for each of the original Candidate Build Alternatives. Demolition of the stone retaining walls under the Candidate Build Alternatives would result in an adverse impact on the NRHP-eligible Gatehouse. Modifications incorporated into the Preferred Alternative 3 Modified shifted the roadway widening to the east at this location and only portions of the original stone retaining walls within the DDOT right-of-way would be relocated.

Segments of three historic trails considered contributing elements to the Historic Trails Cultural Landscape for Rock Creek Park are located along the southern end of the project area (the Western Ridge foot trail, Soapstone Creek Valley Trail and the White Horse bridal trail). Some trees with a diameter greater than 4 inches would be impacted on NPS property within the viewshed of the three historic trails under Alternatives 3, 4, and the Preferred Alternative; however, the removal of these trees and associated understory would not diminish the overall perception of tree covered hillsides within the viewshed of the three trails. Visual intrusions to the viewshed of this cultural landscape of RCPHD would be minimized with the use of context sensitive designs and architecturally compatible materials for the replacement of Soapstone Creek culvert, new retaining walls, new outfall headwalls, and repair of historic stone retaining walls during outfall replacement with the implementation of the Preferred Alternative. Temporary visual and audible intrusions to the three trails associated with the Rock Creek Park cultural landscape would likely occur during the period of construction for any of the alternatives.

No ethnographic resources, museum collections, Indian Trust resources and Native American sacred sites, or paleontological resources occur in the project area and no impact to these resources would occur from the No Action or the Candidate Build Alternatives.

S.6.3 SOCIOECONOMIC RESOURCES

In some locations, the roadway alignment extends beyond the DDOT right-of-way on both the east and west sides of the corridor. However, portions of the roadway that are considered to be outside the DDOT right-of-way may be due to inconsistencies in survey bounds that existed when the current Broad Branch Road was constructed or may be the result of previous repaving projects. These inconsistencies will be investigated in cooperation with the applicable stakeholders during the design phase.

Under Candidate Build Alternatives 3 and 4, and the Preferred Alternative, additional areas outside the existing right-of-way would be required to provide pedestrian and bicycle facilities. Additional parcels or parts of parcels would not require relocation of a residence, business, or other structures. The acquisition of private right-of-way would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Acquisition of right-of-way from the NPS would be performed through a Transfer of Jurisdiction (TOJ). Temporary encroachments on NPS land during construction would be accommodated through temporary construction easements.

The Candidate Build Alternatives are expected to have no effect on land use and zoning within the project corridor.

Under Candidate Build Alternative 2, grading for construction would require a temporary easement on lands belonging to a Sovereign Nation (Malaysia) resulting in negligible, short-term impacts to foreign property. No permanent structures would be constructed outside existing DDOT right-of-way. Under Candidate Build Alternatives 3 and 4, additional right-of-way would need to be acquired within lands belonging to Sovereign Nations (Italy and Malaysia) for permanent construction of retaining walls, resulting in a minor, long-term impacts to foreign property. The revised design for the Preferred Alternative 3 Modified avoids impacts to lands belonging to Sovereign Nations.

The project would not result in any impacts to low-income or minority populations.

S.6.4 AESTHETICS AND VISUAL QUALITY

Effects to aesthetics and visual quality in the project area include alteration of existing cultural and natural features and introduction of vertical elements that could obscure existing views. The visual quality within the project area where new retaining walls are proposed would change from natural or landscaped vegetation to discontinuous retaining walls varying in visible height, relative to one of seven vantage point from within four sectors, including Broad Branch Road itself, Rock Creek Park, and residential or institutional sectors on the west side of the roadway. Proposed retaining walls located on the east side of Broad Branch Road between 27th Street and Beach Drive are associated with Broad Branch and Rock Creek Park. From within the Broad Branch Road sector, the visual quality would change from natural trees and vegetation along the stream banks to discontinuous retaining walls with a visible height of 3.5 feet and ranging in length by each alternative. With all of the retaining walls on the east side measuring 3.5 feet in visible height, views into Rock Creek Park and Fort Circle Parks from the roadway would be visible over the retaining walls for vehicle occupants, cyclists, and pedestrians. Proposed

retaining walls on the east side of Broad Branch Road would most likely be viewed in their entirety from the top of the wall to the stream bottom within the Rock Creek Park sector. From the White Horse Trail, the retaining walls are between 7.5 feet and 13.75 feet high; and from Grant Road, the retaining wall is between 14.75 feet and 16.25 feet high, depending on the alternative. Other visual changes include replacement of the Soapstone Creek Culvert with a concrete arch culvert and the headwalls of three outfalls.

Views to the project area from the Gatehouse at La Villa Firenze (a vantage point in the residential sector) would be partially obstructed under Candidate Build Alternatives 2, 3, and 4 by the construction of a retaining wall between 6.25 feet and 8.25 feet high on the north side of the entrance driveway. This retaining wall would not be constructed as part of the Preferred Alternative; the roadway widening at this location has been shifted to the east side of the road in the Preferred Alternative to avoid impacts to this resource. Under the Candidate Build Alternatives and the Preferred Alternative, views to the project area would be narrowed by a 5 to 6-foot high retaining wall associated with the new concrete arch culvert to replace the existing Soapstone Creek Culvert south of the entrance driveway.

Under Candidate Build Alternatives 3 and 4, and the Preferred Alternative, views to the project area from the Ambassador's residences (Ivory Coast and Tunisia) in the residential sector would include construction of retaining walls between 5.5 feet and 14.5 feet high. These vertical elements represent a visual intrusion of the project area as viewed from the Ambassador's residences hilltop vantage point.

Use of context sensitive designs and architecturally compatible materials for construction of the new concrete arch culvert over Soapstone Creek, retaining walls, and outfall headwalls would maintain the aesthetic quality associated with the rural feel of the views from residences.

S.6.5 Community Resources

The project would have no adverse impacts on local community resources. Improved travelways would prove beneficial to local emergency service providers.

All Candidate Build Alternatives, including the Preferred Alternative, would require temporary disturbance and possible tree removal on NPS park property. Access for motorized vehicles would improve post-construction with the upgrade of facilities and improved safety resulting from stormwater management and improved roadway engineering. All of the build alternatives would require temporary disturbance in Rock Creek Park near existing retaining walls for the restoration or construction of new walls. Additional land on the east side of the alignment would be needed for Alternatives 3 and 4 and the Preferred Alternative to accommodate new or replacement retaining walls, approximately 39 square feet, 236 square feet, and 2,252 square feet, respectively. This area would not alter the ability of the park to function as intended and would enhance safe access to park facilities for both motorized and non-motorized users. A sidewalk on the west side of roadway in the southern part of the project area would connect the Soapstone Valley Trailhead to a NPS parking lot on Beach Drive and would be accomplished through a construction easement.

Each of the Candidate Build Alternatives, including the Preferred Alternative would result in a reconfiguration of the existing forked Y-intersection at Brandywine Street to a T-intersection and the elimination of the central traffic island/triangle park. Sidewalks would be added on both sides of Brandywine Street to connect to the sidewalks proposed for the western side of Broad Branch Road. The new interchange configuration also includes wheelchair accessible ramps/aprons and a crosswalk. The reduction in green space provided by this park would be offset by an increase in total green space at the intersection with the addition of two rain gardens at the interior corners of the new intersection.

S.6.6 Transportation

Under all of the Candidate Build Alternatives, DDOT would rehabilitate Broad Branch Road by improving infrastructure, stormwater management, and sight lines resulting in safer vehicle passage. Under Candidate Build Alternatives 3 and 4, and the Preferred Alternative, continuous sidewalks along the length of the rehabilitated roadway would provide an improved pedestrian facility. Alternative 4 would provide a dedicated bike lane and removes the conflict providing for a safer travel way for both modes. Short-term detours would be required during construction. Maintenance of traffic and detour plans would alleviate impacts to local drivers and work zones would be established to protect bicyclists and pedestrians.

S.6.7 Air Quality

The proposed action would not result in any change in roadway capacity or adjacent land uses; therefore, there would be no measurable change in air quality parameters. Short-term impacts associated with construction would be mitigated through implementation of DDOT standard specifications.

S.6.8 Noise and Vibration

The proposed Candidate Build Alternatives and the Preferred Alternative would not result in any change in roadway capacity or its horizontal or vertical alignment. Therefore, no appreciable long-term impacts from noise and vibration would occur from implementation of any of the alternatives. Construction-generated noise would cause temporary increases in noise levels at nearby residences and community resources. Temporary vibration levels generated during construction may result in impacts to the Carnegie Institution as well as historic retaining walls and drainage structures in the project area.

S.6.9 Hazardous Waste and Materials

Based on a review of available data and site inspections, no evidence of recognized environmental concerns (hazardous material sites) were identified in the project area.

S.6.10 Indirect and Cumulative Effects

There would be no induced or secondary effects caused by the proposed project. The proposed project would serve traffic generated by development on adjoining lands and beyond the limits of the project, but it would not cause any further such development. Moreover, the project is consistent with local comprehensive planning regarding land use goals in the surrounding area and transportation in the project corridor.

Despite the dramatic changes in the landscape that have occurred over time due to human settlement and development in the surrounding area, the intensity of the incremental or cumulative impacts of the project are considered small when reviewed in the context of impacts from other past, present, and reasonably foreseeable future actions and would not rise to a level that would cause significant cumulative impacts.

S.6.11 SECTION 4(f) EVALUATION

Four Section 4(f) properties would be used (or impacted) by the Candidate Build Alternatives: NRHP-listed RCPHD (including retaining walls and stormwater outfall headwalls that may be impacted from proposed reconstruction or demolition and replacement), the individually NRHP-eligible Soapstone Creek Culvert, contributing elements of the NRHP-eligible gatehouse at La Villa Firenze, and Rock Creek Park as both a contributing historic site and as a Park facility (see Sections 3.2 and 3.3.9 for descriptions of these resources). The Preferred Alternative would impact all four Section 4(f) properties: NRHP-listed RCPHD (including retaining walls and stormwater outfall headwalls that may be impacted from proposed reconstruction or demolition and replacement), the individually NRHP-eligible Soapstone Creek Culvert, and Rock Creek Park. The portion of the original stone retaining walls associated with the Gatehouse at La Villa Firenze that are located within the DDOT right-of-way would be relocated.

There is no feasible and prudent alternative that avoids the Section 4(f) use of contributing elements of RCPHD (retaining walls and stormwater outfall headwalls), the Soapstone Creek Culvert, the stone retaining walls associated with the Gatehouse at La Villa Firenze; and Rock Creek Park. Based on the least overall harm balancing factor table and systematic rating system (identified in Table 4-13), the Preferred Alternative has the best rating for least overall harm. The primary discriminator centers around the extent of reconstruction of portions of the stone retaining walls associated with the Gatehouse at La Villa Firenze and serious concerns by the Government of Italy of potential land acquisition of sovereign property for DDOT right-of-way (Factors 4 and 6). Sovereign soil is protected by the principle of inviolability of diplomatic missions as guaranteed by international law. Although the Candidate Build Alternatives all have Section 4(f) uses of contributing elements of the RCPHD (retaining walls and stormwater outfall headwalls), Soapstone Creek Culvert, the stone retaining walls associated with the Gatehouse at La Villa Firenze, and Rock Creek Park, all possible planning to minimize harm to historic properties has been investigated. Minimization measures have already been incorporated into the design of the road and stormwater outfall features; others are stipulated in the draft MOA.

Measures to minimize harm incorporated into the project design include:

- Replacement of Soapstone Creek Culvert: Use of context sensitive design and materials; reuse of existing materials as appropriate.
- Construction of new retaining and coping walls: Use of context sensitive design and appropriate materials.
- Reconstruction of existing historic retaining walls: Use of context sensitive design and materials; reuse of existing materials as appropriate.

- Replacement of outfalls: Reconstruction of stone surrounds in portions of the stone retaining walls and stone headwalls; reuse of existing materials as appropriate.
- Post-construction activities: re-setting original stone and metal boundary markers considered contributing elements to the RCPHD.
- Post-construction activities: Restoration of native tree species and vegetation in Rock Creek Park.

S.6.12 Summary of Impacts

The following table (**Table S-1)** provides a comparative summary of the potential impacts associated with the Preferred Alternative along with the No-Build and other Candidate Build alternatives considered in the Revised Draft EA.

Table S-1. Summary of Impacts

SUMMARY	NO ACTION ALTERNATIVE 1	BUILD ALTERNATIVES			
		ALTERNATIVE 2	ALTERNATIVE 3	PREFERRED ALTERNATIVE 3 MODIFIED	ALTERNATIVE 4
Meets Purpose & Need - Road Conditions - Stormwater Management - Multimodal Needs - Safety	No	Yes	Yes	Yes	Yes
Right-of-Way Acquisition (square feet)	0[1]	3,737	28,827	4,556	41,823
Additional Area of Disturbance (acres)	0	3.30	4.86	4.00	5.03
Improvements to Stormwater Management	No	Yes	Yes	Yes	Yes
Additional Floodplain Encroachments (square feet)	0	15,516	24,247	19,434	27,429
Stream Impacts (linear feet)	0	296	367	487	599
Wetlands Displaced (acres)	0	0	0	0	0
Threatened and Endangered Species Affected	None	None	None	None	None
Loss of Trees (diameter at breast height > 4")	0	249	465	382	463
Archaeological Resource Impacts	None	Potential Impacts	Potential Impacts	Potential Impacts	Potential Impacts
Historic Structure Impacts	None	Adverse Impacts	Adverse Impacts	Adverse Impacts	Adverse Impacts

▶ *Continued – see end of table for notes.*

Table S-1. Summary of Impacts

SUMMARY	NO ACTION ALTERNATIVE 1	BUILD ALTERNATIVES			
		ALTERNATIVE 2	ALTERNATIVE 3	PREFERRED ALTERNATIVE 3 MODIFIED	ALTERNATIVE 4
Land Use and Zoning	No Change	No Change	No Change	No Change	No Change
Environmental Justice Populations Affected	0	0	0	0	0
Retaining Walls – Views from Broad Branch Road and Rock Creek Park	None	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality
Retaining Walls – Views from Residences	None	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality	Potential impacts to aesthetics and visual quality
Area of Permanent Park Impacts (square feet)					
- Rock Creek Park	0	0	39	236	2,252
- District Triangle Park	0	5,899	5,8994	3,502	3,5024,
Pedestrian Improvements	No	Yes	Yes	Yes	Yes
Cyclist Facilities	No	No	No	No	Yes
Air Quality Impacts	None	None	None	None	None
Noise Impacts	None	None	None	None	None
Hazardous Materials	None	None	None	None	None
Construction Costs (millions)	N/A	$37.4	$43.7	$56.3	$57.5
Construction Duration (months)	N/A	24	30	30	36

[1] The existing roadway is within DDOT right-of-way, with minor exceptions. These exceptions occur in six short sections along the project corridor where the existing roadway was constructed outside DDOT-owned property. These small areas account to a total area of 923 square feet. The final NEPA document will serve to provide the appropriate action needed to correct these inconsistencies, which may include an easement, land transfer, or permit.

[2] Activities outside the existing right-of-way (beyond the area of existing pavement previously mentioned) would be accomplished through easements.

S.6.13 Summary of Mitigation and Commitments

Impacts to all resources have been avoided to the extent possible as part of the project development process and preliminary designs of the Candidate Build Alternatives. An ordered approach to mitigating unavoidable impacts has been followed that includes the following sequencing:

Minimization -> Repair or Restore -> Reduce over time -> Compensate

Proposed mitigations for these unavoidable impacts and the environmental commitments to assure their implementation are summarized in the following table (Table S-2).

Table S-2. Summary of Mitigation and Commitments

PROPOSED MITIGATION MEASURES AND COMMITMENTS
GEOLOGY, SOILS, AND TOPOGRAPHY
DDOT will obtain a construction permit from the District Department of Energy and Environment (DOEE) prior to any land disturbing activities.
DDOT will prepare initial erosion and sediment control plans and a stormwater management plans in support of design plans and permit applications.
The construction contractor will perform all construction activities in accordance with the plans and will be self-monitored for compliance.
WATER RESOURCES
DDOT will refine the analysis and quantity of stream impacts during the final design phase and will develop specific mitigations in coordination with the US Army Corps of Engineers (USACE) and DOEE during the permitting process. DDOT anticipates that stream credits will be purchased from an approved mitigation bank.
The construction contractor will develop erosion and sediment control plans (in accordance with USACE and DOEE permit requirements) for all areas of land disturbance during construction to minimize short-term erosion and sediment transport to nearby receiving waters.
The construction contractor will be required to comply with the conditions and pollution control measures specified in DDOT's *Standard Specifications for Highways and Structures – 618 Erosion and Sediment Control.*
DDOT's final design will incorporate stormwater management designs to offset increases in runoff due to increased impervious areas. Designs will incorporate rain gardens and other Low Impact Development (LID) measures to further reduce storm event runoff.
DDOT's final design will include expanded capacity of the Soapstone Culvert and repair/extension to the existing culverts entering Broad Branch, which will mitigate the flooding issues that are currently prevalent in the project area.
WILDLIFE INCLUDING THREATENED AND ENDANGERED SPECIES
DDOT will implement protective actions for the northern long-eared bat. DDOT will coordinate with the US Fish & Wildlife Service (USFWS) and NPS, prior to construction, to identify any known locations of bat hibernacula and/or maternity roost trees within the project vicinity. If identified, Time of Year (TOY) restrictions for tree removal would occur outside of the pup season (June 1 through July 31).
DDOT will coordinate with USFWS to determine if TOY restrictions are required for nesting migratory birds and would incorporate such TOY restrictions into construction specifications if required by USFWS.
The construction contractor will develop erosion and sediment control plans, stormwater management plans, and BMPs in accordance with DDOT's *Standard Specifications for Highways and Structures* to protect habitat integrity.

► *Continued.*

Table S-2. Summary of Mitigation and Commitments

PROPOSED MITIGATION MEASURES AND COMMITMENTS
VEGETATION
The construction contractor will avoid disturbance to trees, to the maximum extent possible, by minimizing cut/fill/pavement within the root zone. Trees will be protected during construction to the extent practicable or replaced according to DDOT's *Standard Specifications for Highways and Structures - Section 608 Trees, Shrubs, Vines and Ground Cover*.
The construction contractor will prevent the introduction of new invasive species and prevent the spread of existing populations by washing all machinery before it enters the construction area and by reseeding all disturbed areas with an approved seed mix.
CULTURAL AND PALEONTOLOGICAL RESOURCES
A Draft Memorandum of Agreement (MOA) has been prepared by FHWA and DDOT in consultation with consulting parties to resolve and mitigate the adverse effects to historic properties in accordance with Section 106 of the NHPA. Mitigation for potential construction impacts to historic and archaeological sites are addressed in the stipulations contained in the Draft MOA. These draft stipulations include: – Documentation of contributing elements of the Rock Creek Park Historic District (RCPHD) and the stone walls at the Gatehouse at La Villa Firenze. – Replacement and/or repair of RCPHD stone retaining walls and stone headwalls, Soapstone Creek Culvert, and the retaining walls at the Gatehouse at La Villa Firenze using architecturally compatible styles with reuse of existing stone or similar materials. – Careful removal and subsequent re-setting of RCPHD stone boundary markers. – Ongoing project review to ensure architectural compatibility of replacement or repair of stone features. – Construction contract requirements for a masonry contractor with demonstrated historic preservation expertise. – Inadvertent discovery procedures for unanticipated archaeological resources.
Mitigation measures to minimize vibration which may create structural instability of two segments of the historic retaining wall will include: – Specify realistic vibration limits in contract documents. – Require the contractor to submit a list of operations that may generate vibration and work with the contractor to reduce the magnitude and/or duration. – Route construction equipment to avoid impacts to sensitive receptors. – Minimize duration of vibration impacts.
To minimize short-term audio intrusions during construction activities, DDOT will implement the following mitigation measures as regulated by Title 20 of the District of Columbia Code of Municipal Regulations (DCMR). – Use of shields, impervious fences or other physical sound barriers to reduce noise. – Use of sound retardant housings or enclosures around noise producing equipment. – Use of effective intake and exhaust mufflers on internal combustion engines and compressors. – Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum. – Advise the engineer in writing of proposed haul routes prior to securing haul permit.
RIGHT-OF-WAY
The acquisition of private right-of-way would be conducted in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended. Acquisition of NPS lands would be implemented through a Transfer of Jurisdiction between DDOT and NPS.

► *Continued.*

Table S-2. Summary of Mitigation and Commitments

PROPOSED MITIGATION MEASURES AND COMMITMENTS
AESTHETICS AND VISUAL QUALITY
Context sensitive designs and architecturally compatible materials for construction will be used for the following elements in order to maintain the aesthetic quality associated with the rural feel of the views from the residences: – New retaining walls and sidewalks. – New concrete arch culvert over Soapstone Creek and associated outfall headwalls.
COMMUNITY RESOURCES
DDOT will continue consultation with the Carnegie Institution to establish appropriate protocols to minimize potential vibration impacts and define scheduling during construction.
EMERGENCY SERVICES
DDOT will continue coordination with emergency service providers and include maintenance of traffic (MOT) plans in all construction documents to minimize disruptions to emergency service vehicles.
PARKS AND RECREATION AREAS
DDOT will coordinate all construction activities involving park properties with NPS and District Department of Parks and Recreation (DPR), including public notices to park users in advance of construction activities.
DDOT will coordination with the District DPR regarding maintenance of rain gardens within the new Brandywine Road intersection
UTILITIES AND INFRASTRUCTURE
DDOT will maintain continuous coordination with utility companies, including regularly scheduled monthly meetings, during design and construction to ensure utility conflicts are avoided to the extent possible.
The contractor will be required to contact Miss Utility to identify/mark all utilities prior to earth disturbance activities.
Notifications will be issued to service customers for all planned outages in accordance with utility provider's approved procedures.
TRANSPORTATION
DDOT will prepare a maintenance of traffic (MOT) plan that identify routes to be used by the contractor to minimize traffic impacts and disruption to residential areas and park properties.
DDOT will maintain one lane of vehicular traffic on Broad Branch Road at all times during construction. Protected work zone passages will be established for bicyclists and pedestrians.
DDOT will schedule the roadway rehabilitation in phases and identify potential detour plans for phase.
DDOT will issue public notifications in advance of construction activities that affect vehicular and pedestrian travel.
AIR QUALITY
The contractor will adhere to District regulations regarding dust control and other air quality emission reduction controls, including DCMR Title 20 and other measures specified in DDOT's *Standard Specifications for Highways and Structures – 107.17 Environmental Protection*, would be followed. Construction generated dust would be further reduced through the following measures: – Mist water over demolition or excavation operations. – Cover trucks when moving materials. – Minimize unnecessary vehicular and machinery activities. – Provide vegetative cover for all exposed soils during and upon completion of construction.

▶ *Continued.*

Table S-2. Summary of Mitigation and Commitments

PROPOSED MITIGATION MEASURES AND COMMITMENTS
NOISE AND VIBRATION
The contractor will implement the following noise control measures, to the greatest extent feasible, to minimize the noise levels in all areas surrounding construction activities: – Use of shields, impervious fences or other physical sound barriers to reduce noise. – Use of sound retardant housings or enclosures around noise producing equipment. – Use of effective intake and exhaust mufflers on internal combustion engines and compressors. – Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum. – Advise the engineer in writing of proposed haul routes prior to securing haul permit. – Subject to the approval of the engineer, place stationary equipment to minimize noise impact on surrounding community.
The contractor will implement the following vibration control measures, to the greatest extent feasible, to minimize vibration levels in all areas surrounding construction activities: – Route construction equipment to avoid impacts to sensitive receptors. – Minimize duration of vibration impacts.
DDOT will coordinate construction schedules with the Carnegie Institute so as to minimize disruption to vibration-sensitive operations at the facility.
HAZARDOUS WASTE AND MATERIALS
The contractor will prepare and implement a plan for management and disposal of controlled hazardous materials and contaminated soil and groundwater that may be encountered during construction activities, as defined in the DDOT *Design and Engineering Manual, Chapter 4.11 (Hazardous Waste and Materials/Contaminated Soils)*.
The contractor will prepare and implement a Health and Safety Plan to address preventative measures, spill controls, and remedial activities for hazardous material incidents.

S.7 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

As part of the planning process for the Broad Branch Road EA, DDOT conducted an agency coordination program. This coordination included project scoping, consultation with resource agencies in accordance with Section 7 of the Endangered Species Act (ESA), consultation with the DC SHPO and the NPS in accordance with Section 106 of the NHPA, individual meetings, and a public hearing following completion of the initial EA. DDOT and FHWA also conducted a series of regularly scheduled meetings with the NPS and DOEE to ensure continuous input from these two agencies. Each agency provided extensive information on existing conditions within the project area and helped coordinate the roadway improvement with on-going improvements in Rock Creek Park – most notably stormwater management and the proposal to "daylight" (or restore) 1,600 linear feet of an unnamed tributary to Broad Branch at the northern end of the proposed Broad Branch Road rehabilitation project. The "daylighting" project was completed in 2014.

Consultations were carried out with the US Department of State and the Sovereign Nations which maintained diplomatic residences along the project corridor. These consultations were instrumental in the development and evaluation of the Candidate Build Alternatives as the sovereign rights of inviolability severely restricted the ability to acquire any permanent right-of-

way from the Sovereign Nation owned-properties. Consultations will continue during the final design and construction phases.

Following publication of the initial EA in October 2013, DDOT continued to coordinate with NPS regarding potential impacts to Rock Creek Park. A series of seven meetings were conducted between March 2014 and November 2018 where NPS representatives were briefed on revisions made to the candidate build alternatives.

Following discussions with the US State Department and the decision that no encroachments would be made upon Sovereign Nation properties, design refinements were made to Candidate Build Alternative 3 which shifted the alignment slightly to the east and resulted in minor encroachments on Rock Creek Park. Seven locations were identified where encroachments on to the NPS park property would occur – characterized as very narrow slivers of land generally less than 1-foot wide and a combined total length of 273 feet. Recognizing the location of the encroachments upon relatively steep grades above Broad Branch, DDOT and NPS agreed that the encroachments would not adversely affect the activities, features or attributes of the park land and the roadway improvement would serve to better stabilize slopes at these same locations. The new alternative was titled Candidate Build Alternative 3 Modified and has been identified by DDOT as the Preferred Alternative.

NPS continued their role as a Cooperating Agency throughout the preparation of the Revised Draft Environmental Assessment, Draft Section 4(f) Evaluation and the Section 106 Memorandum of Agreement. NPS was provided with preview copies of each document and their comments were incorporated accordingly.

NPS will continue to serve in an active role in the post-NEPA phases of the project in that there may be Transfers of Jurisdiction (TOJ) of properties between the two agencies to accommodate the final design and construction of the proposed action.

Throughout the study DDOT actively sought public input. Numerous methods were employed to solicit input including two public information meetings, a project website and a formal public hearing following publication of the initial EA. These outreach activities will continue through the conclusion of the NEPA process.

Input from the participating agencies and the general public were instrumental in the development and refinement of project alternatives. After consideration of the agency and public comments received during the comment period for the initial EA, the modified version of Candidate Build Alternative 3 was selected as the Preferred Alternative. The Preferred Alternative minimizes encroachments outside of the existing right-of-way while still meeting the project's purpose and need.