CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This "Environmental Consequences" chapter analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives considered in this EA. This chapter also includes definitions of impact thresholds (e.g., negligible, minor, moderate, and major), methods used to analyze impacts, and the methods used for determining cumulative impacts. As required by the Council on Environmental Quality (CEQ) regulations implementing NEPA, a summary of the environmental consequences for each alternative is provided in **Table 2** which can be found in "Chapter 2: Alternatives." The resource topics presented in this chapter, and the organization of the topics, correspond to the resource discussions contained in "Chapter 3: Affected Environment."

4.1. GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS BY RESOURCE

Potential impacts of all alternatives are described in terms of type (beneficial or adverse); context; duration (short- or long-term); and intensity (negligible, minor, moderate, major). Definitions of these descriptors include:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context: Context is the affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic. As such, the impact analysis determines the context, not vice versa.

Duration: The duration of the impact is described as short-term or long-term. Duration is variable with each impact topic; therefore, definitions related to each impact topic are provided in the specific impact analysis narrative.

Intensity: Because definitions of impact intensity (negligible, minor, moderate, and major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed.

4.2. CUMULATIVE IMPACTS ANALYSIS METHOD

The CEQ regulations to implement NEPA require the assessment of cumulative impacts in the decision making process for federal projects. Cumulative impacts are defined as "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 what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). As stated in the CEQ handbook, "Considering Cumulative Effects" (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being

affected and should focus on effects that are truly meaningful. Cumulative impacts are considered for all alternatives, including the No Action alternative.

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at Rock Creek Park and, if applicable, the surrounding area. **Table 8** summarizes these actions that could affect the various resources at the park, along with the plans and policies of both the park and surrounding jurisdictions, which were discussed in Chapter 1. Additional explanation for most of these actions is provided in the narrative following the table.

The analysis of cumulative impacts was accomplished using four steps:

Step 1 — Identify Resources Affected - Fully identify resources affected by any of the alternatives. These include the resources addressed as impact topics in chapters 3 and 4 of the document.

Step 2 — Set Boundaries - Identify an appropriate spatial and temporal boundary for each resource. The temporal boundaries are noted to the right of the table and the spatial boundary for each resource topic is listed under each topic.

Step 3 — Identify Cumulative Action Scenario - Determine which past, present, and reasonably foreseeable future actions to include with each resource. These are listed in **Table 8** and described below.

Step 4 — Cumulative Impact Analysis - Summarize impacts of these other actions (x) plus impacts of the proposed action (y), to arrive at the total cumulative impact (z). This analysis is included for each resource in Chapter 4.

Table 8. Cumulative Impact Projects

AGENCY	CUMULATIVE IMPACT PROJECT	DESCRIPTION	STATUS
NPS	Blagden Avenue Hiker/Biker Trail (NPS 2008)	The National Park Service has proposed the construction of a hiker/biker trail along Blagden Avenue between Matthewson Drive and Beach Drive primarily in Rock Creek Park. The Preferred Alternative includes a six-foot wide hiker/biker trail constructed on the southern side of Blagden Avenue. **Affected Resource Areas:** Water quality, wildlife, visitor use and experience, and traffic and transportation	Present, currently in the planning phase.
	Peirce Mill Rehabilitation (Friends of Peirce Mill 2008)	The restoration of Peirce Mill includes removal of an asphalt parking lot and comfort station, installation of an underground pump to re-circulate water used to power the millwheel, construction of a bus parking area, improvements to the bicycle path around the mill and handicap access paths, and an upgrade of electrical and mechanical systems. **Affected Resource Areas:** Wildlife, historic structures, cultural landscapes, visitor use and experience	Completed in 2011.

AGENCY	CUMULATIVE IMPACT PROJECT	DESCRIPTION	STATUS
NPS (continued)	Historic Trails Cultural Landscape Report	The National Park Service currently is developing a cultural landscape report for the historic trails in Rock Creek Park, within U.S. Reservation 339. This report will document the horse trails, pedestrian trails, multi-use trails, and social trails. The trails' significance will be evaluated and treatment recommendations for the trails will be provided. **Affected Resource Areas:** Cultural Landscapes	Future; documentation and planning
	Rock Creek Park and the Rock Creek and Potomac Parkway General Management Plan (NPS 2007)	NPS has prepared a General Management Plan (Rock Creek Park GMP) which outlines their approach to manage Rock Creek Park and the Rock Creek and Potomac Parkway. In the Rock Creek Park GMP, the NPS sets long-term goals for resource protection and identifies improvements to retain and improve the current scope of visitor uses at the Park. These actions include, but are not limited to, upgrading trails and rehabilitating deteriorating sections, rehabilitating the Peirce Mill complex to focus on the history of milling and land use in the area; and rehabilitating the Linnaean Hill complex for adaptive use compatible with park values. In addition, the existing park roadway system would be retained and non-recreational through-traffic would be accommodated. The Rock Creek Park GMP allows for continued weekday auto travel throughout the park, but prescribes traffic-calming and speed enforcement measures to reduce traffic speeds and volumes to improve visitor safety and better control traffic volumes and speeds through the park. **Affected Resource Areas:** Historic structures and districts, cultural landscapes, visitor use and experience, human health and safety, and traffic and transportation	Present; approved in 2007
	Reconstruction and Rehabilitation of Beach Drive and the RCPP (NPS 2006b)	In order to meet visitor needs, allow for routine maintenance, and ensure visitor safety, reconstruction is proposed for Beach Drive and the RCPP from P street to Calvert Street. Improvements include repairs of the road surface, improvements in roadway guardrails and lighting, and drainage controls. **Affected Resource Areas:** Water quality, vegetation, aquatic wildlife, historic resources, cultural landscapes, visitor use and experience, traffic and transportation, and health and safety.	Present; constructed.
	Reconstruction and Rehabilitation of Rock Creek and Potomac Parkway Southbound at Waterside Drive, NW ***(NPS 2012)***	***The NPS, in cooperation with the FHWA, is undertaking a combination of road safety improvements located where the southbound ramp from Waterside Drive, NW merges onto Rock Creek and Potomac Parkway in Washington DC. Safety improvements at Watershed Drive, NW, were originally proposed under the 2006 Reconstruction and Rehabilitation of Beach Drive and the RCPP EA; however, in July 2011, NPS determined that the project design was not following the preferred alternative contained in the 2006 EA and construction was halted at Watershed Drive, NW in order to reinitiate the planning and compliance for this specific component of the overall project.*** ***Affected Resource Areas: Water resources, floodplains, wetlands, soils, vegetation, wildlife, visitor use and experience, transportation and safety, historic structures, cultural landscapes, and archeological resources.***	***Present; ongoing***

AGENCY	CUMULATIVE IMPACT PROJECT	DESCRIPTION	STATUS
DDOT/FHWA	Rehabilitation of Oregon Avenue, NW (DDOT 2011)	***DDOT, in conjunction with FHWA and NPS***, propose to rehabilitate a 1.7 mile section of Oregon Avenue between Military Road and Western Avenue. Rehabilitation would repair the road surface, provide stormwater controls, and restore aging infrastructure. Traffic calming devices, sidewalk treatments and retaining walls are proposed in order to enhance safety. In addition the project would bridge gaps in system linkage for pedestrians and bicyclists to parks, schools and residential areas adjacent to Oregon Avenue. **Affected Resource Areas:** Traffic and transportation, archeology, historic structures and districts	Future; currently undergoing agency and public review
	Klingle Valley Trail (DDOT 2010b)	FHWA and DDOT, in cooperation with NPS, have proposed the construction of a multi-use trail facility within the 0.7 mile barricaded portion of Klingle Road between Porter Street, NW and Cortland Place, NW and the restoration of Klingle Creek. The Preferred Alternative involves a 10-foot wide multi-use trail which would be constructed using permeable pavement/materials within the DDOT right-of-way. The Preferred Option for the restoration of Klingle Creek includes full stream channel and bank stabilization. **Affected Resource Areas:** Soils, water quality, wildlife, and visitor use and experience, traffic and transportation	Present, currently in the design phase.
	Rehabilitation of Broad Branch Road, NW	The FHWA and DDOT propose to rehabilitate Broad Branch Road between Linnean Avenue and Beach Drive, NW. Objectives of the project are to address infrastructural deficiencies, community concerns, and safety concerns. **Affected Resource Areas:** Traffic and transportation	Future; currently undergoing agency and public review

AGENCY	CUMULATIVE IMPACT PROJECT	DESCRIPTION	STATUS
DDOE	Rock Creek Watershed Implementation Plan (DDOE 2010)	DDOE, in the Rock Creek Watershed Implementation Plan, proposes specific management measures, programs, and capital improvements to address the pollutant problems in the watershed. The Plan provides both general management measures that will be applied broadly across the watershed and details specific restoration projects for defined locations in the watershed. Proposed actions include Low Impact Development projects and reforestation projects. One action proposed is the installation of RSCs in the Rock Creek Watershed. DDOE has identified the installation of RSC at two locations (at Bingham Run and at Oregon Avenue) for implementation in the near future. These projects have water quality benefits. **Affected Resource Areas:** Water quality, wildlife, human health and safety	Present; scheduled through 2013
DC Water	Clean Rivers Project (DC Water 2011c)	The Clean Rivers Project is a long-term program to reduce combined sewer overflows into DC waterways, specifically the Anacostia River, Potomac River, and Rock Creek. The project includes the construction of a mile long tunnel system to control Piney Branch/Rock Creek overflows. **Affected Resource Areas:** Water quality, wildlife	Present; completion date is variable based on funding
Smithsonian Institution	National Zoological Park Facilities Master Plan	The Smithsonian Institution (SI) recently underwent a process to identify facilities and infrastructure needs at the National Zoological Park and proposes to implement strategies for the next two decades through a master planning process. SI finalized a Comprehensive Facilities Master Plan in 2009 that will help guide facilities renewal at the National Zoo related to animal welfare, research, exhibits, visitor services, and circulation. **Affected Resource Areas:** Water Quality, Wildlife, Traffic and Transportation	Present; approved in 2008 and to be used for 20-25 years

4.3. SOILS

Methodology and Assumptions

The Soil Survey, topographic maps, and other related documents were reviewed in order to analyze potential impacts to soils from the proposed improvements to the Rock Creek Park multi-use trail. Impacts to soils were qualitatively assessed using professional judgment based on the soil characteristics and current conditions of the project area in comparison with the expected site conditions following construction.

Study Area

The study area for soil resource impacts is the limit of disturbance required for the proposed improvements to the Rock Creek Park multi-use trail, and any necessary staging areas for stockpile material and construction equipment. For cumulative impacts, the study area is Rock Creek Park.

Impact Thresholds
Negligible: The effects to soils would be at or below the lower levels of detection. Any effects to soils would be slight.

Minor: The effects to soils would be detectable. Area of soil affected would be relatively small. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.

Moderate: The effect on soil would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would be necessary to offset adverse effects and likely be successful.

Major: The effect on soil would be readily apparent and substantially change the character of the soils over a large area in and out of the park. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

Duration: **Short-term –** Recovers in less than three years; **Long-term –** Takes more than three years to recover.

4.3.1 IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.3.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of the existing operations and maintenance of the Rock Creek Park multi-use trail. Under the No Action Alternative, visitors to Rock Creek Park would continue to use social trails and other non-paved pathways. Soil compaction would continue to occur along these paths, resulting in poor permeability, increased stormwater runoff, and suppression of vegetative growth. These effects would increase the overall rate of soil erosion throughout the project area. Therefore, due to soil compaction and erosion, short-and long-term minor adverse impacts to soils would occur under the No Action Alternative.

Cumulative Impacts
Stream restoration proposed under the Klingle Valley Trail project includes channel grading, construction of step pools, and stabilization of streambanks. Several stormwater BMPs are proposed for the project, which would reduce soil erosion in the watershed of Klingle Creek (DDOT 2010b). In addition, the Rock Creek Watershed Implementation Plan proposes multiple low impact development programs which would help to manage soil erosion. Sample programs under the Plan include rain leader disconnection, green roof retrofitting, and permeable pavement. Beneficial impacts of the Plan would vary based on the level of success of each individual improvement program (DDOE 2010).

Beneficial impacts to soils would result from projects in the region, due to restoration of Klingle Creek and low impact development planning in the Rock Creek watershed. The No Action Alternative would result in short- and long-term minor adverse impact to water resources in Rock Creek Park due to the continued erosion of soils caused by soil compaction and instability. Although the No Action Alternative would have a minor contribution to the cumulative effect of regional projects, there would still be long-term beneficial cumulative impacts to soils in Rock Creek Park.

Conclusion
The No Action Alternative would result in short and long-term minor adverse impacts to soil resources, due to soil compaction and erosion. The result of cumulative impacts projects would be long-term benefits to soils in

Rock Creek Park. When combined with the No Action Alternative, cumulative impacts projects would still have long-term beneficial impacts with regard to soils.

4.3.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

The Peirce Mill Spur is an eight-foot to 10-foot wide social trail extending from Broad Branch Road to Peirce Mill. Option A for the Peirce Mill Spur represents no changes to the existing trail. Under Option A, people would continue to use the unpaved social trail along Rock Creek between Broad Branch Road and Peirce Mill. Soil compaction and exposure would continue to occur, resulting in poor permeability, suppression of vegetative growth, and increased stormwater runoff. These effects would likely result in increased soil erosion at the Peirce Mill trail spur. Therefore, due to soil compaction, Option A would result in long-term minor adverse impacts to soil resources.

Cumulative Impacts
Benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs in the Rock Creek Watershed Implementation Plan. When combined with the long-term minor adverse impact of the No Action Alternative, cumulative impacts to soils would still be beneficial.

Conclusion
Peirce Mill Trail Spur Option A would result in long-term minor adverse impacts to soil resources, due to soil compaction and erosion. The result of cumulative impacts projects would be long-term benefits to soils in Rock Creek Park. When combined with the No Action Alternative, cumulative impacts projects would still have long-term beneficial impacts with regard to soils.

4.3.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

The Rose Park trail consists of a paved trail between P Street, NW and M Street, NW. Existing trail widths vary from five to six feet. Additionally, a social trail connects the existing paved trail to the M Street sidewalk. Option A for the Rose Park trail represents no action, but continuing maintenance of the existing paved trail by the NPS. Under Option A, visitors to the Rose Park trail would continue to use the existing paved trail connecting P Street to M Street and the social trail that connects the existing paved trail to the M Street sidewalk. Soil compaction would continue to occur along the social path, resulting in poor permeability, suppression of vegetative growth, and increased stormwater runoff. These effects would increase the rate of soil erosion at the Rose Park trail, resulting in long-term minor adverse impacts to soil resources.

Cumulative Impacts
As described under Alternative 1, long-term beneficial impacts would result from projects in the region such as the Klingle Creek stream restoration and Rock Creek Watershed Implementation Plan. When combined with the long-term minor adverse impact of the No Action Alternative, cumulative impacts to soils would still be beneficial.

Conclusion
Rose Park Trail Option A would result in long-term minor adverse impacts to soil resources, due to soil compaction and erosion. The result of cumulative impacts projects would be long-term benefits to soils in Rock Creek Park. When combined with the No Action Alternative, cumulative impacts projects would still have long-term beneficial impacts with regard to soils.

4.3.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.3.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. This alternative would resurface the Rock Creek Park multi-use trail at its existing six-foot to 10-foot widths. In addition, Alternative 2 would resurface the Piney Branch Parkway trail to a varying width of six to eight feet.

Erosion and sediment control measures and other Best Management Practices (BMPs) would be implemented during construction to minimize soil erosion and prevent soils from leaving the project area. Construction access and staging would be designed to avoid and minimize impacts to undisturbed soils. Because the construction activities would occur on soils that are already disturbed, protective measures would be employed during construction, and the disturbed soils would be remediated immediately following construction activities, short-term negligible adverse impacts to soils would occur.

The rehabilitation proposed under Alternative 2 would result in earth disturbance and new pavement within a relatively small area, and on sites where the soils currently exist in a disturbed state. The resurfacing would provide a continuously paved trail surface in Rock Creek Park, which would eliminate areas of degraded trail that contain exposed soils, and which would stabilize the existing social trails and discourage new social trails from being developed in the park. Due to the anticipated reduction in social trail usage, the overall hazard of soil erosion in these areas would decrease.

The timber retaining wall stabilization proposed under Alternative 2 would have long term beneficial impacts by protecting soils from further erosion. Stabilization is proposed between Beach Drive and the Rock Creek Park multi-use trail to reduce soil erosion. In addition, minor grading of the trail along a 180-foot trail section south of Calvert Street would decrease the slope of the trail, thereby decreasing runoff and minimizing soil erosion. In general, these improvements would result in long-term beneficial impacts to soil resources.

Cumulative Impacts

The impact of past, present and reasonably foreseeable future projects is described under the No Action Alternative. Benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs of the Rock Creek Watershed Implementation Plan. When combined with the long-term beneficial impacts of the No Action Alternative, cumulative impacts to soils would be beneficial.

Conclusion

Under Alternative 2, short-term negligible adverse impacts would result from construction. Alternative 2 would have long-term beneficial impacts on soil resources through the stabilization of social trails, discouragement of social trail use, rehabilitation of existing paved trails, and rehabilitation of timber retaining walls. The results of cumulative impacts projects would also be beneficial; therefore, cumulative impacts to soils of Rock Creek Park would be beneficial.

4.3.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. In addition to these improvements, Alternative 3 includes widening of the Rock Creek Park multi-use trail to a width of six - 10 depending on the environmental or physical constraints. Resurfacing of the Piney Branch Parkway trail to a varying width of six-eight feet is also included in this Alternative.

Erosion and sediment control measures and other Best Management Practices (BMPs) would be implemented during construction to minimize soil erosion and prevent soils from leaving the project area. The proposed activities would also result in ground disturbance that would extend outside of the current trail limits in areas to be widened or improved, which would require paving of approximately 2.16 acres of ground surface. These activities would result in minor short-term adverse impacts to soils. However, the proposed action under Alternative 3 would result in earth disturbance within a relatively small area, and on sites where the soils currently exist in a disturbed state.

Long-term beneficial impacts would result from the stabilization of the Rock Creek Park multi-use trail, the stabilization of social trails, and the rehabilitation of timber retaining walls. The trail rehabilitation would stabilize areas of exposed soils and degraded trail sections and would likely reduce the use of social trails in the project area. In addition, drainage improvements throughout the trail corridor would help to minimize soil erosion during storm events, resulting in long-term beneficial impacts to soil resources.

Cumulative Impacts

The impact of past, present and reasonably foreseeable future projects is described under the No Action Alternative. Benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs of the Rock Creek Watershed Implementation Plan. When combined with the long-term beneficial impacts of the No Action Alternative, cumulative impacts to soils would be beneficial.

Conclusion

Under Alternative 3, short-term negligible adverse impacts would result from construction. Alternative 3 would have long-term beneficial impacts on soil resources through the stabilization of social trails, discouragement of social trail use, rehabilitation of existing paved trails, and rehabilitation of timber retaining walls. The results of cumulative impacts projects would also be beneficial; therefore, the cumulative impact to soils of Rock Creek Park would be beneficial.

4.3.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B proposes to pave the Peirce Mill trail spur. Approximately 0.22 acres would be paved in the area of the existing social trail. During construction, minor excavation and construction activities in the study area would cause increased soil disturbance and increased potential for erosion. Erosion and sediment control BMPs would be implemented to minimize soil erosion, and disturbed soils would be paved or otherwise stabilized following preparation of the trail base. Short-term minor adverse impacts to soils would occur during construction. Following construction, the disturbed soils within the project area would be stabilized and

the paving of the social trail would prevent continued soil exposure and erosion, resulting in long-term beneficial impacts to soils.

Cumulative Impacts
As described under Alternative 1, benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs of the Rock Creek Watershed Implementation Plan. When combined with the beneficial effects of constructing the Peirce Mill trail spur, long-term beneficial cumulative impacts to soil resources would result.

Conclusion
Short-term minor adverse impacts to soils would result from implementation of Peirce Mill Trail Spur Option B. Paving of the Peirce Mill spur would result in long-term beneficial impacts due to the stabilization of disturbed soils and rehabilitation of the trail sections. Beneficial cumulative impacts to soil resources would result from the effect of regional projects combined with construction of the Peirce Mill trail spur

4.3.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Rose Park Trail Option B, the existing trail would be resurfaced to a standard width of six feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. An increase of approximately ***0.07*** acres of new pavement would result from paving the social trail and widening the Rose Park Trail to the standard six-foot width. Minor excavation and associated construction activities in the study area would cause soil disturbance, increasing the potential for erosion. Erosion and sediment control measures and other BMPs would be implemented as needed to minimize soil erosion; therefore, short-term minor adverse impacts to soils would occur. Disturbed soils within the project area would be stabilized and the paving of the social trail would reduce the area of exposed soils, resulting in long-term beneficial impacts to soil resources.

Cumulative Impacts
As described under Alternative 1, benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs of the Rock Creek Watershed Implementation Plan. When combined with the beneficial effects of constructing Rose Park Trail Option B, long-term beneficial cumulative impacts to soil resources would result.

Conclusion
Short-term minor adverse impacts to soils would result from construction of Rose Park Trail Option B. Once constructed, Option B would have a beneficial impact by stabilizing soils that are currently unpaved. The effects of Option B when added to cumulative impacts projects would result in overall long-term beneficial impacts to soil resources in Rock Creek Park.

4.3.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Rose Park Trail Option C, the existing trail would be resurfaced at a standard width of eight feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. Under Option C, an increase of approximately ***0.16*** acres of impervious surface would result from the resurfacing of the Rose Park trail to the standard eight-foot width and from paving the social trail. Minor excavation and associated construction activities in the study area would cause soil disturbance, increasing the potential for erosion.

Erosion and sediment control measures and other BMPs would be implemented as needed to minimize soil erosion; therefore, short-term minor adverse impacts to soils would occur.

The increased trail width and paving of the social trail would increase the impervious surface within the project area, but would stabilize areas that are currently degraded. Short-term minor adverse impacts would result from construction activities due to the soil disturbance, but long-term beneficial impacts would result from the stabilization of soils currently used as a social trail.

Cumulative Impacts

As described under Alternative 1, benefits to soil resources would result from stream restoration activities at Klingle Creek, as well as low impact development programs of the Rock Creek Watershed Implementation Plan. When combined with the beneficial effects of constructing Rose Park Trail Option C, long-term beneficial cumulative impacts to soil resources would result.

Conclusion

Short-term minor adverse impacts to soils would result from construction of Rose Park Trail Option C. Once constructed, Option C would have a beneficial impact by stabilizing soils that are currently unpaved. The effect of Option C when added to cumulative impacts projects would be overall long-term beneficial impacts to soil resources in Rock Creek Park.

4.4. WATER QUALITY

Methodology and Assumptions

NPS *Management Policies* (NPS 2006) states that the NPS will "take all necessary actions to maintain or restore the quality of surface waters and ground waters within the Parks, consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations" (NPS 2001a sec 4.6.3).

In order to examine potential impacts to water resources, the existing conditions of Rock Creek and Piney Branch were evaluated. Potential impacts to streams were considered based on the extent of possible sedimentation due to ground disturbance.

Study Area

The study area for water quality consists of the portion of Rock Creek and Piney Branch adjacent to the proposed improvements associated with the Rock Creek Park Multi-Use Trail Rehabilitation project. For cumulative impacts, the study area is Rock Creek Park.

Impact Thresholds

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, well below water quality standards or criteria, and within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable but well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable but at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be temporally altered.

Major: Impacts (chemical, physical, or biological effects) would be detectable and frequently altered from the historical baseline or desired water quality conditions; chemical, physical, or biological water quality standards or criteria would temporarily be slightly and singularly exceeded.

Duration: **Short-term** – Following treatment, recovery would take less than 1 year; **Long-term** – Following treatment, recovery would take longer than 1 year.

4.4.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.4.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of the existing operations and maintenance of the Rock Creek Park multi-use trail. With no new construction to the Rock Creek Park multi-use trail, existing water resources within the study area would generally remain in their current condition. Existing surface water flow patterns into Rock Creek and Piney Branch would remain unchanged. Erosion resulting from the deteriorating trail conditions and the continued use of social trails would have a long-term minor adverse impact on surface waters as a result of sediment transport into these water resources. Therefore, the No Action Alternative would have a long-term minor adverse impact to water resources in Rock Creek Park.

Cumulative Impacts

Stream restoration proposed under the Klingle Valley Trail project includes channel grading, construction of step pools, and stabilization of streambanks. Several stormwater BMPs are proposed for the project, which would increase the capacity of Klingle Creek to safely convey stormwater as it converges with Rock Creek (DDOT 2010b). In addition, the Rock Creek Watershed Implementation Plan proposes multiple water resources improvement programs. Sample programs under the Plan include rain leader disconnection, green roof retrofitting, and permeable pavement. Beneficial impacts of the Plan would vary based on the level of success of each individual improvement program (DDOE 2010). However, Rock Creek and Piney Branch would remain impaired due to the adverse effects of pollution from urbanization and stormwater runoff.

Long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. The No Action Alternative would result in a long-term minor impact to water resources in Rock Creek Park due to the continued erosion caused by the deteriorating trail conditions and the continued use of social trails. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. The No Action Alternative would have a minor contribution to the overall cumulative effect.

Conclusion

Under the No Action Alternative, long-term minor adverse impacts to Rock Creek and Piney Branch water quality due to continued erosion and sediment transport resulting from deteriorating trail conditions and the continued use of social trails. This impact combined with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts to Rock Creek and its tributaries. The No Action Alternative would have a minor contribution to the overall cumulative effect.

4.4.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

The Peirce Mill Spur is an eight-foot to 10-foot wide social trail extending from the Broad Branch/Grove 2 North parking area to Peirce Mill. Option A for the Peirce Mill trail spur represents no changes to the existing trail. Water quality conditions under implementation of Option A would remain unchanged. Rock Creek would remain impaired, due to influences within the watershed on water quality. Current conditions at the Peirce Mill trail spur do not contribute to adverse water quality. Therefore, no impacts to water quality would occur as a result of Option A.

Cumulative Impacts
Although other past, present, and reasonably foreseeable future actions may affect water quality in the area, Peirce Mill Trail Spur Option A would have no impacts on water quality and therefore would not contribute to the effects of other actions. Consequently, there would be no cumulative impacts to water quality under Peirce Mill Trail Spur Option A.

Conclusion
Peirce Mill Trail Spur Option A would have no water quality impacts because current conditions at the Peirce Mill trail spur do not contribute to adverse water quality. Therefore, Peirce Mill Trail Spur Option A would not contribute to cumulative impacts.

4.4.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

The Rose Park trail consists of a paved trail between P Street, NW and M Street, NW. Existing trail widths vary from five to six feet. Additionally, a social trail connects the existing paved trail to the M Street sidewalk. Option A for the Rose Park trail represents no action, but continuing maintenance of the existing paved trail by the NPS.

Water quality conditions of Rock Creek and its tributaries are largely unaffected by Rose Park. There are no surface waters, groundwater resources, or wetlands in the park. Rock Creek is a receiving water body for Rose Park runoff; however, the effect of the runoff is too small to be detected, relative to the size of the Rock Creek watershed. Therefore, long-term negligible adverse impacts would occur to water quality as a result of Option A.

Cumulative Impacts
As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Rose Park Trail Option A would result in long-term negligible impacts to water quality since Rock Creek receives runoff from Rose Park. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. Rose Park Trail Option A would have a very minor contribution to the overall cumulative effect.

Conclusion
Long-term negligible adverse water quality impacts would occur as a result of Rose Park Trail Option A due to the relative magnitude of Rose Park within the Rock Creek watershed. This impact combined with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts

to Rock Creek and its tributaries. Rose Park Trail Option A would have a very minor contribution to the overall cumulative effect.

4.4.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

As described in the Affected Environment, water quality of Rock Creek and Piney Branch is impaired due to urban, suburban and agricultural influences. A main source of the impairment is the impervious surface area within the watershed. Under the Action Alternatives and Options, trail improvements would involve an increase in impervious surfaces within the project area. Although impervious surface area contributes to water quality impairment, effects of the proposed pavement on water quality would be too small to be detectable, ***due to the relatively small increase in impervious surface and the linear nature of the trail, where most runoff is quickly absorbed by adjacent ground.*** The effects of impervious areas on Rock Creek and Piney Branch are largely associated with urban development of the watershed. When taking into account that Rock Creek Park is surrounded by urban land, the proposed increases in impervious surfaces are not great enough to result in an adverse impact on water quality. **Table 9** depicts the existing, additional, and total impervious area proposed under the Action Alternatives and Options.

Table 9. Existing and Proposed Impervious Area

Surface Area	Alternative 2	Alternative 3	Peirce Mill Trail Spur Option B	Rose Park Trail Option B	Rose Park Trail Option C
Existing Impervious Area	3.43 ac.	3.43. ac.	0 ac.	0.20 ac.	0.20 ac.
Additional Impervious Area	1.16 ac.	2.16 ac.	0.22 ac.	0.07 ac.	0.16 ac.
Total Impervious Area	4.59 ac.	5.59 ac.	0.22 ac.	0.27 ac.	0.36 ac.

4.4.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. This alternative would resurface the Rock Creek Park multi-use trail at its existing six-foot to 10-foot widths. In addition, Alternative 2 would resurface the Piney Branch Parkway trail to a varying width of six to eight feet.

Under Alternative 2, ground disturbance would be necessary during construction of the proposed improvements. In order to protect the existing water quality condition of Rock Creek and Piney Branch, Erosion and Sediment Controls and various other BMPs would be employed as needed during construction to reduce soil erosion and to prevent contamination of the water by sediment. During construction periods, the use of erosion and sediment controls and other BMPs would result in short-term negligible adverse impacts to water quality.

The trail resurfacing and rehabilitation would result in long-term beneficial impacts by reducing erosion and stabilizing non-vegetated areas. The proposed repairs of existing ***timber*** retaining walls would result in decreased amounts of sediments entering Rock Creek and would provide long term beneficial impacts to surface waters. Proposed drainage improvements, such as grading of the trail in order to stabilize soils, would provide a beneficial impact. While Alternative 2 would have long-term beneficial impacts to water resources in

Rock Creek Park, the overall beneficial impact to water resources would be small compared to the overall size of the study area and of the Rock Creek drainage area.

Cumulative Impacts
As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Alternative 2 would result in long-term beneficial impacts to water quality as a result of reduced erosion and stabilization of non-vegetated areas from trail resurfacing and rehabilitation. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. The beneficial impact of Alternative 2 would not contribute to the adverse cumulative impact.

Conclusion
Alternative 2 would result in long-term beneficial impacts to water quality in Rock Creek, due to rehabilitation of the ***timber*** retaining walls and improvements to drainage infrastructure. The effects of Alternative 2 when combined with past, present, and reasonably foreseeable future actions would be long-term minor adverse impacts.

4.4.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. In addition to these improvements, Alternative 3 includes widening of the Rock Creek Park multi-use trail to a width of six - 10 depending on the environmental or physical constraints. Resurfacing of the Piney Branch Parkway trail to a varying width of six-eight feet is also included in this Alternative.

During construction, the soil disturbance associated with the construction activities would have a short-term negligible adverse impact to water quality due to an increase in sediment transport from the disturbed soils. Erosion and sediment control measures and other BMPs would minimize this impact.

The trail resurfacing and rehabilitation would result in long-term beneficial impacts by reducing erosion and stabilizing non-vegetated areas. The proposed repairs of existing ***timber*** retaining walls would result in decreased amounts of sediments entering Rock Creek and would provide a long term beneficial impact to surface waters. Proposed drainage improvements, such as grading of the trail in order to stabilize soils, would provide a beneficial impact. The overall beneficial impact to water resources would be small compared to the overall size of the study area and of the Rock Creek drainage area. As a result, Alternative 3 would have long-term beneficial impacts to water resources in Rock Creek Park.

Cumulative Impacts
As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Alternative 3 would result in long-term beneficial impacts to water quality as a result of reduced erosion and

stabilization of non-vegetated areas from trail resurfacing and rehabilitation. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. The beneficial impact of Alternative 3 would not contribute to the adverse cumulative impact.

Conclusion
Long-term beneficial impacts would result from Alternative 3, from rehabilitation of the ***timber*** retaining walls and drainage improvements. The effects of Alternative 3 when combined with past, present, and reasonably foreseeable future actions would be long-term minor adverse impacts.

4.4.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B represents resurfacing of the trail to a standard eight-foot width. Approximately 0.22 acres would be paved in the area of the existing social trail. Short-term negligible adverse effects to water quality would occur as a result of transport of sediments from the disturbed soils during construction. Erosion and sediment control measures and other BMPs would minimize the risk of sediment transport to waterbodies.

Effects of the increase in impervious surface on water quality of Rock Creek would be negligible. Already, Rock Creek functions as receiving waters for a watershed that is mostly impervious. Due to the relative magnitude of impervious surfaces in the watershed, long-term negligible adverse impacts associated with pavement of the trail would occur.

Cumulative Impacts
As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Peirce Mill Trail Spur Option B would result in long-term negligible adverse impacts due to the increase in impervious surface associated with pavement of the trail. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. Peirce Mill Trail Spur Option B would have a very minor contribution to the overall cumulative effect.

Conclusion
Long-term negligible adverse impacts would result from the increase in impervious surface under Peirce Mill Trail Spur Option B. The impacts would be negligible due to the relative magnitude of impervious surfaces within the Rock Creek watershed. This impact combined with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts to Rock Creek and its tributaries. Peirce Mill Trail Spur Option B would have a very minor contribution to the overall cumulative effect.

4.4.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Rose Park Trail Option B, the existing trail would be resurfaced at a standard width of six feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. Under Option B, an increase of ***0.07*** acres of impervious surface would result from paving ***and widening*** the social trail. During construction, minor excavation and construction activities in the study area would cause increased soil

disturbance and erosion. Erosion control measures and other BMP's would be implemented as needed to minimize soil erosion and to protect receiving water bodies; therefore, short-term negligible adverse impacts to the water quality of Rock Creek would occur. Following construction, effects of the increase in paving on water quality of Rock Creek would not be detectable. Already, Rock Creek functions as receiving waters for a watershed that is mostly impervious. Due to the relative magnitude of impervious surfaces in the watershed, long-term negligible adverse impacts to water quality would occur as a result of Option B.

Cumulative Impacts

As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Rose Park Trail Option B would result in long-term negligible adverse impacts due to the increase in impervious surface associated with pavement of the social trail. This impact in combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. Rose Park Trail Option B would have a very minor contribution to the overall cumulative effect.

Conclusion

Long-term negligible adverse impacts to water quality would occur as a result of Rose Park Trail Option B as a result of the increase in impervious surface associated with pavement of the social trail. Impacts would be negligible due to the relative magnitude of impervious surfaces in the watershed. This impact combined with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts to Rock Creek and its tributaries. Rose Park Trail Option B would have a very minor contribution to the overall cumulative effect.

4.4.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Rose Park Trail Option C, the existing trail would be resurfaced at a standard width of six feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. An increase of approximately ***0.16*** acres of impervious surface would result from paving the social trail, and from widening of the trail. During construction, minor excavation and construction activities in the study area would cause increased soil disturbance and erosion. Erosion control measures and other BMP's would be implemented as needed to minimize soil erosion and to protect receiving water bodies; therefore, short-term negligible adverse impacts to the water quality of Rock Creek would occur. Following construction, effects of the increase in paving on water quality of Rock Creek would not be detectable. Already, Rock Creek functions as receiving waters for a watershed that is mostly impervious. Due to the relative magnitude of impervious surfaces in the watershed ***and the linear nature of the paved trail***, long-term negligible adverse impacts to water quality would occur as a result of Option C.

Cumulative Impacts

As described under the No Action Alternative, long-term beneficial impacts would result from projects in the region, due to stream restoration and water resource management activities. Short- and long-term beneficial impacts would occur with construction of the Klingle Valley project. Long-term adverse impacts to Rock Creek and its tributaries would continue as a result of pollution from urbanization and stormwater runoff. Rose Park Trail Option C would result in long-term negligible adverse impacts due to the increase in impervious surface associated with pavement of the social trail and widening of the trail. This impact in

combination with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts in the context of the study area due to the impairment of Rock Creek and its tributaries. Rose Park Trail Option C would have a very minor contribution to the overall cumulative effect.

Conclusion
Long-term negligible adverse impacts to water quality would occur as a result of Rose Park Trail Option C as a result of the increase in impervious surface associated with pavement of the social trail and widening of the trail. This impact combined with past, present, and reasonably foreseeable future actions would result in long-term minor adverse cumulative impacts to Rock Creek and its tributaries. Rose Park Trail Option C would have a very minor contribution to the overall cumulative effect.

4.5. VEGETATION

Methodology and Assumptions
Available information on vegetation and vegetative communities potentially impacted by the proposed alternatives was compiled. Impacts to vegetation were based on the anticipated extent of vegetation removal for trail construction, impacts to large trees due to critical root zones impairment, and the extent of encroachment in the proposed project area.

Study Area
The study area for impacts to vegetation is the limit of disturbance required for the proposed improvements to the Rock Creek Park multi-use trail, and any necessary staging areas for stockpile material and construction equipment. For cumulative impacts, the study area is Rock Creek Park.

Impact Thresholds
Negligible: No native vegetation would be affected or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be on a small scale and no species of special concern would be affected.

Minor: The alternative would affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation to offset adverse effects, including special measures to avoid affecting species of special concern, could be required and would be effective.

Moderate: The alternative would affect some individual native plants and would also affect a sizeable section of the species' population and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some species of special concern could also be affected.

Major: The alternative would have a considerable effect on native plant populations, including species of special concern, and affect a relatively large area in and out of the park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed.

Duration: **Short-term -** Recovers in less than three years; **Long-term -** Takes more than three years to recover.

4.5.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.5.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of the existing operations and maintenance of the Rock Creek Park multi-use trail. Under the No Action Alternative, vegetative conditions along the Rock Creek Park multi-use trail would continue to slowly deteriorate, in small, localized areas. Visitors to the trail would continue to use social trails, thereby continuing to tread upon vegetation. As a result, existing vegetation would be diminished and new vegetative growth would be precluded. Due to the effects of social trail use, there would be long-term minor adverse impacts to vegetation under the No Action Alternative.

Cumulative Impacts
Beneficial impacts to vegetation would take place under the Rock Creek Watershed Implementation Plan. Reforestation, riparian planting, and wetland creation are proposed, which would result in long-term beneficial impacts to Rock Creek Park (DDOE 2010). Otherwise, several regional projects require removal of vegetation in order to accommodate infrastructural improvements or restorative measures. Vegetation removal would be avoided to the maximum extent practicable, and would only occur in localized areas. Also, revegetation would occur to the extent practical for these projects. Therefore the effects of removing vegetation would be long-term negligible adverse impacts.

Based on the effects of the Rock Creek Watershed Implementation Plan, cumulative impact projects would result in long-term beneficial impacts to vegetation. The No Action Alternative would result in long-term minor adverse impacts to vegetation, due to the effects of social trail use. Although the No Action Alternative would have a minor contribution to the cumulative effect of regional projects, there would still be long-term beneficial cumulative impacts to vegetation in Rock Creek Park.

Conclusion
Under the No Action Alternative, long-term minor adverse impacts to vegetation would occur due to continuing use of social trails. Although the No Action Alternative would contribute a minor adverse impact to the cumulative effect of projects in the region, the effect of cumulative impact projects on vegetation would still be beneficial.

4.5.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

The Peirce Mill Spur is an eight-foot to 10-foot wide social trail extending from the Broad Branch/Grove 2 parking area to Peirce Mill. Option A for the Peirce Mill trail spur represents no changes to the existing trail. As a result of Option A, vegetative conditions along the Peirce Mill trail spur would continue to deteriorate slowly, in small, localized areas. Visitors would continue to use the social trail. Usage of the path would further compact soils and prevent vegetative regrowth. Due to the effects of social trail use, there would be long-term minor adverse impacts to vegetation under Option A.

Cumulative Impacts
The impact of past, present and reasonably foreseeable future projects is described under Alternative 1. Vegetation in Rock Creek Park would benefit from reforestation, riparian planting, and wetland creation. When combined with the long-term minor adverse impacts of Peirce Mill Trail Spur Option A, cumulative long-term beneficial impacts to vegetation would still occur.

Conclusion
Long-term minor adverse impacts would result from the No Action Alternative, due to the effects of social trail use. Although the No Action Alternative would contribute a minor adverse impact to the cumulative effect of projects in the region, the effect of cumulative impact projects on vegetation would still be beneficial.

4.5.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

The Rose Park trail consists of a paved trail between P Street, NW and M Street, NW. Existing trail widths vary from five to six feet. Additionally, a social trail connects the existing paved trail to the M Street sidewalk. Option A for the Rose Park trail represents no action, but continuing maintenance of the existing paved trail by the NPS. Under Option A, vegetative conditions at Rose Park would remain relatively unchanged. Suppression of vegetative growth would continue in areas of heavy foot traffic and on the social trails that connect the existing paved trail to the M Street sidewalk; therefore, long-term negligible adverse impacts would result from Option A. No impacts to trees within the park would occur.

Cumulative Impacts
The impact of past, present and reasonably foreseeable future projects is described under Alternative 1. Vegetation would benefit from reforestation, riparian planting, and wetland creation. When combined with the long-term negligible adverse impacts of the No Action Alternative, long-term beneficial cumulative impacts to vegetation would result.

Conclusion
Long-term negligible adverse impacts to vegetation would result from Rose Park Trail Option A due to continuing use of social trails. The result of cumulative impacts projects would be long-term benefits to vegetation in Rock Creek Park. When combined with the No Action Alternative, the effect of cumulative impacts projects would be long-term beneficial impacts to vegetation.

4.5.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.5.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. This alternative would resurface the Rock Creek Park multi-use trail at its existing six-foot to 10-foot widths. In addition, Alternative 2 would resurface the Piney Branch Parkway trail to a varying width of six to eight feet. During construction, the proposed grading and excavation activities would cause short-term minor adverse impacts to vegetation in small localized areas. Any disturbed areas would be stabilized and re-vegetated following construction in accordance with BMPs. All re-seeding and planting would be done in accordance with an NPS approved planting plan in order to fulfill functional and aesthetic requirements of Rock Creek Park.

Under Alternative 2, the existing vegetation surrounding the Rock Creek Park multi-use trail would experience small, localized effects. Primarily, the proposed action under Alternative 2 is trail resurfacing, which would require no removal of vegetation. However, the proposed new trail connections and drainage improvements would require the removal of existing vegetation in small areas. Based on visual observations of the vegetative community, many of the species within the improvement areas are invasive, non-native plants. Therefore, because these species provide little value, the removal of existing vegetation in small areas would have long-term negligible adverse impacts.

No large, mature trees in the trail corridor would be removed. ***One large tree is proposed for removal along Beach Drive, near the intersection with Piney Branch Parkway due to its proximity to the road and trail.*** However, construction activities would have the potential to effect critical root zones of the trees. In order to preserve the trees, tree protection devices and other BMPs would be employed to protect the critical root zone. These measures include the installation of tree protection fencing prior to construction, site access limitations, protective treatments for exposed roots, and construction supervision by a project arborist. Results of the tree protection measures would vary, as site conditions and proposed trail construction varies throughout the trail corridor. Therefore, because Alternative 2 would result in a range of impacts to large trees, long-term negligible to minor adverse impacts would occur.

Cumulative Impacts

The same projects would contribute to cumulative impacts as described previously under Alternative 1. Beneficial impacts would result from reforestation, riparian planting, and wetland creation. Although Alternative 2 would contribute negligible to minor adverse impacts to the cumulative effect of projects in the region, cumulative impacts to vegetation would still be beneficial.

Conclusion

Long-term negligible to minor adverse impacts would result from Alternative 2, due to the removal of vegetation, and potential impacts to tree roots within the trail corridor. Based on the overall effects of regional projects, cumulative impacts to vegetation in Rock Creek Park would be beneficial when combined with the effects of Alternative 2.

4.5.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. In addition to these improvements, Alternative 3 includes widening of the Rock Creek Park multi-use trail to a width of six to 10 feet depending on the environmental or physical constraints. Resurfacing of the Piney Branch Parkway trail to a varying width of six to eight feet is also included in this Alternative. During construction, the proposed grading and excavation activities would cause short-term minor adverse impacts to vegetation in small localized areas. Any disturbed areas would be stabilized and re-vegetated following construction in accordance with BMPs. All re-seeding and planting would be done in accordance with an NPS approved planting plan in order to fulfill functional and aesthetic requirements of Rock Creek Park.

Under Alternative 3, ***approximately 16 trees would be removed to clear space for trail widening. In addition, the critical root zones of approximately 679 trees are located within the proposed widening area. Where trees are removed, or damaged beyond repair, trees would be replaced at a 1:1 ratio. Funding for tree replacement would be provided by DDOT/FHWA, and would be carried out in accordance with NPS standards.*** Tree protection measures and BMPs would be employed during construction to minimize the extent of vegetation removal and to limit impacts to critical root zones. Results of the tree protection measures would vary, as site conditions and proposed trail construction varies throughout the trail corridor. Other disturbed vegetation, resulting from construction access and grading for drainage improvements, would be re-vegetated following construction activities. Therefore, because Alternative 3 would result in a range of impacts to large trees, long-term negligible to minor adverse impacts would occur.

Most of the improvements proposed by Alternative 3 would be constructed in the area occupied by the existing Rock Creek Park multi-use trail. However, proposed widening and improvements would require paving of an additional 2.16 acres of ground surface. Existing vegetation in the proposed widening area consists primarily of maintained grasses. The trail widening and drainage improvements would result in the removal of vegetation, but the area of vegetation loss is very small in comparison to the size of the project area. Therefore Alternative 3 would result in long-term minor adverse impacts to vegetation due to minor clearing of vegetation, and conversion of vegetated areas to trail use.

Cumulative Impacts
The same projects would contribute to cumulative impacts as described previously under Alternative 1. Beneficial impacts would result from reforestation, riparian planting, and wetland creation. Although trail resurfacing and widening proposed by Alternative 3 would contribute a minor adverse impact to the cumulative effect of projects in the region, cumulative impacts to vegetation would still be beneficial.

Conclusion
Alternative 3 would result in long-term minor adverse impacts due to the loss of herbaceous vegetation from trail widening, and potential impacts to tree roots within the trail corridor. Based on the overall effects of regional projects, cumulative impacts to vegetation in Rock Creek Park would be beneficial when combined with the effects of Alternative 3.

4.5.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B represents resurfacing of the trail to a standard eight-foot width. Approximately 0.22 acres would be paved in the area of the existing social trail. Short-term negligible adverse effects to water quality would occur as a result of transport of sediments from the disturbed soils during construction. Erosion and sediment control measures and other BMPs would minimize the risk of sediment transport to waterbodies.

During construction, various grading and excavation activities could cause short-term minor adverse impacts to vegetation in small localized areas. Any disturbed areas would be stabilized and re-vegetated according to an NPS approved planting plan following construction, thereby mitigating the impacts and resulting in no long-term effect on vegetation.

Proposed pavement of the Peirce Mill trail spur would require paving of approximately 0.22 acres of ground surface. Most of the proposed widening area consists of bare soils; however there are maintained grasses in the area. Because the effect of pavement would be a permanent loss of vegetation in these areas, long-term minor adverse impacts would occur under Option B.

No large, mature trees in the Peirce Mill spur area would be removed. However, construction activities would have the potential to effect critical root zones of the trees. In order to protect the trees, special measures would be employed during construction. These measures include the installation of tree protection fencing prior to construction, site access limitations, protective treatments for exposed roots, and construction supervision by a project arborist. Results of the tree protection measures would vary, as site conditions and proposed trail construction varies throughout the trail spur. Therefore, because Option B would result in a range of impacts to large trees, long-term negligible to minor adverse impacts would occur.

Cumulative Impacts
The same projects would contribute to cumulative impacts as described previously under Alternative 1. Beneficial impacts would result from reforestation, riparian planting, and wetland creation. Although the eight-foot trail spur proposed by Option B would contribute a minor adverse impact to the cumulative effect of projects in the region, cumulative impacts to vegetation would still be beneficial.

Conclusion
Option B would result in long-term minor adverse impacts due to the loss of herbaceous vegetation from trail widening, and potential impacts to tree roots within the trail corridor. Based on the overall effects of regional projects, cumulative impacts to vegetation in Rock Creek Park would be beneficial when combined with the effects of Option B.

4.5.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Rose Park Trail Option B, the existing trail would be resurfaced at a standard width of six feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. Under Option B, an increase of ***0.07*** acres of impervious surface would result from paving the social trail. During construction, various grading and excavation activities would cause short-term minor adverse impacts to vegetation in small localized areas for construction access and staging. Construction access and staging areas would be located in appropriate areas and any wooded areas would be restricted. Disturbed areas would be stabilized and re-vegetated according to a NPS approved planting plan following construction, thereby mitigating the impacts.

The proposed action under Option B is trail resurfacing, which would require no removal of vegetation. However, 0.20 acres of ground surface would be paved in the location of the existing social trail. Vegetation in the social trail area is sparse, but consists of maintained grasses. The paving of areas outside of the existing paved trail would result in the loss of vegetation. The area of vegetation loss would be very small in comparison to the project area, and would result in long-term minor adverse impacts.

No large, mature trees in the Rose Park area would be removed under Option B. However, construction activities would have the potential to effect critical root zones of the trees. In order to preserve the trees, special measures would be employed in the critical root zone. These measures include the installation of tree protection fencing prior to construction, site access limitations, protective treatments for exposed roots, and construction supervision by a project arborist. ***Special measures would be taken to preserve the large oak tree near the Dumbarton Street playground area. Measures could include development of a tree save plan by an arborist or licensed tree expert, or installation of tree protection fencing. Impacts to the tree's root system would be avoided to the extent possible. If necessary, alternative trail materials and/or narrowing of the trail would be utilized to preserve the tree's roots.*** Results of the tree protection measures would vary, as site conditions and proposed trail construction varies throughout the Rose Park trail. Therefore, because Option B would result in a range of impacts to large trees, long-term negligible to minor adverse impacts would occur.

Cumulative Impacts
As described under Alternative 1, benefits to vegetative resources would result from reforestation, riparian planting, and wetland creation under the Rock Creek Watershed Implementation Plan. Although the six-foot trail proposed by Option B would contribute a minor adverse impact to the cumulative effect of projects in the region, cumulative impacts to vegetation would still be beneficial.

Conclusion
Long-term minor adverse impacts to vegetation would result from Rose Park Trail Option B, due to a loss of vegetated area and potential impacts to tree roots along the trail. The result of cumulative impacts projects would be long-term benefits to vegetation in Rock Creek Park. When combined with Option B, cumulative impacts projects would still result in long-term beneficial impacts to vegetation.

4.5.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Rose Park Trail Option C, the existing trail would be resurfaced at a standard width of eight feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. An increase of approximately ***0.16*** acres of impervious surface would result from paving the social trail, and from widening of the trail. During construction, various grading and excavation activities would cause short-term minor adverse impacts to vegetation in small localized areas for construction access and staging. Construction access and staging areas would be located in appropriate areas and any wooded areas would be restricted. Disturbed areas would be stabilized and re-vegetated according to a NPS approved planting plan following construction, thereby mitigating the impacts.

Existing vegetation in the proposed trail widening area consists of maintained grasses, while the social trail pathway is mostly comprised of grasses and bare soil. Because the effect of pavement would be a permanent loss of vegetation in these areas, long-term minor adverse impacts would occur under Option C.

No large, mature trees in the Rose Park area would be removed under Option C. However, construction activities would have the potential to effect critical root zones of the trees. In order to preserve the trees, special measures would be employed in the critical root zone. These measures include the installation of tree protection fencing prior to construction, site access limitations, protective treatments for exposed roots, and construction supervision by a project arborist. ***Special measures would be taken to preserve the large oak tree near the Dumbarton Street playground area. Measures could include development of a tree save plan by an arborist or licensed tree expert, or installation of tree protection fencing. Impacts to the tree's root system would be avoided to the extent possible. If necessary, alternative trail materials and/or narrowing of the trail would be utilized to preserve the tree's roots.*** Results of the tree protection measures would vary, as site conditions and proposed trail construction varies throughout the Rose Park trail. Therefore, because Option C would result in a range of impacts to large trees, long-term negligible to minor adverse impacts would occur.

Cumulative Impacts
As described under Alternative 1, benefits to vegetative resources would result from reforestation, riparian planting, and wetland creation under the Rock Creek Watershed Implementation Plan. Although the eight-foot trail proposed by Option C would contribute a minor adverse impact to the cumulative effect of projects in the region, cumulative impacts to vegetation would still be beneficial.

Conclusion
Long-term minor adverse impacts to vegetation would result from Rose Park Trail Option C, due to a loss of vegetated area and potential impacts to tree roots along the trail. The result of cumulative impacts projects would be long-term benefits to vegetation in Rock Creek Park. When combined with Option C, cumulative impacts projects would still result in long-term beneficial impacts to vegetation.

4.6. WILDLIFE

Methodology and Assumptions
According to NPS *Management Policies* (NPS 2006), the restoration of native wildlife species is a high priority. Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals. Information on Rock Creek Park wildlife was taken from park documents and records.

Study Area
The study area for impacts to wildlife includes the limit of disturbance required for the proposed improvements, as well as potential wildlife habitats throughout Rock Creek Park. Wildlife habitat areas in the park consist of forested uplands, stream channels and maintained open spaces. For cumulative impacts, the study area is Rock Creek Park.

Impact Thresholds
Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be well within natural fluctuations.

Minor: Impacts would be detectable, but they would not be expected to be outside the natural range of variability of native species' populations, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability. Key ecosystem processes might be disrupted. Loss of habitat might affect the viability of at least some native species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Duration: **Short-term –** Recovers in less than 1 year; **Long-term –** Takes more than 1 year to recover.

4.6.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.6.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of the existing operations and maintenance of the Rock Creek Park multi-use trail.

Aquatic Wildlife
Potential impacts to aquatic wildlife would occur under the No Action Alternative in the form of continuing erosion of the Rock Creek and Piney Branch streambanks. Excess sediments are known to negatively impact aquatic ecosystems. A number of benthic macroinvertebrate species depend on channel substrates for spawning and feeding. Overloading of the channel bottom causes degradation of benthic habitat, resulting in a

reduction of benthic diversity and abundance. Sedimentation also causes degradation of fish spawning areas. In severe cases, fish mortality is caused by the smothering or suffocation of fish. Under the No Action Alternative, erosive conditions would persist in several locations adjacent to the Rock Creek Park multi-use trail. The negative effects associated with these conditions would be negligible, due to the relative magnitude of the watershed. As a result, long-term negligible adverse impacts to aquatic wildlife would occur.

Terrestrial Wildlife

Rock Creek Park provides habitat for a variety of woodland and riparian wildlife species that can tolerate urban conditions. Rock Creek Park is recognized as a prime birding site, especially for migrants and seasonal visitors. Under Alternative 1, woodland and riparian habitat within the Rock Creek Park multi-use trail corridor would remain the same. The continuing deterioration of the trail corridor is not expected to result in appreciable losses of habitat in the form of individual large trees or wooded areas.

Currently, human activities on the Rock Creek Park multi-use trail result in small disturbances to terrestrial wildlife. Generally, terrestrial wildlife species of Rock Creek have adapted to the disturbances. Based on the predictability of human actions on the trail, and the resiliency of the park's species, continuation of the existing trail condition would not result in a measureable impact to terrestrial wildlife. Therefore, because small disturbances to terrestrial wildlife would continue, the No Action Alternative would have long-term negligible adverse impacts.

Cumulative Impacts

Regional projects would have long-term beneficial impacts to wildlife, by improving existing aquatic habitat. The Blagden Avenue Hiker/Biker trail (NPS 2008), Klingle Valley trail (DDOT 2010b), Rock Creek Watershed Implementation Plan (DDOE 2010), and Clean Rivers project (DC Water 2011c) would all improve water quality and aquatic habitat conditions. The installation of a fish passage structure at Peirce Mill has resulted in increased aquatic habitat for certain aquatic species (Friends of Peirce Mill 2008). Additional projects which would remove barriers to fish passage are proposed under the Rock Creek Watershed Implementation Plan.

Terrestrial wildlife would experience short-term negligible adverse impacts as a result of the regional projects. Construction activities would cause wildlife to avoid the construction areas, but the wildlife is expected to return following construction. In the long-term, terrestrial habitat area may increase due to reforestation under projects such as the Rock Creek Watershed Implementation Plan.

Under the No Action Alternative, the effect on wildlife would consist of long-term negligible adverse impacts to aquatic and terrestrial organisms. Impacts associated with projects in the vicinity of Rock Creek would result in long-term beneficial impacts to aquatic wildlife and long-term negligible adverse impacts to terrestrial wildlife. Combining the No Action Alternative and regional projects, cumulative long-term beneficial impacts to aquatic wildlife would occur due to the relative magnitude of improvements to aquatic habitat. Cumulative long-term negligible adverse impacts to terrestrial wildlife would occur, due to the continuing human activity in Rock Creek Park.

Conclusion

Under the No Action Alternative, erosive conditions would persist in several locations adjacent to Rock Creek. As a result, long-term negligible adverse impacts to aquatic wildlife would occur. Due to small disturbances associated with human activity on the trail, there would be long-term negligible adverse impacts to terrestrial wildlife. Although the No Action Alternative would contribute a small adverse impact to aquatic and terrestrial

wildlife, the combined effect of regional projects would still provide a beneficial impact to aquatic wildlife. The cumulative effect on terrestrial wildlife would be a long-term negligible adverse impact.

4.6.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Option A proposes no changes to existing habitat in the Peirce Mill trail spur area. Aquatic and terrestrial wildlife would experience no displacement under this option. Due to small disturbances associated with human activity on the social trail, there would be long-term negligible impacts to terrestrial wildlife. Implementation of Option A would result in no impacts to aquatic wildlife.

Cumulative Impacts
Alternative 1 describes regional projects which would result in cumulative impacts to wildlife. No cumulative impacts to aquatic wildlife would result from regional projects and Peirce Mill Trail Spur Option A. When combined with the effects of regional projects, terrestrial wildlife would experience a cumulative long-term negligible adverse impact.

Conclusion
No impacts to aquatic wildlife would occur under Peirce Mill Trail Spur Option A. Long-term negligible adverse impacts to terrestrial wildlife would occur. When combined with the effects of regional projects, there would be long-term negligible adverse impacts to terrestrial wildlife, and no impacts to aquatic wildlife.

4.6.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Option A proposes no changes to existing habitat in the Rose Park area. Aquatic wildlife is absent from Rose Park. Terrestrial wildlife inhabitants of the park would experience no displacement under Option A. Due to small disturbances associated with human activity on the trail, there would be long-term negligible impacts to terrestrial wildlife. No impacts to aquatic wildlife would occur.

Cumulative Impacts
Alternative 1 describes regional projects which would result in cumulative impacts to wildlife. No cumulative impacts to aquatic wildlife would result from regional projects and Rose Park Trail Option A. When combined with the effects of regional projects, terrestrial wildlife would experience a cumulative long-term negligible adverse impact.

Conclusion
No impacts to aquatic wildlife would occur under Rose Park Trail Option A. Long-term negligible adverse impacts to terrestrial wildlife would occur. When combined with the effects of regional projects, there would be long-term negligible adverse impacts to terrestrial wildlife, and no impacts to aquatic wildlife.

4.6.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.6.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. This alternative would resurface the Rock Creek Park multi-use trail at its existing six-foot to 10-foot widths. In addition, Alternative 2 includes resurfacing the Piney Branch Parkway trail to a varying width of six-eight feet, depending on physical and environmental constraints.

Aquatic Wildlife

Construction of Alternative 2 would require ground disturbances, which would expose soils in the project area. Erosion and sediment control measures and other BMPs would be used to prevent soil movement into nearby stream channels. Alternative 2 would also improve drainage infrastructure along the Rock Creek Park multi-use trail. The improvement would have a long-term beneficial effect on aquatic wildlife by reducing sediment release into Rock Creek and its tributaries, resulting in increased aquatic habitat quality.

Terrestrial Wildlife

Alternative 2 would result in disturbance to wildlife during construction activities, and would result in the removal of vegetation in small localized areas. ***Construction activities would temporarily increase noise levels, but DDOT would require that construction noise be within allowable limits established by the District. DDOT will continue coordination with the National Zoo during the design phases to ensure that construction activities are acceptable and would not cause unacceptable negative impacts to the Zoo patrons and animals.*** During construction, larger terrestrial wildlife would likely avoid the immediate area by moving to habitable areas nearby. Some smaller species such as inspects, reptiles and amphibians may be impacted by construction activities, including impacts to habitat. Vegetative disturbance would be minor, and would be limited to the area immediately adjacent to existing trails. No rare habitat areas are known to exist in the project area; therefore no rare habitat areas would be disturbed. Because of the small size of the impact and short construction duration, Alternative 2 would result in short-term and long-term negligible adverse impacts to terrestrial wildlife.

In summary, Alternative 2 would result in long-term beneficial impacts to aquatic wildlife due to stabilization of riparian areas. Short-term and long-term negligible adverse impacts to terrestrial wildlife would occur due to disturbance during construction and minor loss of vegetation.

Cumulative Impacts

Cumulative impacts projects are described under Alternative 1. Beneficial impacts would result from improvements to the aquatic habitat of Rock Creek and its tributaries. Negligible impacts would result from regional projects with regard to terrestrial habitats. Combining Alternative 2 and regional projects, cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

Conclusion

Under Alternative 2, construction activities would result in soil disturbance and the potential for sediment transport to Rock Creek. The stabilization of the existing trails and drainage improvement would result in some conversion of vegetation to trail use. Therefore, Alternative 2 would have short-term negligible adverse impacts to aquatic resources, but long-term beneficial impacts. Long-term negligible adverse impacts to terrestrial wildlife would occur due to the removal of vegetation. Cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

4.6.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. In addition to these improvements, Alternative 3 includes widening of the Rock Creek Park multi-use trail to a minimum width of six feet where there are environmental or physical

constraints and a maximum width of 10 feet where environmentally feasible. Resurfacing of the Piney Branch Parkway trail to a varying width of six-eight feet is also included.

Aquatic Wildlife

Indirect impacts to aquatic resources would occur due to increased potential for soil erosion during construction activities. Erosion and sediment control measures and other BMPs would be implemented as needed to control soil erosion and to protect receiving water bodies. As a result, short-term negligible adverse impacts would occur to aquatic habitat in Rock Creek and its tributaries from Alternative 3.

Alternative 3 also includes improvements to drainage infrastructure along the Rock Creek Park multi-use trail. The improvement would have a long-term beneficial effect on aquatic wildlife by reducing sediment release into Rock Creek and its tributaries, resulting in increased aquatic habitat quality.

Terrestrial Wildlife

Alternative 3 would result in disturbance to wildlife during construction activities, and would result in the removal of vegetation in small localized areas. ***Construction activities would temporarily increase noise levels, but DDOT would require that construction noise is within allowable limits established by the District.*** During construction, larger terrestrial wildlife would likely avoid the immediate area by moving to habitable areas nearby. Some smaller species such as inspects, reptiles and amphibians may be impacted by construction activities, including impacts to habitat. Vegetative disturbance would be minor, and would be limited to the area immediately adjacent to existing trails. No rare habitat areas are known to exist in the project area; therefore no rare habitat areas would be disturbed. Because of the small size of the impact and short construction duration, Alternative 3 would result in short-term and long-term negligible adverse impacts to terrestrial wildlife.

Cumulative Impacts

Cumulative impacts projects are described under Alternative 1. Beneficial impacts would result from improvements to the aquatic habitat of Rock Creek and its tributaries. Negligible impacts would result from regional projects with regard to terrestrial habitats. Combining Alternative 3 and regional projects, cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

Conclusion

Under Alternative 3, construction activities would result in soil disturbance and the potential for sediment transport to Rock Creek. The stabilization of the existing trails and drainage improvement would result in some conversion of vegetation to trail use. Therefore, Alternative 3 would have short-term negligible adverse impacts to aquatic resources, but long-term beneficial impacts. Long-term negligible adverse impacts to terrestrial wildlife would occur due to the removal of vegetation. Cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

4.6.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B would resurface the existing social trail between Broad Branch Road and Peirce Mill, which would result in 0.22 acres of pavement. The proposed improvement would result in earth disturbance during construction, which would increase the potential for sediments to enter Rock Creek, thereby affecting aquatic habitat. Erosion and sediment control measures and BMPs would be established prior to earth disturbance

activities to minimize the risk of adverse effects to the aquatic resources. As a result, short-term negligible adverse impacts would occur to aquatic habitat in Rock Creek and its tributaries under Option B.

During construction, terrestrial wildlife would likely avoid the immediate area by moving to habitable areas nearby. Vegetative disturbance would be minor, and would be limited to the area of the existing social trail. The social trail area supports only sparse vegetation as a result of continued trampling of vegetation and soil compaction. No rare habitat areas are known to exist in the project area; therefore no rare habitat areas would be disturbed. Because of the short construction duration and the negligible effects to terrestrial vegetation, Alternative 3 would result in short-term and long-term negligible adverse impacts to terrestrial wildlife.

Cumulative Impacts

The impact of past, present and reasonably foreseeable future projects is described under the No Action Alternative. Aquatic wildlife would benefit from the improvement of habitat conditions in Rock Creek and its tributaries. Impacts to terrestrial habitat would be negligible. When combined with the impacts of constructing the Peirce Mill trail spur, cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

Conclusion

Peirce Mill Trail Spur Option B would result in ground disturbance which would have a short-term negligible impact on aquatic species due to the potential increase in sediment transport. Short- and long-term negligible adverse impacts to terrestrial wildlife would result from construction activities due to losses of terrestrial wildlife habitat. Cumulative long-term beneficial impacts to aquatic wildlife would occur, and cumulative long-term negligible adverse impacts to terrestrial wildlife would occur under Option B.

4.6.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Option B, indirect impacts to aquatic resources would occur due to increased potential for soil erosion during construction activities. Erosion and sediment control measures and other BMPs would be implemented as needed to control soil erosion and to protect receiving water bodies. Due to the soil disturbance, short-term negligible adverse impacts would occur to aquatic habitat in Rock Creek and its tributaries from Option B.

During construction, terrestrial wildlife would likely avoid the immediate area by moving to habitable areas nearby, causing a short-term negligible adverse impact to wildlife. The proposed paving of the social trail would result in loss of sparse vegetation groundcover, but would not obstruct the movements of local terrestrial wildlife throughout the maintained open space. Trees within Rose Park would not be affected allowing continued opportunity for wildlife to use the park for foraging, nesting and hiding sites, which are well-suited to terrestrial wildlife needs. No rare or unique habitat is known to exist in the proposed pavement area. Due to the removal of vegetation, long-term negligible adverse impacts to terrestrial wildlife associated with Option B would occur.

Cumulative Impacts

The impact of past, present and reasonably foreseeable future projects is described under the No Action Alternative. Aquatic wildlife would benefit from improvement of habitat conditions in Rock Creek and its tributaries. Impacts to terrestrial habitat would be negligible. When combined with the impacts of resurfacing the Rose Park trail and paving the social trail, cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

Conclusion
Construction activities under Options B would involve soil disturbance which would result in short-term negligible adverse impacts to aquatic species due to the increased risk of sediment transport. Terrestrial wildlife would experience short-term negligible adverse impacts due to disturbances during construction. The loss of vegetation would result in long-term negligible adverse impacts to terrestrial wildlife. Adding the effects of Option B to regional projects would result in cumulative long-term beneficial impacts to aquatic wildlife and cumulative long-term negligible adverse impacts to terrestrial wildlife.

4.6.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Option C, indirect impacts to aquatic resources would occur due to increased potential for soil erosion during construction activities. Erosion and sediment control measures and other BMPs would be implemented as needed to control soil erosion and to protect receiving water bodies. Due to the soil disturbance, short-term negligible adverse impacts would occur to aquatic habitat in Rock Creek and its tributaries from Option C.

During construction, terrestrial wildlife would likely avoid the immediate area by moving to habitable areas nearby, causing a short-term negligible adverse impact to wildlife. The proposed paving of the social trail would result in loss of sparse vegetation groundcover, but would not obstruct the movements of local terrestrial wildlife throughout the maintained open space. Trees within Rose Park would not be affected. No rare or unique habitat is known to exist in the proposed pavement area. Due to the removal of vegetation, long-term negligible adverse impacts to terrestrial wildlife associated with Option C would occur.

Cumulative Impacts
The impact of past, present and reasonably foreseeable future projects is described under the No Action Alternative. Aquatic wildlife would benefit from improvement of habitat conditions in Rock Creek and its tributaries. Impacts to terrestrial habitat would be negligible. When combined with the impacts of resurfacing the Rose Park trail and paving the social trail, cumulative long-term beneficial impacts to aquatic wildlife would occur and long-term negligible adverse impacts to terrestrial wildlife would occur.

Conclusion
Construction activities under Options C would involve soil disturbance which would result in short-term negligible adverse impacts to aquatic species due to the increased risk of sediment transport. Terrestrial wildlife would experience short-term negligible adverse impacts due to disturbances during construction. The loss of vegetation would result in long-term negligible adverse impacts to terrestrial wildlife. Adding the effects of Option C to regional projects would result in cumulative long-term beneficial impacts to aquatic wildlife and cumulative long-term negligible adverse impacts to terrestrial wildlife.

4.7. CULTURAL RESOURCES

4.7.1. GENERAL METHODOLOGY AND ASSUMPTIONS

The NPS categorizes cultural resources by the following categories: archeological resources, cultural landscapes, historic districts and structures, museum objects, and ethnographic resources. Only impacts on archeological resources, cultural landscapes, and historic districts and structures are of potential concern for this project.

The analyses of impacts on cultural resources that are presented in this section respond to the requirements of both NEPA and Section 106 of the NHPA. In accordance with the Advisory Council's regulations

implementing Section 106 (36 CFR Part 800, *Protection of Historic Properties*), impacts on cultural resources were identified and evaluated by (1) determining the APE; (2) identifying cultural resources present in the APE that are listed in or eligible to be listed in the NRHP (i.e., historic properties); (3) applying the criteria of adverse effect to affected historic properties; and (4) considering ways to avoid, minimize, or mitigate adverse effects. The assessment of effects to cultural resources is also taking place in a series of meetings with the DC HPO, other interested federal agencies, and Consulting Parties invited by the DDOT and the NPS.

Under the implementing regulations for Section 106, a determination of either *adverse effect* or *no adverse effect* must also be made for affected historic properties. 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 proposal that would occur later, be farther removed in distance, or be cumulative (36 CFR 800.5). A determination of *no adverse effect* means there is either no effect or that the effect would not diminish, in any way, the characteristic of the cultural resource that qualify it for inclusion in the NRHP.

CEQ regulations and DO-12 of the NPS also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact: for example, reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. Cultural resources are nonrenewable resources and adverse impacts generally consume, diminish, or destroy the original historic material or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

4.7.2. STUDY AREA

The overall study area for cultural resources is the APE as defined in accordance with Section 106 regulations (see the "Cultural Resources" section in "Chapter 3: Affected Environment").

4.8. HISTORIC STRUCTURES AND DISTRICTS

Methodology and Assumptions

The NPS guidance for evaluating impacts, DO-12, (NPS 2001) requires that impact assessment be scientific, accurate, and quantified to the extent possible. For cultural resources, it is rarely possible to measure impacts in quantifiable terms; therefore, impact thresholds must rely heavily on the professional judgment of resource experts.

A summary is included in the impact analysis sections for cultural landscapes and historic districts and structures. The impact analysis is an assessment of the effect of the undertaking (implementation of the alternatives) on NRHP-eligible or listed cultural resources only, based upon the Advisory Council's criteria of adverse effect.

Study Area

The study area for cultural resources is the APE as defined by the NPS under Section 106 regulations (see the "Cultural Resources" section in "Chapter 3: Affected Environment"). As indicated in Chapter 3, the APE for this undertaking is a 200-foot band expanded as appropriate to capture key adjacent historic properties, which encompasses NPS reservations 339 (Rock Creek Park) and 360 (Rock Creek and Potomac Parkway), as well

as a portion of the Georgetown Historic District in northwest Washington DC. The APE was established by DDOT and the NPS after consultation with the DC HPO and Consulting Parties invited under the Section 106 process. For the purposes of evaluation, the proposed APE for historic resources includes the area from which the project site is visible, as well as resources that could be impacted due to changes in the character of the area (see the Cultural Resource Map in **Appendix D** showing individually listed historic properties, historic districts, and contributing features of the historic districts).

Impact Thresholds

For a historic district or structure to be listed on the NRHP, it must possess significance (the meaning or value ascribed to the historic district or structure), and the features necessary to convey its significance must have integrity. For purposes of analyzing potential impacts on historic districts and structures, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is at the lowest level of detection with neither adverse nor beneficial consequences. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse impact: Alteration of a pattern(s) or feature(s) of a historic district or structure listed on or eligible for the NRHP would not diminish the integrity of a character-defining feature(s) or the overall integrity of the historic property. For purposes of Section 106, the determination would be *no adverse effect.*

Moderate: Adverse impact: The impact would alter a character-defining feature(s) of a historic district or structure and diminish the overall integrity of that feature(s) of the historic property. For purposes of Section 106, the determination of effect would be *adverse effect*, but one that could be fairly easily avoided, minimized, or mitigated through an Agreement Document.

Major: Adverse impact: The impact would alter character-defining feature(s) of the historic district or structure and severely diminish the integrity of that feature(s) and the overall integrity of the historic property. For purposes of Section 106 the determination of effect would be *adverse effect* and would present serious difficulty to avoid, minimize, or mitigate through an Agreement Document.

Duration – **Short-term** impacts are equivalent to the period of construction; **Long-term** impacts last beyond the period of construction.

4.8.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.8.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The present use of the trail network is causing deterioration of the park grounds alongside the trail. Without taking action, these problems would persist and perhaps increase. Under the No Action Alternative, trail users would continue to leave the paved surfaces and create social paths due to difficulties navigating the narrow sections of the trails, particularly when passing other users going in opposite directions. Safety hazards, such as path misalignments, surface defects, sharp turns, steep slopes, and overgrowing vegetation also discourage people from staying on the trails. The new social paths established by users damage the surrounding grounds, existing circulation patterns, and views within the APE, all of which are character-defining features of the

National Register properties. In addition, sand and silt build-up damage the path in many locations, which would potentially distort the overall character of the trail.

In summary, the No Action Alternative would have a minor long-term adverse impact on historic resources due to the continued deterioration of the trail and its character-defining features.

Cumulative Impacts
As described in the Rock Creek Park GMP, the Peirce Mill Rehabilitation project would have "a significant beneficial impact" where rehabilitation increases the trail system's integrity (NPS 2007). Other projects identified in the Rock Creek Park GMP would also provide beneficial impacts. However, there would be no incremental impact as a result of No Action Alternative when combined with these improvements. Therefore, there would be no cumulative impact on historic resources and cultural landscapes within the APE.

Conclusion
Under the No Action Alternative, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts to the contributing circulation resources, green space, and views within the APE. However, these impacts would not be sufficient to diminish the overall park integrity. There would be no cumulative impact on historic resources and cultural landscapes within the APE as a result of the No Action Alternative. For purposes of Section 106, the determination of effect for the No Action Alternative would be *no adverse effect*.

4.8.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Under Option A, a new trail spur through Peirce Mill would not be inserted. The present use of social trails near Peirce Mill is causing deterioration of the park grounds. Trail users would continue to leave the paved surfaces and create social paths, damaging the surrounding grounds, and existing circulation patterns. Under the no action option, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts.

Cumulative Impacts
As described in the Rock Creek Park GMP, the Peirce Mill Rehabilitation project would have "a significant beneficial impact" where rehabilitation increases the trail system's integrity (NPS 2007). Other projects identified in the Rock Creek Park GMP would also provide beneficial impacts. However, there would be no incremental impact as a result of No Action Alternative when combined with these improvements. Therefore, there would be no cumulative impact on historic resources and cultural landscapes within the APE.

Conclusion
Under the No Action Alternative, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts to the contributing circulation resources, green space, and views within the APE. However, these impacts would not be sufficient to diminish the overall park integrity. There would be no cumulative impact on historic resources and cultural landscapes within the APE as a result of the No Action Alternative. For purposes of Section 106, the determination of effect for the No Action Alternative would be *no adverse effect*.

4.8.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Under Option A, NPS would continue to maintain the existing Rose Park trail; the trail would not be widened and a new trail connection would not be inserted. The present use of social trails throughout Rose Park is causing deterioration of the park grounds. Trail users will continue to leave the paved surfaced and create

social paths, damaging the surrounding grounds, and existing circulation patterns. Under the no action option, problems of deterioration will persist, resulting in local direct and indirect long-term minor adverse impacts

Cumulative Impacts
As described in the Rock Creek Park GMP, the Peirce Mill Rehabilitation project would have "a significant beneficial impact" where rehabilitation increases the trail system's integrity (NPS 2007). Other projects identified in the Rock Creek Park GMP would also provide beneficial impacts. However, there would be no incremental impact as a result of No Action Alternative when combined with Option A for Rose Park. Therefore, Rose Park Trail Option A would not contribute to cumulative impacts.

Conclusion
Under the No Action Alternative, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts to the contributing circulation resources, green space, and views within the APE. However, these impacts would not be sufficient to diminish the overall park integrity. There would be no cumulative impact on historic resources and cultural landscapes within the APE as a result of the No Action Alternative. For purposes of Section 106, the determination of effect for the No Action Alternative would be *no adverse effect*.

4.8.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.8.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

All work proposed under Alternative 2 would be completed in accordance with *the Secretary of the Interior's Standards for the Treatment of Historic Properties* in order to avoid and/or minimize any adverse impacts. This analysis includes actions common to all build alternatives, including spot improvements related to trail user and vehicular traffic separation; roadway crossing safety; new connections; minor trail realignments and grading; drainage and soil erosion; and ***timber*** retaining walls.

The spine of the trail network extends along the western side of the Rock Creek and Potomac Parkway and Beach Drive as it winds through Rock Creek to Peirce Mill, often following historic trail routes. The undertaking intends to maximize retention of the trail's historic alignment to allow for a fuller interpretation of the historic usage of the park and parkway. Minor trail realignment and grading improvements would enhance sight distance and approaches along the trail to the south of Shoreham Drive, at Devil's Chair Bridge, south of Peirce Mill, and south of Calvert Street. Due to their localized nature, minor trail realignments and grade improvements may slightly alter the character-defining features but would not diminish the overall integrity of the resource, thus having local direct and indirect long-term minor adverse impacts on contributing features.

The undertaking proposes to construct several new trail connectors to increase safety and trail connectivity. In some areas, this may include paving extant social trails. While new trail connectors would result in a small amount of increased paving, the connectors are proposed for a short span of the trail. To reduce adverse impacts to the park, all proposed trail connections would be the minimum span needed to achieve the stated goals and laid directly on the existing topography. New connectors would be consistent in material and design features with the existing trails and would not introduce new elements inconsistent with the park and parkway's other features. The new connection improvements would be carefully laid out in order to leave plantings and views unaffected. The topography in the areas of some improvements may require minor re-grading for new connections. New paved connections through grassy areas and in areas previously undeveloped would have local direct and indirect long-term minor adverse impacts; however, formalizing and

paving extant social trails may provide a local indirect long-term beneficial impact by limiting damage to the green setting through which the trails run.

Two proposed paved trail sections would have the potential to affect contributing resources to the Rock Creek Park Historic District, including one along the existing social trail to the east of the Broad Branch/Grove 2 North parking area near Peirce Mill, which would join to the existing Rock Creek Park multi-use trail located immediately south of the parking area. According to the Revised 2003 Cultural Landscape Inventory (CLI) for Peirce Mill, the existing path follows the historic alignment of an early nineteenth-century wagon route between Peirce Mill and Blagden Mill, which was later used as a bridle path. The circulation routes surrounding Peirce Mill, one of the most significant cultural landscapes within the APE, reflect the evolving orientation of the landscape as it changed from a functional to recreational purposes. The CLI states that Peirce Mill's "current configuration of circulation systems . . . retains only limited integrity to all significant periods" due to alterations over the twentieth century. While the addition of a trail connection would slightly complicate the visitor's understanding of the mill's historic circulation system, and would introduce additional paving within the APE, the improvement would not alter the character-defining features or significantly diminish the overall integrity of the existing, historic trail. New paved connections near Peirce Mill's historic circulation would have local direct and indirect long-term, minor adverse impacts.

The second new paved trail section would be a new eight-foot trail along Piney Branch Parkway, a contributing resource in the Rock Creek Park Historic District. The parkway, a PWA project that addressed increased automobile use, was completed in 1935. The proposed extension would follow both paved and social trails between Beach Drive on the west and Arkansas Avenue on the east. The proposed trail would generally follow the alignment of a foot path that previously extended through this section of the park, according to a 1921 Office of Public Buildings and Grounds map. The path does not appear, however, on a 1942 map. The new portions of the trail would inject a considerable amount of paving alongside Piney Branch Parkway, but would formalize the existing social path, perhaps preventing further damage to the grassy border of the parkway by providing a permanent pathway for recreational users. New paving would involve no significant re-grading to minimize its impact. Due to the presence of paved portions of a trail in this area, the social trail, and the generally open character of the parkway, the new trail improvement at Piney Branch would have local direct and indirect long-term minor adverse impacts.

The bridges in the park and along the parkway are important components of the trails, providing ease of circulation throughout the network. Generally, construction around the footbridges, bridges, and tunnels may cause a short-term disruption in trail usage, as access to sections of the trail could temporarily be cut off. The proposed improvements to the Devil's Chair Bridge and the Shoreham Hill footbridge would only affect the approaches to the bridges and therefore would not disturb the significant creek abutments of either bridge. The alteration of the approach on the north side of the Devil's Chair Bridge would retain the existing concrete railing. The altered approaches would therefore have local direct and indirect long-term negligible adverse impacts on the Devil's Chair Bridge and the Shoreham Hill footbridge. Although the improvements at these two footbridges would slightly modify views of both the bridges and the trails, the work would not impair the historic bridle path alignments. Due to the minor nature of the alterations, the topography, and vegetation, the planned improvements would have negligible adverse impacts on views to and from nearby historic resources such as Oak Hill Cemetery.

Alternative 2 proposes to construct two new structures within the APE, including a new footbridge immediately adjacent to the west side of the existing Beach Drive Bridge and a new sidewalk along the western length of the Beach Drive tunnel. Since neither the bridge nor the tunnel are contributing resources to

the historic district and since materials used would be consistent with existing materials within the park, the this improvement would have local direct and indirect long-term minor adverse impacts on contributing resources in the APE.

Drainage and erosion issues would also be addressed by improvements under Alternative 2. Current creek conditions, erosion, and drainage issues south of the Beach Drive tunnel and south of Peirce Mill allow for frequent trail inundation near the creek's edge, causing silt to build up on the surface and erosion of the trail base. The proposed improvements would not only create safer conditions along the path; they would also increase the effective life of this trail section and nearby historic resources, including Peirce Mill. The drainage and erosion improvement south of the Beach Drive tunnel would reconstruct and armor the creek bank to stabilize the area. Details of the streambank stabilization method would be included in the final project design. Neither the tunnel nor the trail section in question is a contributing resource; however, the stabilization would be compatible with the undeveloped nature of the surroundings and as a result would have no adverse effect on historic resources.

An improvement south of Peirce Mill proposes to address erosion issues through a minor modification of the running vertical profile of the existing trail. If the improved re-grading is not sufficient to address the drainage and erosion issues and the culvert cannot handle the projected flow, a new culvert can be inserted adjacent to the existing culvert to supplement its flow capacity. Design details for a potential new culvert have not been finalized, however if it is necessary, the new culvert will utilize materials consistent with existing materials and will not introduce new elements inconsistent with the park and the parkway's other features. Some of the culverts along Beach Drive contribute to Rock Creek Park's significance, including culvert no. 67, which is in the vicinity of the proposed improvement south of Peirce Mill; however, the improvement would not remove or alter any of culvert no. 67's historic material. The drainage and erosion improvements will have no adverse effect on historic resources and would have the potential for beneficial effects in the stabilization of existing trail routes.

Cumulative Impacts

The Peirce Mill Rehabilitation and other improvements identified in the Rock Creek Park GMP would have direct long-term beneficial impacts on the Rock Creek Park and Rock Creek and Potomac Parkway Historic Districts. The incremental impacts of these actions, when combined with the proposed action would result in long-term beneficial cumulative impacts. However, if construction of any of the improvements identified in the Rock Creek Park GMP were constructed concurrently with Alternative 2, a short-term minor adverse cumulative effect on historic districts and structures would result.

Conclusion

Since its inception, the trail network throughout Rock Creek Park and the Rock Creek and Potomac Parkway has been adapted for new uses – from early service uses, to pedestrian promenades and carriage drives, to equestrian paths, and finally, to modern-day cycling, jogging, and skating. The Rock Creek Trail Rehabilitation project endeavors to carefully continue the evolution of the park and the parkway and aid in carrying out the recreational mission set forth in Rock Creek Park's 1890 enabling legislation and excerpted below:

> *-The designated area is to be "perpetually dedicated and set apart as a public park or pleasure ground for the benefit and enjoyment of the people of the United Sates"*

> *-The park is to "provide for the preservation from injury or spoliation of timber, animals, or curiosities within said park, and their retention in their natural condition, as nearly as possible"*
>
> *-Park managers are directed to provide for public recreation, specifically to "layout and prepare roadways and bridle paths, to be used for driving and for horseback riding, respectively, and footways for pedestrians"* (NPS, 1990).

Overall, the impacts of Alternative 2 would be modest and the historic alignments and characteristics of the trails and their landscape setting are well respected. Alternative 2 proposes sensitive realignments and connecting paths that do not significantly alter historic trails. With the exception of the new trail along Piney Branch Parkway, all new trails will be introduced in short spans and would not significantly diminish the overall integrity of the historic resources or cultural landscapes within the APE. Cumulative impacts on the historic districts, historic resources, and cultural landscapes within the APE would be beneficial. The determination of effect for purposes of Section 106 for Alternative 2 would be *no adverse effects*.

4.8.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

All work proposed under Alternative 3 would be completed in accordance with the Secretary *of the Interior's Standards for the Treatment of Historic Properties* in order to minimize any adverse impacts.

The spot improvements proposed under Alternative 3 are the same as those detailed in Alternative 2 and would therefore have the same impacts described in Alternative 2. In addition to these improvements, Alternative 3 proposes to resurface and widen the multi-use trail to a minimum of six feet at locations with existing physical and environmental constraints, and to a maximum of 10 feet for safety where environmentally feasible. This increase, which varies from one foot to four feet, has the greatest potential impact on the trail network itself. One of the stated goals of this project is to increase safety while maintaining the trail in a relatively unchanged state, due to the importance of the resource, which this widening should accomplish. Widening the trail would improve sight lines, reduce hazardous corners, and promote safe passing for users. In general, widening occurs in locations where visitor use has effectively extended the width of the existing path or created a parallel unpaved path. The trail widening would therefore pave bare dirt surfaces, or social trails, already used by visitors. Providing sufficient room for most users may provide a beneficial impact by decreasing damage to the green setting through which the trails run. It should be noted, however, that there are a few locations where social trails do not closely follow the existing paved surface. These unpaved trails would likely continue to be used, whether or not the paved surface is widened.

As stated previously, the additional paving required for widening the trail – both contributing and noncontributing sections – varies along the network between 1 and four feet. Because widening existing trails would introduce new paved surfacing, the action would be minimized in areas that follow historic paths. Since the topography of the park and parkway varies, a few small areas may have to be regraded if the paved trail is to be widened. As proposed, the widening and areas of minor regrading would potentially modify historic paths, but would preserve their character-defining features and would retain the curvilinear design without significantly diminishing the integrity of the resource.

In addition to the historic trail routes and green space in the park and parkway, the roadways in the study area, including Rock Creek and Potomac Parkway, Beach Drive, and Piney Branch Parkway, are contributing

features within the APE, with the potential to be affected by the proposed actions due to their proximity to the trail network. The winding roads are characterized by flanking trees and their canopies. Vegetation would be carefully protected in the widening plans; however, if trail widening results in the removal of vegetation, the action has the potential to open this space in certain locations, slightly altering views of the park and parkway and the visitors' experience.

For the reasons stated above, widening the trail between 1 and four feet may alter the character-defining features but would not diminish the overall integrity of the resource thus having local direct and indirect long-term minor adverse impacts. A local direct and indirect short-term negligible adverse impact to green space paralleling the trails may also occur if the paved trails are inaccessible during construction forcing visitors to use grassy areas for their recreation.

Cumulative Impacts
The Peirce Mill Rehabilitation and other improvements identified in the Rock Creek Park GMP would have direct long-term beneficial impacts on the Rock Creek Park and Rock Creek and Potomac Parkway Historic Districts. If any of the improvements identified in the Rock Creek Park GMP were constructed concurrently with Alternative 2, a short-term minor adverse cumulative effect on historic districts and structures would result. However, the incremental impacts of these actions, when combined with the proposed action would result in long-term beneficial cumulative impacts.

Conclusion
Alternative 3 would introduce additional paving within the APE, adding to the adverse impacts on the historic resources of Rock Creek Park and Rock Creek and Potomac Parkway. Due to the limited extent of the additional impacts and local direct long-term beneficial impact of replacing social trails with permanent trails, as compared to Alternative 2, the new work would not raise the intensity of Alternative 3's overall impact. The actions would not significantly diminish the overall integrity of any of the historic resources or cultural landscapes in the APE. The adverse impacts would therefore remain local direct long-term and minor. Cumulative impacts on the historic districts, historic resources, or cultural landscapes within the APE would be beneficial. The determination of effect for purposes of Section 106 for Alternative 3 would be *no adverse effects.*

4.8.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B proposes a trail connection north of Peirce Mill and would pave a social trail presently connecting Peirce Mill to Broad Branch Road. According to the Revised 2003 Cultural Landscape Inventory (CLI) for Peirce Mill, the social trail partially follows the course of an early nineteenth-century millrace that was filled in by 1970 and then takes a diagonal path away from it. The circulation routes surrounding Peirce Mill, one of the most significant cultural landscapes within the APE, reflect the evolving orientation of the landscape as it changed from functional to recreational purposes. The CLI states that Peirce Mill's "current configuration of circulation systems on site retains only limited integrity to all significant periods." Materials to be removed and paving would be minimal. Since the paved path would partially follow the historic alignment of the millrace, additional alterations that further diminish the integrity of the millrace course would be minimized.

Cumulative Impacts
Peirce Mill Trail Spur Option A would contribute no incremental impacts when combined with past, present, and future activities within the APE. Therefore there would be cumulative impacts under Option A. The

Peirce Mill Rehabilitation and would have direct long-term beneficial impacts. Peirce Mill Trail Spur Option B would have long-term beneficial impacts and, when combined with the Peirce Mill Rehabilitation, a long-term beneficial cumulative impact would result.

Conclusion
Under Peirce Mill Trail Spur Option B, there would be a long-term beneficial impact due to the improvement of the deteriorated grounds where social trails exist. There would be additional long-term beneficial impacts created from engaging the public with the historic millrace alignment. Peirce Mill Trail Spur Option B would introduce additional paving within the APE; however, due to the limited extent of the additional impacts, the work would not significantly diminish the overall integrity of any historic resources or cultural landscapes in the APE. The adverse impacts would therefore remain local direct long-term and minor.

Peirce Mill Trail Spur Option A would not contribute to cumulative impacts. Under Peirce Mill Trail Spur Option B, a long-term beneficial cumulative impact to historic sites and districts would occur. The determination of effect for purposes of Section 106 for the Peirce Mill Trail Spur Options would be *no adverse effects.*

4.8.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Option B, the Rose Park trail would be resurfaced along its current alignment to a continuous six-foot width and would also include connections to the existing Rock Creek Trail system to the north and M Street to the south to increase safety and access to the trail network. The widening of the trail would avoid damage to the existing trees and would retain the curvilinear design of the multi-use trail without significantly diminishing the integrity of the resource. The proposed connections at M Street would pave an existing social trail. The social trail runs through a group of small trees and is one of a number of social trails in the area providing links to the paved trail. The paving of the trail will avoid damage to the existing trees. Widening the trail and inserting new paved connections would have local direct and indirect long-term minor adverse impacts.

Cumulative Impacts
There are no other identified past, present or future actions within geographic proximity that would potentially have an incremental impact to Rose Park. Therefore, there are no cumulative impacts.

Conclusion
The action alternatives would introduce additional paving within the APE; however, due to the limited extent of the additional impacts, and the local direct long-term beneficial impact of replacing social trails with permanent trails, the work would not substantially raise the intensity of Option B's overall impact. The action would not significantly diminish the overall integrity of any of the historic resources in the APE. The adverse impacts would therefore remain local direct long-term and minor. The determination of effect for purposes of Section 106 would be *no adverse effects.* There would be no cumulative impacts.

4.8.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Option C, the Rose Park trail would be resurfaced along its current alignment to a continuous eight-foot width and would also include connections to the existing Rock Creek Trail system to the north and M Street to the south. The impacts of Option C are similar to those described under Option B; however Option C would introduce additional paving within the APE, adding to the adverse impacts on the historic resources of Rose

Park but not raising the overall impact evaluation. Widening the trail and inserting new paved connections would have local direct and indirect long-term minor adverse impacts.

Cumulative Impacts
There are no other identified past, present or future actions within geographic proximity that would potentially have an incremental impact to Rose Park. Therefore, there are no cumulative impacts.

Conclusion
The action alternatives would introduce additional paving within the APE; however, due to the limited extent of the additional impacts, and the local direct long-term beneficial impact of replacing social trails with permanent trails, the work would not substantially raise the intensity of Option B or C's overall impact. The action would not significantly diminish the overall integrity of any of the historic resources in the APE. The adverse impacts would therefore remain local direct long-term and minor. The determination of effect for purposes of Section 106 would be *no adverse effects*. There would be no cumulative impacts.

4.9. CULTURAL LANDSCAPES

Study Area
Cultural landscapes, as defined by *The Secretary of the Interior's Standards for the Treatment of Historic Properties: Guidelines for the Treatment of Cultural Landscapes* (NPS 1992), consist of "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." The Rock Creek Park administrative unit encompasses the last major natural landscape in the District. The area comprising the park was little modified by human interaction prior to its creation as a park. Since that time, the park has balanced the preservation and maintenance of the valley's natural and cultural resources with the recreational and transportation requirements of modern Washington, DC while incorporating the highest cultural and aesthetic values. As such, Rock Creek Park is considered a significant cultural and historic landscape.

In 1997, the NPS began a cultural landscape inventory of Rock Creek Park in order to more effectively document and manage the qualities and attributes of the park's component landscapes and cultural features that make it significant and worthy of preservation (National Park Service 1998, revised 2003). The results of that inventory concluded that Rock Creek Park met the criteria for listing in the NRHP as a historic designed landscape. In addition, the inventory determined that two component landscapes of the park, Linnaean Hill (including the Peirce-Klingle Mansion) and the Peirce Mill contribute to the significance of the Rock Creek Park cultural landscape, and thus comprise individually eligible landscape elements.

Impact Thresholds
For an historic district, structure, or cultural landscape to be listed in the NRHP, it must possess significance and the features which convey its significance must have integrity. For purposes of evaluating potential impacts on historic districts and structures, the thresholds of change are defined as follows:

Negligible: The impact is at the lowest level of detection with neither adverse nor beneficial consequences. For Section 106 of the NHPA, the determination of effect would be *no adverse effect*.

Minor: Adverse Impact: - Alteration of the patterns or features of a historic district or structure would not diminish the integrity of the character-defining features or the overall integrity of the historic property. For Section 106, the determination would be *no adverse effect*.

Moderate: Adverse Impact: - The project would alter the character-defining features of the historic district or structure and diminish the integrity of the features of the historic property. The determination of effect for Section 106 would be an adverse effect, but one that could be avoided, minimized or mitigated.

Major: Adverse Impact: - The project would alter the character-defining features of the historic district or structure and severely diminish the integrity of the features and the overall integrity of the historic property. For purposes of Section 106, the determination of effect would be *adverse effect* and the effects would be difficult to avoid, minimize or mitigate.

4.9.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.9.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the multi-use trail would not be widened or otherwise improved causing the park grounds flanking the trail to continue to deteriorate. Trail users would continue to leave the paved surfaces and create social paths due to difficulties navigating the narrow sections of the trails, particularly when passing other users going in opposite directions. Safety hazards, such as path misalignments, surface defects, sharp turns, steep slopes, and overgrowing vegetation also discourage people from staying on the trails. The new social paths established by users damage the existing circulation patterns, and views within the APE, all of which are character-defining features of the National Register properties. In addition, sand and silt deposition would continue to damage the path in many locations, which would potentially distort the overall character of the trail.

In summary, the No Action Alternative would have a minor long-term impact to cultural landscapes due to the continued deterioration of the trail, and the natural setting of Rock Creek Park.

Cumulative Impacts

There would be no incremental impact as a result of No Action Alternative when combined with these improvements. Therefore, there would be no cumulative impact on historic resources and cultural landscapes within the APE.

Conclusion

Under the No Action Alternative, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts to the contributing circulation resources, green space, and views within the APE. However, these impacts would not be sufficient to diminish the overall park integrity. There would be no cumulative impacts under the No Action Alternative. For purposes of Section 106, the determination of effect for the No Action Alternative would be *no adverse effect.*

4.9.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Under Option A, a new trail spur through Peirce Mill would not be inserted. The present use of social trails near Peirce Mill is causing deterioration of the park grounds. Trail users would continue to leave the paved surfaces and create social paths, damaging the surrounding grounds, and existing circulation patterns. Under the No Action option, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts.

Cumulative Impacts
As described in the Rock Creek Park GMP, the Peirce Mill Rehabilitation project would have "a significant beneficial impact" where rehabilitation increases the trail system's integrity (NPS 2007). Other projects identified in the Rock Creek Park GMP would also provide beneficial impacts. However, there would be no incremental impact as a result of No Action Alternative when combined with these improvements. Therefore, there would be no cumulative impact on cultural landscapes within the APE.

Conclusion
Under the No Action Alternative, problems of deterioration would persist, resulting in local direct and indirect long-term minor adverse impacts to the contributing circulation resources, green space, and views within the APE. However, these impacts would not be sufficient to diminish the overall park integrity. There would be no cumulative impact on cultural landscapes within the APE as a result of the No Action Alternative. For purposes of Section 106, the determination of effect for the No Action Alternative would be *no adverse effect*.

4.9.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Rose Park is assessed in this EA because it is located within the APE and is a contributing resource to the Georgetown Historic District; however, s***ince the trail in Rose Park is an existing feature in the landscape, Rose Park Trail Option A would not have an effect on the cultural landscape of Rose Park or Rock Creek and Potomac Parkway.***

4.9.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.9.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING AND ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

The two Action Alternatives would implement the same spot improvements; however, Alternative 3 would widen the existing trail in certain areas. The Action Alternatives would result in improved safety, user accessibility, and erosion control within a historical significant park and cultural landscape. Improvements proposed in the Action Alternatives would be modest and would aid in carrying out the recreational mission set forth in Rock Creek Park's 1890 enabling legislation.

The trail network throughout the park is a significant component of Rock Creek Park's circulation system, and as such, is a contributing feature of the park's cultural landscape. The trails have historically provided Washingtonians access to the park and their continued use and evolution represents the long tradition of recreational activities offered within the park. The undertaking proposes sensitive realignments to the trails and connecting paths that do not significantly alter the cultural landscape. With the exception of the new trail along Piney Branch Parkway, all new trails would be introduced in short spans. Any re-grading, widening, or trail connections would respect and retain the curvilinear design of the multi-use trail – a character-defining feature of the resource. New trail surfaces would be compatible with the historic character of the circulation network in color and materials and would not detract from the natural setting. These actions would not significantly diminish the integrity of the trail network and thus would have local direct and indirect long-term minor adverse impacts on the trail network.

The wooded quality of Rock Creek Park is intrinsic to its natural setting and is a character-defining feature of the park. While landscape plans would be developed with sensitivity to the cultural landscape and in accordance with NPS policies, the Action Alternatives would remove a small amount of vegetation and may affect a limited number of mature trees. The removal of vegetation has the potential to open this space in certain locations, slightly altering views of the park and parkway and the visitors' experience; however, the overall integrity of the resource would not be diminished due to the limited effect on vegetation and the measures to avoid vegetation loss through design. For these reasons, vegetation removal would have local direct and indirect long-term minor adverse impacts.

Cumulative Impacts

Cumulative impacts of Rock Creek Park GMP and the Peirce Mill Rehabilitation, in combination with Action Alternatives for the current undertaking, would have direct long-term beneficial impacts on the cultural landscape. Construction activity resulting from these projects would result in a short-term minor adverse cumulative effect on the cultural landscape depending on the duration and extent of construction.

Conclusion

Since its inception, the trail network throughout Rock Creek Park and the Rock Creek and Potomac Parkway has been adapted for new uses – from early service uses, to pedestrian promenades and carriage drives, to equestrian paths, and finally, to modern-day cycling, jogging, and skating. The Rock Creek Park Multi-use Trail Rehabilitation project endeavors to carefully continue the evolution of the park and the parkway and aid in carrying out the recreational mission set forth in Rock Creek Park's 1890 enabling legislation as excerpted below:

> *-The designated area is to be "perpetually dedicated and set apart as a public park or pleasure ground for the benefit and enjoyment of the people of the United Sates"*
>
> *-The park is to "provide for the preservation from injury or spoliation of timber, animals, or curiosities within said park, and their retention in their natural condition, as nearly as possible"*
>
> *-Park managers are directed to provide for public recreation, specifically to "layout and prepare roadways and bridle paths, to be used for driving and for horseback riding, respectively, and footways for pedestrians"* (Bushong 1990).

Action Alternatives 2 and 3 would temporarily close sections of the trail while construction is underway, creating short-term minor adverse impacts. In the long term, the rehabilitation project under Alternatives 2 and 3 would seem to provide a balance of local long-term direct and indirect minor adverse impacts and local long-term direct and indirect beneficial impacts within the APE. Adverse impacts would include the introduction of new paving in previously unpaved areas and areas of re-grading. Due to modest trail realignments and re-grading, these actions would have minor adverse impacts on views in the immediate vicinity of the work. However, the actions would have beneficial impacts, including increased longevity of the trails, decreased damage to the trails by formalizing social trails, and improved safety for all park users. Overall, the impacts of the Action Alternatives would be modest, and the historic alignments and characteristics of the trails and their cultural landscape setting are well respected. The undertaking proposes sensitive realignments and connecting paths that do not significantly alter historic trails. With the exception of the new trail along Piney Branch Parkway, all new trails will be introduced in short spans and would not significantly diminish the overall integrity of the historic resources or cultural landscapes within the APE. Cumulative impacts on the historic districts, historic resources, and cultural landscapes within the APE would be beneficial. The determination of effect for purposes of Section 106 for Action Alternatives 2 and 3 would be *no adverse effects*.

4.9.2.2. PEIRCE MILL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B proposes a trail connection north of Peirce Mill and would pave a social trail presently connecting Peirce Mill to Broad Branch Road. According to the Revised 2003 Cultural Landscape Inventory (CLI) for Peirce Mill, the social trail partially follows the course of an early nineteenth-century millrace that was filled in by 1970. The circulation routes surrounding Peirce Mill, one of the most significant cultural landscapes within the APE, reflect the evolving orientation of the landscape as it changed from functional to recreational purposes. The CLI states that Peirce Mill's "current configuration of circulation systems on site retains only limited integrity to all significant periods." Since the paved path would partially follow the historic alignment of the millrace, additional alterations that further diminish the integrity of the millrace course would be minimized. The Peirce Mill Cultural Landscape Report prepared in 2009 identified the new trail in the preferred treatment.

Under Option B, there would be a long-term beneficial impact due to the improvement of the deteriorated grounds where social trails exist. There would be additional long-term beneficial impacts created from engaging the public with the historic millrace alignment. While the proposed improvement would introduce additional paving within the APE, due to the limited extent of the additional impacts, the work would not significantly diminish the overall integrity of the cultural landscapes within the APE. The adverse impacts would remain local, direct, long-term, and minor.

Cumulative Impacts
Cumulative impacts of this action, in combination with Alternative 2 or 3 for the current undertaking would therefore have direct long-term beneficial impacts on Rock Creek Park and Peirce Mill, a component landscape of the park. The rehabilitation of Peirce Mill would have long-term beneficial impacts. Construction activity resulting from these projects would result in a short-term minor adverse cumulative effect on cultural landscapes depending on the duration and extent of construction. Cumulative impacts of the Peirce Mill Spur Options, in combination with the No-Action Alternative for the current undertaking would therefore primarily have direct long-term beneficial impacts on cultural landscapes within the APE.

Conclusion
Under Option B, there would be a long-term beneficial impact due to the improvement of the deteriorated grounds where social trails exist. There would be additional long-term beneficial impacts created from engaging the public with the historic millrace alignment.

The action alternative would introduce additional paving within the APE; however, due to the limited extent of the additional impacts, the work would not significantly diminish the overall integrity of the cultural landscapes in the APE. The adverse impacts would therefore remain local direct long-term and minor.

Cumulative impacts of this action would have direct long-term beneficial impacts on Rock Creek Park and Peirce Mill, a component landscape of the park. The determination of effect for purposes of Section 106 for the Peirce Mill Spur Options would be *no adverse effects*.

4.9.2.3. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*) AND C

Rose Park is assessed in this EA because it is located within the APE and is a contributing resource to the Georgetown Historic District. ***However, because the trail is an existing part of the park's landscape, the***

proposed improvements would have a negligible impact on the overall integrity of the cultural landscape of Rose Park and the Rock Creek and Potomac Parkway.

4.10. ARCHEOLOGICAL RESOURCES

Methodology and Assumptions

Archeological resources within Rock Creek Valley have been shown to include potentially deeply buried resources as well as resources that are present at and exposed on the current land surface. Potential impacts to resources are assessed according to the extent the proposed alternatives would involve ground-disturbing activities such as excavation, grading, or vegetation removal. Analysis of possible impacts to archeological resources was based on a review of previous archeological studies, the nature of previously identified archeological sites, the consideration of the proposed design concepts, and other sources of information.

Study Area

The APE for archeological resources is defined as that area within the project LOD between Pennsylvania Avenue to the south and Broad Branch Road to the north, inclusive of the Piney Branch Parkway trail and proposed connections to existing bicycle and pedestrian networks.

Impact Thresholds

Impacts to archeological sites occur when proposed alternatives result in complete or partial destruction of the resource, and are equivalent to a loss of integrity as defined in Section 106 of NHPA. In determining the appropriate impact threshold, both the extent to which the proposed alternative results in a loss of integrity and the degree to which losses can be compensated by mitigating activities, including preservation or data recovery, are considered. Only those resources considered significant for listing in the NRHP are protected by federal regulations. Resources are eligible for listing in the NRHP if they meet one or more eligibility criteria (for archeological site, generally Criterion D, having the potential to provide information important to history or prehistory) and if they possess integrity.

For the analysis of impacts to archeological resources, the determination of the intensity of an impact is based on the foreseeable loss of integrity to known or potential resources. The analysis considers only the direct impacts of construction-related activities as the facility should have no ground-disturbing activities and no additional effects upon archeological resources under any of the alternatives under consideration upon completion of construction. However, all impacts are considered long term, in that the impact to an archeological resource will last past the period of construction. The definition of impact thresholds used in this analysis are:

Negligible: The lowest level of detection that would have neither adverse not beneficial impacts. The determination of effect for Section 106 of NHPA would be no adverse effect.

Minor: Disturbance of archeological resources will result in little, if any, loss of site integrity. The determination of effect for Section 106 of NHPA would be no adverse effect.

Moderate: Site disturbance will result in a loss of integrity and a partial loss of the character-defining features and information potential that form the basis of the site's NRHP eligibility. Mitigation is accomplished by a combination of archeological data recovery and in-place preservation. The determination of effect for Section 106 of NHPA would be an adverse effect.

Major: The disturbances result in a loss of site integrity to the extent that the resource is no longer eligible for listing in the NRHP. The site's character-defining features and information potential are lost to the extent that archeological data recovery is the primary form of mitigation. The determination of effect for Section 106 of NHPA would be an adverse effect.

Beneficial: Beneficial impacts can occur when an archeological site is stabilized in its current condition to maintain its existing level of integrity or when an archeological site is preserved in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (NPS 1992). The determination of effect for Section 106 of NHPA would be *no adverse effect*.

Duration: **Short-term** impacts last for the duration of construction-related activities while **long-term** impacts last beyond the proposed construction activities. All impacts to archeological sites are considered long-term impacts.

4.10.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.10.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, NPS would continue to care for the existing trails with spot repairs and maintenance initiated as needed. Under this alternative, there would be no impacts to archeological resources as maintenance and repairs would continue to be confined to the existing trail footprint. As none of these activities would involve considerable ground disturbance either within or adjacent to the existing trail, any existing archeological resources would remain undisturbed.

Cumulative Impacts

Because there is no impact to archeological resources as a result of the No Action Alternative, it would not contribute to the overall cumulative impact on archeological resources.

Conclusion

As no ground disturbing actions are anticipated under the No Action Alternative, selection of this alternative would have *no adverse effects* to archeological resources. Because there is no impact to archeological resources as a result of the No Action alternative, it would not contribute to the overall cumulative impact on archeological resources.

4.10.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Under Option A, the social trail would remain unchanged. Because there would be no ground disturbance, any existing archeological resources would remain undisturbed, and there would be no impacts to archeological resources.

Cumulative Impacts

Because there is no impact to archeological resources as a result of Option A, the No Action Alternative would not contribute to the overall cumulative impact on archeological resources.

Conclusion

There would be no impact to archeological resources under Peirce Mill Trail Spur Option A. No cumulative impacts would occur.

4.10.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Under the No Action Alternative, the NPS would continue to existing management and maintenance practices for the existing Rose Park trail. There would be no impacts to archeological resources as no ground disturbing activities are anticipated. As none of these activities would involve ground disturbance, any existing archeological resources would remain undisturbed.

Cumulative Impacts
Because there is no impact to archeological resources as a result of Option A, the No Action Alternative would not contribute to the overall cumulative impact on archeological resources.

Conclusion
There would be no impact to archeological resources under Rose Park Trail Option A. No cumulative impacts would occur.

4.10.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.10.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Under Alternative 2, the multi-use trail would be resurfaced at existing widths, spot improvements would be made for visitor use and safety, connections to existing bicycle and pedestrian networks would be included at Cathedral Avenue, Calvert Street, Connecticut Avenue, the Beach Drive tunnel sidewalk, P Street, Rose Park trail, and unpaved portions of Piney Branch Parkway trail would be paved to six feet at locations with environmental constraints and eight feet where environmentally feasible. These various actions and options are evaluated individually as they differ in the degree to which each might result in impacts to archeological resources.

Resurfacing with Spot Improvements and Connections
Under this alternative, no ground disturbance would occur with regard to the trail resurfacing to existing widths. Spot improvements are envisioned to include several minor trail realignments, drainage and erosion control improvements, street crossing improvements, ***timber*** retaining wall rehabilitation, and grade improvements. Given that the spot improvements are envisioned to be small-scale in nature, most such actions would entail little ground disturbance. For these actions and areas, the small scale of anticipated ground disturbance suggests that impacts to archeological resources would be negligible to minor and would involve the limited disturbance of near-surface deposits in relatively small areas. Partial loss of archeological sites under these scenarios would be negligible to minor.

Several spot improvements incorporate greater degrees of ground disturbance. Three spot improvement locations include grade improvements between Calvert Street and Connecticut Avenue, embankment stabilization north of Calvert Street, and drainage and erosion control improvements south of Tilden Street. These locations have not been surveyed for the presence of archeological sites. For these locations the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources would be minor to moderate and would generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

Under Alternative 2, new connections from the existing Rock Creek Park multi-use trail to existing bicycle and pedestrian networks would be constructed at Cathedral Avenue, Calvert Street, Connecticut Avenue, the Beach Drive tunnel sidewalk, P Street, Rose Park trail, and Piney Branch Parkway trail. These areas have either been

included in intensive archival review projects (Rose Park and P Street), have been surveyed by pedestrian reconnaissance (Piney Branch Parkway trail and Beach Drive tunnel), or have not been investigated (Connecticut Avenue, Cathedral Avenue, and Calvert Street). No archeological sites have been found as a result of the limited archeological investigations conducted at the proposed connection locations. Areas adjacent to Rock Creek are generally characterized as having a moderate to high potential for the presence of precontact Native American archeological sites. Grading and vegetation removal to construct the proposed connections would impact potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources would be minor to moderate and would generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

As the presence of NRHP-eligible archeological sites is at present unknown outside of 51NW001, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail connector construction, grading, and spot improvements. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Piney Branch Parkway Trail and Connections

Under Alternative 2 the unpaved portions of Piney Branch Parkway trail would be paved to six feet at locations with environmental constraints and eight feet where environmentally feasible, and connections would be created to Beach Drive and Rock Creek Park multi-use trail at the west end and to the Arkansas Avenue and Taylor Avenue sidewalks at the east end. Most recently, this area has been investigated by a pedestrian walkover and shovel test and test unit excavations with the NRHP-listed archeological site 51NW001 (Fiedel et al.) Parkway trail APE and is a precontact Native American quarry site. Based on the presence of this site, there is a high probability for additional quarries or subsidiary sites in or near the project APE.

Grading and vegetation removal to widen the existing unpaved portion of the trail and construct the proposed connections could impact identified and potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources would be minor to moderate and generally involve the disturbance of near-surface deposits. Partial loss of identified and potential archeological sites under these scenarios would be minor to moderate.

As the presence of NRHP-eligible archeological sites is at present unknown outside of the 51NW001 site area, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail and connector construction. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Cumulative Impacts

Although past actions may have affected archeological resources, the present and reasonably foreseeable future actions listed in **Table 8** would have no impacts to archeological resources in the study area. The Rock Creek Park Multi-Use Trail Rehabilitation has the potential to impact potential archeological sites in areas that have not yet been surveyed for these resources. These include portions of spot improvements, trail connections, and the Piney Branch Parkway trail and connections. Therefore, Alternative 2 would increase negative cumulative impacts upon archeological resources within Rock Creek Park.

Conclusion

Alternative 2 would resurface the trail to the existing width resulting in no ground-disturbing activities. However, spot improvements and selection of options for the creation of trail access spurs would result in limited and localized ground disturbing activities. In this instance avoidance, minimization, and mitigation within as yet unidentified archeological resources, would result in *no adverse effects*. Alternative 2 would increase negative cumulative impacts upon potential archeological resources within Rock Creek Park.

4.10.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Under Alternative 3, the multi-use trail would be resurfaced and widened to a minimum of six feet at locations with existing physical and environmental constraints and to a maximum of 10 feet where environmentally feasible, spot improvements would be made for visitor use and safety, connections to existing bicycle and pedestrian networks would be included at Cathedral Avenue, Calvert Street, Connecticut Avenue, the Beach Drive tunnel sidewalk, P Street, Rose Park trail, and Piney Branch Parkway trail would be constructed, and unpaved portions of Piney Branch Parkway trail would be paved to six feet at locations with environmental constraints and eight feet where environmentally feasible.

Resurfacing with Spot Improvements and Connections

Under this alternative, the existing Rock Creek Park multi-use trail would be resurfaced and widened to a minimum of six feet at locations with existing physical and environmental constraints, and to a maximum of 10 feet where environmentally feasible. The area from Harvard Street south to Pennsylvania Avenue currently ranges from less than six feet wide to maximally eight feet wide with the exception of a short section to either side of Massachusetts Avenue, which is currently 10 feet wide. For this area, intensive shovel test pit survey has been conducted in limited areas within the National Zoo and between Connecticut Avenue and Q Street. Areas south of Q Street have not been surveyed for archeological resources or have been investigated by intensive archival research. For these locations the restricted scale of anticipated ground disturbance, generally between two and four feet wide along the multi-use trail, suggests that impacts to potential archeological resources would be minor to moderate and would generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

In general, all paved areas north of Harvard Street to Broad Branch Road would either not require widening or widening would be two feet or less. These areas have been investigated for archeological resources either by intensive archival research or pedestrian reconnaissance. Two archeological sites, 51NW154 and 51NW008, neither of which have been evaluated for listing in the NRHP, have been located with the project APE north of Harvard Street. For the area north of Harvard Street and for archeological sites 51NW154 and 51NW008, the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources or deposits would be minor to moderate and would generally involve the disturbance of near-surface deposits. Such impacts could range in intensity from minor to moderate depending on the nature of the potential archeological resources. Partial loss of archeological sites under these scenarios would be negligible to minor. One final archeological site, 51NW216, is the location of the Colored Union Benevolent Association Cemetery dated between 1870 and 1890. Because of the uncertainty of the location of all 7,500 interments within this cemetery, it is possible that the proposed trail widening would occur above graves. However, anticipated ground disturbance would be minimal and would not impact any interments. The final trail route would avoid all known graves.

In several areas, the proposed LOD is wider than those discussed above. These restricted areas include:

- West bank of Rock Creek north of Piney Branch Parkway
- West bank of Rock Creek between Piney Branch parkway and Porter Street, NW
- East Bank of Rock Creek south of Porter Street, NW
- East bank of Rock Creek north of Bluffs Bridge
- At Peirce Mill (51NW154)
- East bank of Rock Creek at the National Zoo
- West bank of Rock Creek between Calvert Street and Connecticut Avenue
- East bank of Rock Creek at Beach Drive tunnel
- At Shoreham Hill Footbridge
- West bank of Rock Creek at Devils Chair Bridge
- West Bank of Rock Creek at P Street Bridge

Impacts at these locations could range in intensity from minor to moderate depending on the nature of the potential archeological resources. Partial loss of archeological sites under these scenarios would be minor to moderate.

Several spot improvements incorporate greater degrees of ground disturbance. Three spot improvement locations include grade improvements between Calvert Street and Connecticut Avenue, embankment stabilization north of Calvert Street, and drainage and erosion control improvements south of Tilden Street. These locations have not been surveyed for the presence of archeological sites. For these locations the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources would be minor to moderate and would generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

Under Alternative 3, new connections would be constructed from the existing Rock Creek Park multi-use trail to the existing bicycle and pedestrian networks at Cathedral Avenue, Calvert Street, Connecticut Avenue, the Beach Drive tunnel sidewalk, P Street, Rose Park trail, and Piney Branch Parkway trail. These areas have either been included in intensive archival review projects (Rose Park and P Street) or have been surveyed by pedestrian reconnaissance (Piney Branch Parkway trail and Beach Drive tunnel) or have not been investigated (Connecticut Avenue, Cathedral Avenue, and Calvert Street). No archeological sites have been found as a result of the limited archeological investigations conducted at the proposed connection locations. Areas adjacent to Rock Creek are generally characterized as having a moderate to high potential for the presence of precontact Native American archeological sites. Grading and vegetation removal to construct the proposed connections would impact potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to potential archeological resources would be minor to moderate and would generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

Piney Branch Parkway Trail and Connections

Under Alternative 3 the unpaved portions of Piney Branch Parkway trail would be paved to six feet at locations with environmental constraints and eight feet where environmentally feasible, and connections would be created to Beach Drive and Rock Creek Park multi-use trail at the west end and to the Arkansas Avenue and Taylor Avenue sidewalks at the east end. Most recently, this area has been investigated by a pedestrian walkover and shovel test and test unit excavations with the NRHP-listed archeological site 51NW001 (Fiedel et al. 2008). Site 51NW001, the Piney Branch Quarry, is located adjacent to but north of the Piney Branch

Parkway trail APE and is a precontact Native American quarry site. Based on the presence of this site, there is a high probability for additional quarries or subsidiary sites in or near the project APE.

Grading and vegetation removal to widen the existing unpaved portion of the trail and construct the proposed connections could impact identified and potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to identified and potential archeological resources would be minor to moderate and generally involve the disturbance of near-surface deposits. Such impacts to other as yet undiscovered archeological resources could range in intensity from minor to moderate depending on the nature of the potential archeological resources. Partial loss of identified and potential archeological sites under these scenarios would be minor to moderate.

As the presence of NRHP-eligible archeological sites is at present unknown outside of the 51NW001 site area, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail and connector construction. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Cumulative Impacts

Although past actions may have affected archeological resources, the present and reasonably foreseeable future actions presented in **Table 8** would have no impacts to archeological resources in the study area. Alternative 3 has the potential to impact potential archeological sites in areas that have not yet been surveyed for these resources. These include portions of spot improvements, trail connections, and the Piney Branch Parkway trail and connections. Therefore, Alternative 3 would increase negative cumulative impacts upon archeological resources within Rock Creek Park.

Conclusion

Alternative 3 would result in the widening and paving of the trail, the undertaking of spot improvements, and the possible selection of options for the creation of trail access spurs. All of these activities would result in limited and localized ground disturbing activities. In this instance avoidance, minimization, and mitigation within as yet unidentified archeological resources, would result in a determination of *no adverse effects*. Alternative 3 would increase negative cumulative impacts upon potential archeological resources within Rock Creek Park.

4.10.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Under this option, the existing social trail would be paved to an eight-foot width from south of Broad Branch Road to Peirce Mill. Peirce Mill has been registered with DC HPO as archeological site 51NW154. The Peirce Mill archeological site has not been evaluated for listing in the NRHP. Grading and vegetation removal to widen the social trail could impact archeological deposits associated with the Peirce Mill, if present. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to archeological resources associated with 51NW154 would be minor to moderate and generally involve the disturbance of near-surface deposits. Partial loss of archeological site deposits under these scenarios would be minor to moderate.

As 51NW154 has not been evaluated for listing in the NRHP, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail connector

construction, grading, and spot improvements. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Cumulative Impacts
Although past actions may have affected archeological resources, the present and reasonably foreseeable future actions presented in **Table 8** would have no impacts to archeological resources in the study area. The Peirce Mill Trail Spur Option B would involve paving within recorded archeological site 51NW154 that has the potential to impact archeological deposits. Therefore, the Peirce Mill Trail Spur Option B would increase negative cumulative impacts upon archeological resources within Rock Creek Park.

Conclusion
Peirce Mill Trail Spur Option B would result in the paving of an existing social trail within a known resource, 51NW154, which has not been evaluated for listing in the NRHP. All of these activities would result in limited and localized ground disturbing activities. In this instance avoidance, minimization, and mitigation within known resource 51NW154, as well as yet unidentified archeological resources, would result in a determination of *no adverse effects*. Peirce Mill Trail Spur Option B would increase negative cumulative impacts upon the known archeological resource, 51NW154, within Rock Creek Park.

4.10.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under this option the existing Rose Park trail would be resurfaced and widened to six feet, and a new connection to M Street along an existing social trail would be created. Fehr (1981) and Robinson & Associates (1993) characterize areas adjacent to Rock Creek as having a moderate to high potential for the presence of precontact Native American archeological sites. Background research indicates that the areas considered under this option have not been surveyed for the presence of archeological resources. Grading and vegetation removal to widen the existing trail and construct the proposed connections could impact potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to archeological resources would be minor to moderate and generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

As the presence of NRHP-eligible archeological sites is at present unknown, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail and connector construction and grading. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Cumulative Impacts
Although past actions may have affected archeological resources, the present and reasonably foreseeable future actions presented in **Table 8** would have no impacts to archeological resources in the study area. As this APE has not been surveyed for the presence of archeological resources, the Rose Park Trail Option B has the potential to impact potential archeological sites. Trail paving has the potential to impact as yet unidentified archeological sites. Therefore, the Rose Park Trail Option B would increase negative cumulative impacts upon archeological resources within Rock Creek Park.

Conclusion
Rose Park Trail Option B would result in the repaving and widening of an existing trail and the paving of connections in areas that have not been surveyed for the presence of archeological resources. All of these

activities would result in limited and localized ground disturbing activities. In this instance avoidance, minimization, and mitigation within as yet unidentified archeological resources would result in a determination of *no adverse effects*. Rose Park Trail Option B would increase negative cumulative impacts upon as yet unidentified archeological resources within Rock Creek Park.

4.10.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under this option the existing Rose Park trail would be resurfaced and widened to eight feet, and a new connection to M Street along an existing social trail would be created. Fehr (1981) and Robinson & Associates (1993) characterize areas adjacent to Rock Creek as having a moderate to high potential for the presence of precontact Native American archeological sites. Background research indicates that the areas considered under this option have not been surveyed for the presence of archeological resources. Grading and vegetation removal to widen the existing trail and construct the proposed connections could impact potential archeological resources. Under this scenario the restricted scale of anticipated ground disturbance suggests that impacts to archeological resources would be minor to moderate and generally involve the disturbance of near-surface deposits. Partial loss of archeological sites under these scenarios would be minor to moderate.

As the presence of NRHP-eligible archeological sites is at present unknown, and as final design plans are not available, only general strategies for the mitigation of adverse impacts can be outlined. It is the preferred mitigation strategy to avoid any disturbance to archeological sites by siting of the project component, including trail and connector construction and grading. The lead agencies would continue to coordinate with DC HPO on further archeological investigations or mitigation measures if necessary.

Cumulative Impacts
Although past actions may have affected archeological resources, the present and reasonably foreseeable future actions presented in **Table 8** would have no impacts to archeological resources in the study area. As this APE has not been surveyed for the presence of archeological resources, the Rose Park Trail Option C has the potential to impact potential archeological sites. Trail paving has the potential to impact as yet unidentified archeological sites. Therefore, the Rose Park Trail Option C would increase negative cumulative impacts upon archeological resources within Rock Creek Park.

Conclusion
Rose Park Trail Option C would result in the repaving and widening of an existing trail and the paving of connections in areas that have not been surveyed for the presence of archeological resources. All of these activities would result in limited and localized ground disturbing activities. In this instance avoidance, minimization, and mitigation within as yet unidentified archeological resources would result in a determination of *no adverse effects*. Rose Park Trail Option C would increase negative cumulative impacts upon as yet unidentified archeological resources within Rock Creek Park.

4.11. VISITOR USE AND EXPERIENCE

Methodology and Assumptions
The potential impacts on the visitor's ability to experience the full range of trail usage and adjoining park amenities were analyzed by first examining the overall purposes and objectives of Rock Creek Park as stated by NPS in various park plans and documents. Then the potential changes in visitor use and experience proposed by the alternatives were evaluated by identifying changes in user safety, aesthetics or visual quality,

ability to navigate and access the trail unimpeded, and whether or how these projected changes would affect the desired visitor experience, to what degree, and for how long.

Study Area
The study area for visitor use and experience is the trail and area immediately surrounding the trail. For cumulative impacts, the study area is Rock Creek Park.

Impact Thresholds
The thresholds of change for the intensity of impacts on visitor use and experience are defined as follows:

Negligible: Changes in visitor use and/or experience would be below or at the level of detection. The visitor would not likely be aware of the impacts associated with the alternative.

Minor: Changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the impacts associated with the alternative, but the effects would be slight.

Moderate: Changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the impacts associated with the alternative and would likely be able to express an opinion about the changes.

Major: Changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the impacts associated with the alternative and would likely express a strong opinion about the changes.

Duration: **Short-term –** occurs only during the treatment action; **Long-term –** occurs after the treatment action.

4.11.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.11.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of current trail conditions and management practices. No improvements aside from regular maintenance activities performed by NPS would occur. Trail users would continue to experience disadvantageous conditions including an uneven, cracked trail surface, poor drainage, and substandard sightlines and grade changes. The No Action Alternative has the potential to cause usage of the trail to decrease over time. Aesthetic issues such as cracked and heaving pavement, and soil erosion and water ponding would continue to occur.

Under the No Action Alternative, multiple types of users would continue to compete for space along the trail. Especially where the trail is constructed at substandard widths, overcrowding of the trail presents a difficulty for pedestrians, bicyclists, runners, and those enjoying nature to safely pass one another. Therefore, due to the potential for accidents along narrow and overcrowded sections of the trail, the No Action Alternative would have long-term moderate adverse impacts on visitor use and experience.

Cumulative Impacts
The Blagden Avenue Hiker/Biker trail (NPS 2008) and the Klingle Valley trail (DDOT 2010b) would both have beneficial impacts on visitor use and experience, by improving connectivity and access to the Rock Creek Park multi-use trail. The restoration of Peirce Mill (Friends of Peirce Mill 2008) would have a beneficial impact as this would provide Rock Creek Park visitors with educational and historical preservation opportunities. The Rock Creek Park GMP (NPS 2007) would also have a beneficial impact on visitor use and experience as the plan establishes long-term goals and outlines improvements to retain and improve the current

scope of visitor uses at the Park. Overall, long-term beneficial impacts would result from cumulative impacts projects on visitor use and experience. Although the No Action Alternative would contribute an adverse impact when combined with regional projects, there would still be long-term beneficial cumulative impacts to visitor use and experience based on these regional projects.

Conclusion
The No Action Alternative would result in long-term moderate adverse impacts on visitor use and experience, due to existing trail conditions and overcrowding of the trail, as well as aesthetic issues. Cumulative impacts under the No Action Alternative would be beneficial, based on the many cumulative impacts projects in Rock Creek Park with long-term benefits.

4.11.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Under Option A, the unpaved social trail from south of Broad Branch Road to Peirce Mill would remain unchanged. Currently, the Peirce Mill trail spur is an unmarked, unpaved pathway that is closer to Rock Creek than the Rock Creek Park multi-use trail. Leaving the spur unpaved would not have any noticeable beneficial or adverse impact on visitor use and experience, as trail users would not be prohibited from using the spur and would have the option to use the main stem of the Rock Creek Park multi-use trail.

Cumulative Impacts
Regional projects would have beneficial impacts to visitor use and experience, as described under Alternative 1. Because Peirce Mill Trail Spur Option A would not result in a beneficial or adverse impact, there would be no appreciable cumulative impact.

Conclusion
Peirce Mill Spur Option A would not have a noticeable impact on visitor use and experience as trail users would not be prohibited from using the unpaved spur and would have another trail option in the form of the main stem of Rock Creek Trail. Cumulative impacts would be beneficial based on the improvements provided by regional projects.

4.11.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Under Option A, no new construction would occur along the five-foot to six-foot wide section of the Rose Park trail between P Street, NW and M Street, NW. NPS would continue to maintain the trail in its existing state. The narrow trail width creates the potential for user conflict as it is hard to pass other users, especially those with strollers or bicyclists using trailers, while staying on the trail. Trail users on the main stem of Rock Creek Trail cannot safely access the Rose Park Trail as there is no existing direct connection. Unpaved trail spurs currently provide this connection but are disadvantageous as they meander through open spaces of Rose Park. Under Option A, the trail surface would remain cracked, narrow, and uneven. Rose Park Trail Option A would have a long-term minor adverse impact on visitor use and experience because of the cracked and uneven trail surface, and the narrow trail width.

Cumulative Impacts
Regional projects would have beneficial impacts to visitor use and experience, as described under Alternative 1. Although Rose Park Trail Option A would contribute a minor adverse impact, there would still be long-term beneficial cumulative impacts to visitor use and experience based on regional projects.

Conclusion
Rose Park Trail Option A would have a long-term minor adverse impact on visitor use and experience due to the cracked and uneven trail surface, and user conflicts resulting from the narrow trail width. Cumulative impacts would be beneficial based on the improvements provided by regional projects.

4.11.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.11.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Under Alternative 2, the overall trail condition would be improved. This alternative includes resurfacing the trail at its existing varying width. A new trail section would be added immediately south of the Broad Branch/Grove 2 parking area allowing trail users to continue on Rock Creek Park multi-use trail without the interference of vehicles pulling in and out of parking spaces. The trail would be widened through the Beach Drive tunnel and along the Beach Drive Bridge over Rock Creek. Trails users would be allowed to continue safely on the trail during times when the National Zoo gates were closed. Trail users would also gain a better sense of safety as the tunnel trail section would be widened and physically separated from vehicular traffic. Widening the trail over the Rock Creek Bridge would also create a better sense of safety as the trail width would increase from three feet to ***10*** feet at the bridge. Users would be able to pass one another more easily. Under Alternative 2, improved road crossings would occur at five heavily traveled roadways including Broad Branch Road, Jewett Street, the National Zoo entrance, Shoreham Drive and P Street, NW.

The construction of Alternative 2 would have a short-term moderate adverse impact on visitor use and experience. Construction equipment and noise would distract from the park aesthetics and natural soundscape. The Rock Creek Park multi-use trail is heavily traveled on a daily basis and construction work would temporarily impede use of the trail. Trail users and drivers would be notified in advance of any closures or detours. Potential mitigations would include electronic signage, postings to the Rock Creek Park and DDOT websites and social network pages, and email blasts to interested parties identified during the planning process. These impacts, while adverse, would be short term and only last for the duration of construction.

Resurfacing of the trail would correct the uneven and cracked pavement, creating a smoother riding surface for trail users as well as improve aesthetics. The potential for user conflict especially in areas of narrow width would continue to occur under Alternative 2. On these narrow areas, trail users would have to slow down or go off the trail to allow the parties to pass, which would result in ruts and compacted soils along the trail. Resurfacing and improvements under Alternative 2 would have long-term beneficial impacts on visitor use and experience because potential user conflicts would be mitigated and the trail would be more aesthetically pleasing.

Cumulative Impacts
Regional projects would have beneficial impacts to visitor use and experience, as described under Alternative 1. Resurfacing and improvements under Alternative 2 would result in long-term beneficial impacts because the physical and aesthetic condition of the Rock Creek Park multi-use trail would be improved. Therefore, Alternative 2 would contribute to beneficial cumulative impacts on visitor use and experience when coupled with these past, present, and reasonably foreseeable actions.

Conclusion
The construction of Alternative 2 would have a short-term moderate adverse impact on visitor use and experience because construction would temporarily impede use of the trail. Resurfacing and improvements

under Alternative 2 would have a long-term beneficial impact on visitor use and experience due to physical and aesthetic improvements; however, the trail would remain at its current width. Long-term beneficial cumulative impacts would result for Alternative 2 in combination with regional projects.

4.11.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Under Alternative 3, the trail would be resurfaced and widened to a minimum width of six feet and a maximum width of ***10*** feet. Widening the trail to a standard width would allow for multiple users, including those with bicycle trailers and strollers, to pass one another more easily on the trail. In addition, the overall trail condition would be improved. A new trail section would be added immediately south of the Broad Branch/Grove 2 parking area allowing trail users to continue on the Rock Creek Park multi-use trail without the interference of vehicles pulling in and out of parking spaces. The trail would be widened through the Beach Drive tunnel and along the Beach Drive Bridge over Rock Creek. Trails users would be allowed to continue safely on the trail during times when the National Zoo gates were closed. Trail users would also gain a better sense of safety as the tunnel trail section would be widened and physically separated from vehicular traffic. Widening the trail over the Rock Creek Bridge would also create a better sense of safety as the trail would increase from three feet to ***10*** feet. Under Alternative 3, improved road crossings would occur at five heavily traveled roadways including Broad Branch Road, Jewett Street, the National Zoo entrance, Shoreham Drive and P Street, NW.

The construction of Alternative 3 would have a short-term moderate adverse impact on visitor use and experience. Construction equipment and noise would distract from the park aesthetics and natural soundscape. The Rock Creek Park multi-use trail is heavily traveled on a daily basis and construction work would temporarily impede use of the trail. Trail users and drivers would be notified in advance of any closures or detours. Potential mitigations would include electronic signage, postings to the Rock Creek Park and DDOT websites and social network pages, and email blasts to interested parties identified during the planning process. Construction of Alternative 3 would take slightly longer than Alternative 2 since the trail would be widened. The construction impacts associated with Alternative 3, while adverse, would be short term and only last for the duration of construction.

Resurfacing of the trail would correct the uneven and cracked pavement, creating a smoother riding surface for trail users. Widening the trail would reduce the potential for user conflicts. Resurfacing and widening under Alternative 3 would have a long-term beneficial impact on visitor use and experience because potential user conflicts would be mitigated and the trail would be more aesthetically pleasing.

Cumulative Impacts

Regional projects would have beneficial impacts to visitor use and experience, as described under Alternative 1. Resurfacing and improvements under Alternative 3 would result in long-term beneficial impacts because the condition of the Rock Creek Park multi-use trail would be improved. Therefore, Alternative 3 would contribute to beneficial cumulative impacts on visitor use and experience when coupled with these past, present, and reasonably foreseeable actions.

Conclusion

The construction of Alternative 3 would have a short-term moderate adverse impact on visitor use and experience because construction would temporarily impede use of the trail. Resurfacing and improvements under Alternative 3 would have a long-term beneficial impact on visitor use and experience. Widening of the

trail would reduce the potential for user conflicts. Long-term beneficial cumulative impacts would result for Alternative 3 in combination with regional projects.

4.11.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Currently, trail users in this area have a choice to either stay on the main trail or use the unpaved footpath that runs alongside Rock Creek. The resurfacing and widening of the unpaved footpath under Option B would have a long-term beneficial impact on visitor use and experience as trail users of multiple types would be given another trail option to experience the park's resources.

Cumulative Impacts
As described under Alternative 1, long-term beneficial impacts to visitor use and experience would result from the Blagden Avenue Hiker/Biker trail, the Klingle Valley trail, the restoration of Peirce Mill, and the Rock Creek GMP. Option B would contribute a small beneficial increment when combined with these past, present, and reasonably foreseeable actions because this option would provide improved access within Rock Creek Park.

Conclusion
The resurfacing and widening of the unpaved footpath under Option B would have a long-term beneficial impact on visitor use and experience as trail users of multiple types would be given another trail option to experience the park's resources. Cumulative impacts under Peirce Mill Trail Spur Option B would be beneficial.

4.11.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Option B, the Rose Park trail would be resurfaced and widened to a uniform width of six feet. In addition, a direct connection to Rock Creek Trail and sidewalks on M Street and P Street would be constructed. With the new connection, the trail would no longer require usage of the P Street Ramp, a steep hillside with no sidewalk. While the trail would be widened to a consistent six-foot width, it would continue to present a challenge for multiple types of users to pass one another, especially those with strollers, bike trailers and wheelchairs. Option B would have a long-term beneficial impact on visitor use and experience, based on the trail resurfacing, widening, and access improvements.

Cumulative Impacts
As described under Alternative 1, long-term beneficial impacts to visitor use and experience would result from the Blagden Avenue Hiker/Biker trail, the Klingle Valley trail, the restoration of Peirce Mill, and the Rock Creek GMP. Rose Park Trail Option B would contribute a small beneficial increment when coupled with these past, present, and reasonably foreseeable actions. Cumulative impacts under Rose Park Trail Option B would be beneficial.

Conclusion
Option B would provide improved access from the Rock Creek Park multi-use trail to the Rose Park trail, and improvement of the trail condition. As a result, there would be long-term beneficial impacts to visitor use and experience. When combined with the beneficial impacts of regional projects, the cumulative impact of Option B on visitor use and experience would be beneficial.

4.11.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Option C, the trail would be resurfaced and widened to a uniform width of eight feet. In addition, a direct connection to Rock Creek Trail and sidewalks on M Street and P Street would be constructed. With the new connection, the trail would no longer require usage of the P Street Ramp, a steep hillside with no sidewalk. An eight-foot trail width would provide multiple trail users with space to pass one another on the trail, reducing the potential for user conflicts. Option C would have a long-term beneficial impact on visitor use and experience, based on the trail resurfacing, widening, and access improvements.

Cumulative Impacts
As described under Alternative 1, long-term beneficial impacts to visitor use and experience would result from the Blagden Avenue Hiker/Biker trail, the Klingle Valley trail, the restoration of Peirce Mill, and the Rock Creek GMP. Rose Park Trail Option B would contribute a small beneficial increment when coupled with these past, present, and reasonably foreseeable actions. Cumulative impacts under Rose Park Trail Option C would be beneficial.

Conclusion
Option C would provide improved access from the Rock Creek Park multi-use trail to the Rose Park trail, improvement of the trail condition, and a wider trail. As a result, there would be long-term beneficial impacts to visitor use and experience. When combined with the beneficial impacts of regional projects, the cumulative impact of Option C on visitor use and experience would be beneficial.

4.12. HUMAN HEALTH AND SAFETY

Methodology and Assumptions
The potential change in human health and safety proposed by the alternatives was evaluated by identifying changes in user safety including the user's ability to navigate and access the trail unimpeded.

Study Area
The study area for human health and safety is the Rock Creek Park multi-use trail within the project limits.

Impact Thresholds
The impact intensities for the assessment of impacts on health and safety follow. Where impacts on health and safety become moderate, it is assumed that current visitor satisfaction and safety levels would begin to decline, and some of the Park's long-term visitor goals would not be achieved.

Negligible: The effects would be at the lowest levels of detection and would not have an appreciable effect on the human health or safety.

Minor: The effect would be detectable but would not have an appreciable effect on human health and safety. If mitigation were needed, it would be relatively simple and would likely be successful.

Moderate: The effects would be readily apparent and result in noticeable effects to human health and safety on a local scale. If mitigation were needed, measures would likely be successful.

Major: The effects would be readily apparent and result in substantial, noticeable effects to human health and safety on a regional scale. If required, mitigation measures would be extensive, and success would not be guaranteed.

Duration: **Short-term –** Effects last one year or less; **Long-term –** Effects last longer than one year.

4.12.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.12.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the Rock Creek Park multi-use trail would generally remain in its current condition, and normal maintenance activities performed by the NPS would continue. Existing conditions include uneven and cracked trail surfaces, poor grade changes and poor drainage. Also, trail users compete for space along the trail due to substandard trail widths. In general, the existing conditions represent minor slip, trip and fall hazards.

With no construction of the proposed trail rehabilitation, the existing trail conditions would continue to pose a minor slip, trip and fall hazard to trail users. However, these hazards are common and would not have an appreciable effect on human health and safety. Bicyclists and pedestrians experience a similar slip, trip and fall hazard in the urban environments surrounding Rock Creek Park. NPS maintenance of the trail would continue in a manner that would promote safety to the extent possible. As a result, the No Action Alternative would have negligible adverse impacts on human health and safety.

Cumulative Impacts

The Rock Creek Park GMP would have a beneficial impact on human health and safety as the plan calls for rehabilitating deteriorated trail sections. Specifically, the GMP calls for rehabilitation of the Rock Creek Park multi-use trail in selected areas, and construction of a paved Piney Branch Parkway trail (NPS 2007). Rehabilitation is also proposed for Rock Creek Park trail sections located along Oregon Avenue (DDOT 2011), Beach Drive and the Rock Creek and Potomac Parkway (NPS 2006b). The Rock Creek Watershed Implementation Plan would also have a beneficial impact, as the plan involves improvements that address the pollutant problem in the watershed (DDOE 2010). In addition to these projects, the NPS would continue to provide an environment at Rock Creek Park that is conducive to human health and safety to the extent possible.

Overall, the negligible adverse impact of the No Action Alternative would not result in an adverse incremental effect on human health and safety in the region. Based on the ongoing and proposed safety provisions within Rock Creek Park, cumulative impacts on human health and safety in the park would be beneficial.

Conclusion

Leaving the trail in its existing condition would have long-term, negligible adverse impacts on human health and safety. Trail users would continue experience a minor slip, trip and fall hazard due to depreciating conditions of the trail. However, the NPS would continue its normal maintenance activities in order to sustain safe trail usage to the extent possible. There would be a beneficial cumulative impact associated with ongoing and proposed safety provisions in Rock Creek Park.

4.12.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Under Option A, the existing social trail would remain unchanged. Users would continue to use the trail as an alternative route between Broad Branch Road and Peirce Mill. There would be no impacts to human health and safety.

Cumulative Impacts
Cumulative impacts projects are described under the Alternative 1: the No Action Alternative. Peirce Mill Trail Spur Option A would have no impacts to human health and safety. Based on the ongoing and proposed safety provisions of Rock Creek Park, cumulative impacts to human health and safety under Option A would be beneficial.

Conclusion
Peirce Mill Trail Spur Option A would have no impacts to human health and safety. Current conditions are not unsafe. Cumulative impacts to human health and safety under Option A would be beneficial, due to ongoing and proposed safety provisions of Rock Creek Park.

4.12.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Under Rose Park Trail Option A, there would be no new construction or rehabilitation of the Rose Park trail. Existing trail conditions include a minor slip, trip and fall hazard due to cracked pavement and substandard trail width. The hazard is comparable to the same slip, trip and fall hazard that pedestrians and bicyclists experience in the urban environments surrounding Rose Park. ***Trail width would continue to be substandard causing potential conflicts among some users and causing users to leave the trail surface to pass.*** NPS maintenance of the Rose Park trail would continue in a manner that would promote safety to the extent possible. As a result, the No Action Alternative would have negligible adverse impacts on human health and safety.

Cumulative Impacts
Cumulative impacts projects are described under the Alternative 1: the No Action Alternative. Rose Park Trail Option A would have no impacts to human health and safety. Based on the ongoing and proposed safety provisions of Rock Creek Park, cumulative impacts to human health and safety under Option A would be beneficial.

Conclusion
Rose Park Trail Option A would have a long-term negligible adverse impact on human health and safety. Trail users would continue experience a minor slip, trip and fall hazard due to depreciating conditions of the trail. However, the NPS would continue its normal maintenance activities in order to sustain safe trail usage to the extent possible. Cumulative impacts to human health and safety under Option A would be beneficial, due to ongoing and proposed safety provisions of Rose Park.

4.12.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.12.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes to rehabilitate the Rock Creek Park multi-use trail through upgrades which include resurfacing. Impacts on human health and safety were determined by analyzing impacts associated with additional proposed upgrades such as separation of traffic and trail users, safety improvements at roadway crossings, minor trail realignments, minor trail grading, and drainage and soil erosion improvements.

Under Alternative 2, short-term safety measures would be implemented in proposed construction areas throughout the Rock Creek Park multi-use trail. Signage would be utilized in order to warn pedestrians and bicyclists in zones that are under construction. Staging areas that house equipment and materials would be fenced off from the public. At road crossings, maintenance of traffic (MOT) during construction stages would

be conducted to provide safe conditions for trail users, drivers and workers. As a result of safety mitigation measures, construction of Alternative 2 would have short-term negligible adverse impacts.

The proposed improvements under Alternative 2 include resurfacing the trail at its current widths. Resurfacing of the trail would result in increased safety through the correction of uneven and cracked pavement. A smoother surface would help to minimize slip, trip and fall hazards along the trail.

Alternative 2 also proposes to improve the existing design of the multi-use trail, in order to increase safety for pedestrians and bicyclists. Vehicle separation improvements at the Broad Branch/Grove 2 North parking area, the Beach Drive tunnel, and the Beach Drive Bridge over Rock Creek would increase safety by distancing trail users from vehicle traffic. Improved road crossings would occur at five heavily traveled roadways including Broad Branch Road, Jewett Street, the National Zoo entrance, Shoreham Drive and P Street, NW. These crossing improvements would be designed to increase driver awareness of trail users, thereby reducing the potential for trail user and motorist conflicts. Improvements that would minimize the existing potential for user conflict on the trail include the new bicycle and pedestrian bridge at Beach Drive over Rock Creek, Beach Drive tunnel sidewalk widening, and minor realignments at curves and approaches for turning and sight-distance improvements.

Overall, the proposed actions would enhance safety throughout the multi-use trail. Based on the resurfacing, vehicle separations, and improved road crossings, Alternative 2 would result in long-term beneficial impacts to human health and safety.

Cumulative Impacts
Impacts to human health and safety as a result of cumulative impacts projects are described under the No Action Alternative. Based on the ongoing and proposed safety provisions within Rock Creek Park, cumulative impacts on human health and safety in the park would be beneficial. When combined with the long-term beneficial impacts of Alternative 2, long-term beneficial cumulative impacts would occur.

Conclusion
Construction associated with Alternative 2 would have short-term negligible adverse impacts, based on the implementation of safety mitigation measures. Rehabilitation of the trail to include vehicle separation, road crossing improvements, trail resurfacing, and minor realignments would result in enhanced safety for trail users. Therefore, Alternative 2 would have long-term beneficial impacts to human health and safety. Alternative 2 would contribute a beneficial cumulative impact to human health and safety on the Rock Creek Park multi-use trail.

4.12.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes to rehabilitate the Rock Creek Park multi-use trail through upgrades which include resurfacing and widening. Impacts on human health and safety were determined by analyzing impacts associated with additional proposed upgrades such as separation of traffic and trail users, safety improvements at roadway crossings, minor trail realignments, minor trail grading, and drainage and soil erosion improvements.

Under Alternative 3, short-term safety measures would be implemented in proposed construction areas throughout the Rock Creek Park multi-use trail. Signage would be utilized in order to warn pedestrians and bicyclists in zones that are under construction. Staging areas that house equipment and materials would be

fenced off from the public. At road crossings, maintenance of traffic (MOT) during construction stages would be conducted to provide safe conditions for trail users, drivers and workers. As a result of safety mitigation measures, construction of Alternative 3 would have short-term negligible adverse impacts.

The proposed improvements under Alternative 3 include resurfacing and widening of the trail to a maximum 10 foot width. Resurfacing of the trail would result in increased safety through the correction of uneven and cracked pavement. A smoother surface would help to minimize slip, trip and fall hazards along the trail. In addition, widening of the trail would reduce the potential for conflicts between trail users. The increase in trail width would allow for multiple types of users to pass one another without having to leave the paved alignment.

Alternative 3 also proposes to improve the existing design of the multi-use trail, in order to increase safety for pedestrians and bicyclists. Vehicle separation improvements at the Broad Branch/Grove 2 North parking area, the Beach Drive tunnel, and the Beach Drive Bridge over Rock Creek would increase safety by distancing trail users from vehicle traffic. Improved road crossings would occur at five heavily traveled roadways including Broad Branch Road, Jewett Street, the National Zoo entrance, Shoreham Drive and P Street, NW. These crossing improvements would be designed to increase driver awareness of trail crossings, and further reduce the potential for trail user and motorized vehicle conflicts. Improvements that would minimize the existing potential for user conflict on the trail include the new bicycle and pedestrian bridge at Beach Drive over Rock Creek, Beach Drive tunnel sidewalk widening, and minor realignments at curves and approaches for turning and sight-distance improvements.

Trail improvements under Alternative 3 including resurfacing, widening, vehicle separation, and improved road crossings would enhance safety throughout the multi-use trail. Therefore, Alternative 3 would result in long-term beneficial impacts to human health and safety.

Cumulative Impacts
Impacts to human health and safety as a result of cumulative impacts projects are described under the No Action Alternative. Based on the ongoing and proposed safety provisions within Rock Creek Park, cumulative impacts on human health and safety in the park would be beneficial. When combined with the long-term beneficial impacts of Alternative 3, long-term beneficial cumulative impacts would occur.

Conclusion
Construction associated with Alternative 3 would have short-term negligible adverse impacts, based on the implementation of safety mitigation measures. Rehabilitation of the trail to include vehicle separation, road crossing improvements, trail resurfacing, and minor realignments would result in enhanced safety for trail users. In addition, trail users would benefit from widening of the trail, which would reduce the potential for conflicts between trail users. As a result, Alternative 3 would have long-term beneficial impacts to human health and safety. Alternative 3 would contribute a beneficial cumulative impact to human health and safety on the Rock Creek Park multi-use trail.

4.12.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Peirce Mill Spur Option B involves paving the existing social trail between Broad Branch Road and Peirce Mill. During construction, short-term safety measures would be implemented in the proposed construction area. Safety signage would be posted to warn trail users of the construction, and fencing would be placed to keep the public from construction staging areas. As a result of safety mitigation measures, construction of Peirce Mill Trail Spur Option B would have short-term negligible adverse impacts.

The existing social trail is well-defined and can be navigated easily by a pedestrian or a bicyclist. However, the construction of a smooth paved surface would slightly improve safety conditions for certain trail users such as in-line skaters and wheelchair users. Because resurfacing the social trail would provide safety benefits to these users, Peirce Mill Trail Spur Option B would have long-term beneficial impacts to human health and safety.

Cumulative Impacts
Cumulative impacts projects are described under the Alternative 1: the No Action Alternative. When combined with other past, present, and future actions within Rock Creek Park, Peirce Mill Spur Option B would contribute a small benefit to human health and safety. The overall cumulative impact of Option B combined with cumulative impact projects would be beneficial.

Conclusion
Peirce Mill Trail Spur Option B would provide a long-term beneficial impact to human health and safety, because the trail would become safely accessible to trail users such as in-line skaters and wheelchair users. Cumulative impacts of Option B would be beneficial based on the ongoing and proposed safety provisions in Rock Creek Park.

4.12.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Rose Park Trail Option B consists of resurfacing of the existing Rose Park trail to a width of six feet. During construction, the Rose Park trail would be closed. Safety measures would be employed during the construction period, including signage to warn trail users of the construction, and fencing to keep the public from construction staging areas. As a result, there would be short-term negligible adverse impacts to human health and safety.

Under Rose Park Trail Option B, resurfacing the trail would create a smoother trail surface. Rehabilitation of the trail to cover cracked and uneven pavement would result in increased safety, by minimizing slip, trip and fall hazards. Providing a continuous trail with end points and connections to M Street and P Street as proposed under Rose Park Trail Option B would also improve safety for trail users. Although the existing social trails in these areas are easily navigated by pedestrians and bicyclists, a paved connection would improve safety conditions for certain users such as in-line skaters and wheelchair users. ***Better trail connections, a smoother surface and trail widening could further promote the safe use of the trail through Rose Park. Increased trail use and pedestrian/bicyclist conflicts resulting from the proposed trail width increase of zero to two-feet are not expected to be noticeable. Any additional trail usage would not cause a noticeable increase in the risk of unsafe conflicts for trail users, and any added risk would be offset by the improved trail conditions.***

According to Conflicts on Multiple-Use Trails: Synthesis of the Literature and State of the Practice (FHWA and the National Recreational Trails Advisory Committee), trail-user conflicts on multiple-use trails is recognized as a common concern. High speed differentials between users, inadequate sight distances, inadequate trail width, poor trail surfaces, and congestion are reported factors influencing user safety. This research does not list any information on trail safety for conflicts with other nearby recreational uses such as use of ball fields, picnicking in campground or children playing on playgrounds, but it is assumed these activities would add to the trail congestion. A general trail user response to congestion is to slow down and take precaution. In addition, research shows that user information and education can have a measureable effect on reducing user conflict and increasing safety. Brochures at trailheads and signage along the trail to promote sharing and to identify safety issues such as trail congestion are effective measures to reduce

user conflicts. These, and other measures, will be considered during advanced trail design to reduce user conflicts and enhance user safety.

Because resurfacing of the Rose Park trail and connections to M Street and P Street would provide safety benefits, Option B would have long-term beneficial impacts to human health and safety.

Cumulative Impacts
Cumulative impacts projects are described under the Alternative 1: the No Action Alternative. When combined with other past, present, and future actions within Rock Creek Park, Rose Park Trail Option B would contribute a small benefit to human health and safety. The overall cumulative impact of Option B combined with cumulative impact projects would be beneficial.

Conclusion
Rose Park Trail Option B would have a long-term beneficial impact to human health and safety, through resurfacing of the existing trail. Option B would also result in beneficial cumulative impacts based on the ongoing and proposed safety provisions of Rose Park.

4.12.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Rose Park Trail Option C consists of resurfacing of the existing Rose Park trail to a width of eight feet. During construction, the Rose Park trail would be closed. Safety measures would be employed during the construction period, including signage to warn trail users of the construction, and fencing to keep the public from construction staging areas. As a result, there would be short-term negligible adverse impacts to human health and safety.

Under Rose Park Trail Option C, resurfacing the trail would create a smoother trail surface. Rehabilitation of the trail to cover cracked and uneven pavement would result in increased safety, by minimizing slip, trip and fall hazards. Widening of the trail to an eight-foot width (***the minimum multi-use trail width recommended by AASHTO for short distances under physical constraints***) would provide sufficient space for multiple trail users. Providing a continuous trail with end points and connections to M Street and P Street as proposed under Rose Park Trail Option B would also improve safety for trail users. Although the existing social trails in these areas are easily navigated by pedestrians and bicyclists, a paved connection would improve safety conditions for certain users such as in-line skaters and wheelchair users. ***Better trail connections, a smoother surface and trail widening could further promote the use of the trail through Rose Park. Increased trail use and pedestrian/bicyclist conflicts resulting from the proposed increase in trail width of two to four feet are not expected to be noticeable. Any additional trail usage would not cause a noticeable increase in the risk of unsafe conflicts for trail users, and any added risk would be offset by the improved trail conditions.***

According to Conflicts on Multiple-Use Trails: Synthesis of the Literature and State of the Practice (FHWA and the National Recreational Trails Advisory Committee), trail-user conflicts on multiple-use trails is recognized as a common concern. High speed differentials between users, inadequate sight distances, inadequate trail width, poor trail surfaces, and congestion are reported factors influencing user safety. This research does not list any information on trail safety for conflicts with other nearby recreational uses such as use of ball fields, picnicking in campground adjacent to trails or children playing on playgrounds, but it is assumed these activities would add to the trail congestion. A general trail user response to congestion is to slow down and take precaution. In addition, research shows that user information and education can have a significant effect on reducing user conflict and increasing safety. Brochures at trailheads and signage along the trail to promote sharing and to identify safety issues such as trail congestion are effective

measures to reduce user conflicts. These, and other measures, will be considered during advanced trail design to reduce user conflicts and enhance user safety.

Because resurfacing of the Rose Park trail and connections to M Street and P Street would provide safety benefits, Option C would have long-term beneficial impacts to human health and safety.

Cumulative Impacts

Cumulative impacts projects are described under the Alternative 1: the No Action Alternative. When combined with other past, present, and future actions within Rock Creek Park, Rose Park Trail Option C would contribute a small benefit to human health and safety. The overall cumulative impact of Option C combined with cumulative impact projects would be beneficial.

Conclusion

Long-term beneficial impacts to human health and safety would result from Option C, through resurfacing of the trail and widening the trail to a width of eight feet. Option C would also result in beneficial cumulative impacts based on the ongoing and proposed safety provisions of Rose Park.

4.13. PARK OPERATIONS AND MANAGEMENT

Methodology and Assumptions

The NPS staff's knowledge regarding operational efficiency, protection, and preservation of important resources, and providing an effective visitor experience was used to determine intensity levels of potential impacts on park operations and management.

Study Area

The study area for park operations and management is Rock Creek Park multi-use trail and the area immediately bordering the trail.

Impact Thresholds

Negligible: The impacts would be at low levels of detection and would not have an appreciable impact on park operations.

Minor: The impact would be detectable and would be of a magnitude that would not have an appreciable impact on park operations. If mitigation was needed to offset adverse impacts, it would be simple and likely successful.

Moderate: The impacts would be readily apparent and result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation measures would be necessary to offset adverse impacts and would likely be successful.

Major: The impacts would be readily apparent, result in a substantial change in park operation in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse impacts would be needed, extensive, and success could not be guaranteed.

Duration: **Short-term -** Impacts lasting for the duration of the treatment action; **Long-term -** Impacts lasting longer than the duration of the treatment action.

4.13.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.13.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the Rock Creek Park multi-use trail would generally remain in its current condition, and normal maintenance activities performed by the NPS would continue. Normal maintenance activities include asphalt patching, weed control, tree trimming, and removal of sediment and debris from the trail. The NPS monitors the trail and performs maintenance as needed, to ensure that the trail remains open. Because the current maintenance needs of the trail corridor are noticeable and require attention, the No Action Alternative would result in long-term minor adverse impacts to park operations and management.

Cumulative Impacts
The Rock Creek Park GMP would provide benefits to park operations and maintenance as the plan calls for rehabilitation of deteriorated trail sections. The plan also involves upgrades to facilities which would provide improved working conditions for park administrative staff and Park Police (NPS 2007). Park operations would be disrupted during construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. The No Action Alternative would contribute a minor adverse impact to park operations and management, by way of the increasing maintenance needs of the trail. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect of the No Action Alternative would be a long-term negligible adverse impact.

Conclusion
Under the No Action Alternative, current maintenance of the Rock Creek Park multi-use trail would continue. Based on the amount of maintenance required by the trail condition, long-term minor adverse impacts to park operations and management would occur. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect would be a long-term negligible adverse impact.

4.13.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Peirce Mill Spur Option A proposes no changes to the existing social trail between Broad Branch Road and Peirce Mill. Currently, the NPS does not maintain the trail. No maintenance would be anticipated under the No Action Alternative. As a result, there would be no impacts to park operation and maintenance under Option A.

Cumulative Impacts
The Rock Creek Park GMP would provide benefits to park operations and maintenance as the plan calls for rehabilitation of deteriorated trail sections. The plan also involves upgrades to facilities which would provide improved working conditions for park administrative staff and Park Police. Park operations would be disrupted during construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. When combined with cumulative impact projects, Peirce Mill Spur Option A would have no incremental effect on park operations and management therefore there would be no cumulative impact.

Conclusion
Peirce Mill Trail Spur Option A would have no impact on park operations and management. There would be no cumulative impact when combined with the effects of regional projects.

4.13.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Under the Option A, the current maintenance of the Rose Park trail would continue. Maintenance activities include asphalt patching, weed control, tree trimming, and removal of sediment and debris from the trail. The

NPS monitors the trail and performs maintenance as needed, to ensure that the trail remains open. Because the current maintenance needs of the trail corridor are noticeable and require attention, Option A would result in long-term minor adverse impacts to park operations and management.

Cumulative Impacts
The Rock Creek Park GMP would provide benefits to park operations and maintenance as the plan calls for rehabilitation of deteriorated trail sections. The plan also involves upgrades to facilities which would provide improved working conditions for park administrative staff and Park Police. Park operations would be disrupted during construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. Option A would contribute a minor adverse impact to park operations and management, by way of the increasing maintenance needs of the trail. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect of the No Action Alternative would be a long-term negligible adverse impact.

Conclusion
Under the Rose Park Trail Option A, current maintenance of the Rose Park trail would continue. Based on the amount of maintenance required by the trail condition, long-term minor adverse impacts to park operations and management would occur. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect would be a long-term negligible adverse impact.

4.13.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.13.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. This alternative would resurface the Rock Creek Park multi-use trail and the Piney Branch Parkway trail.

Construction throughout the Rock Creek Park multi-use trail would be conducted by DDOT. In order to construct trail improvements, detours and closings of the trail would be required. During the construction of road crossing improvements, maintenance of traffic would be required. DDOT would implement temporary traffic controls along the trail and at road crossings as needed. Overall, the construction to be done would be relatively simple, would be completed by small groups of workers, and would require relatively small equipment and machinery. No short-term impacts to park operations and management would occur, because DDOT would perform all of the temporary trail closings, maintenance of traffic, and rehabilitation of the trail..

Long-term maintenance of the trail would be conducted by the NPS. As a result of Alternative 2, some of the trail maintenance required of park service staff would be reduced. Currently, NPS maintenance activities include patching of the trail, and removal of sediment and debris. Resurfacing of the trail would address patching needs for the foreseeable future. Sediment and debris would be kept from the trail surface through the proposed grading, stabilization, and BMP installation throughout the trail. Overall, Alternative 2 would prevent many of the maintenance jobs required by the existing trail.

Although there would be some reductions in trail maintenance, other aspects of Alternative 2 would result in some small additional maintenance needs. New connections and sections would increase the overall amount of trail to be maintained. Additional lengths of trail would require snow removal during winter weather events. Under Alternative 2, stormwater management (bioretention facilities and/or bioswales) would be constructed.

Maintenance of the new facilities would be necessary and would be conducted by NPS. The overall effect of these additional maintenance needs would not have an appreciable impact on park operations.

Also, trail improvement under Alternative 2 would result in small, site specific trail maintenance needs. For instance, the two-foot vegetated buffer proposed between the Broad Branch/Grove 2 North parking area and trail would need to be trimmed separately from the larger grassed area that is mowed by a large tractor. Maintenance of the bridge over Rock Creek would occur in the form of spot improvements and snow removal, as needed. Striping at the Porter Street underpass would need to be replaced periodically, when worn down. Where raised pavement is installed to calm motorized traffic at trail crossings, the raised pavement would eventually wear down from usage and snow removal and would have to be replaced by NPS staff. Once incorporated into routine maintenance activities, these site specific needs would be addressed without an appreciable effect on park operations.

In sum, Alternative 2 would help to reduce some of the current maintenance needs of the Rock Creek Park multi-use trail. Other aspects of the trail improvement would add new maintenance needs including some site specific tasks. Overall, resurfacing of the trail would result in a long-term beneficial impact, because the effect of the new maintenance needs would not have a noticeable adverse impact on park operations.

Cumulative Impacts

The Rock Creek Park GMP would have a beneficial impact on park operations and maintenance as the plan calls for rehabilitating deteriorated trail sections. In addition, the plan involves upgrades to facilities which would provide improved working conditions for park administrative staff and Park Police. Park operations would be disrupted during construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. The beneficial impact of Alternative 2 on park operations and maintenance would contribute to overall beneficial cumulative impacts in Rock Creek Park.

Conclusion

Once constructed, there would be a reduction in the maintenance needed throughout the trail, resulting in a long-term beneficial impact on park operations and management. The cumulative impact of Alternative 2 combined with the impacts of regional projects would result in a long-term beneficial impact.

4.13.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes multiple improvements to rehabilitate and enhance the existing Rock Creek Park multi-use trail, including new connections to neighboring trails, drainage and erosion controls, improved bridge crossings and safety improvements. In addition to these improvements, Alternative 3 includes widening of the Rock Creek Park multi-use trail and the Piney Branch Parkway trail.

Construction throughout the Rock Creek Park multi-use trail would be conducted by DDOT. In order to construct trail improvements, detours and closings of the trail would be required. During the construction of road crossing improvements, maintenance of traffic would be required. DDOT would implement temporary traffic controls along the trail and at road crossings as needed. Overall, the construction ***of the trail will*** be relatively simple, will be completed by small groups of workers, and would require relatively small equipment and machinery***. Construction of the bridge will have short-term, minor adverse impacts.*** DDOT will perform all of the temporary trail closings, maintenance of traffic, and rehabilitation of the trail. ***During construction, short-term, minor adverse impacts to park operations and management will occur to NPS staff resources***

under the selected alternative and options because of their participation in the planning and coordination efforts.

Long-term maintenance of the trail would be conducted by the NPS. As a result of Alternative 3, some of the trail maintenance required of park service staff would be reduced. Currently, NPS maintenance activities include patching of the trail, and removal of sediment and debris. Resurfacing of the trail would address patching needs for the foreseeable future. Sediment and debris would be kept from the trail surface through the proposed grading, stabilization, and BMP installation throughout the trail. Overall, Alternative 3 would prevent many of the maintenance jobs required by the existing trail.

Although there would be some reductions in trail maintenance, other aspects of Alternative 3 would result in some small additional maintenance needs. Widening, new connections and sections would increase the overall amount of trail to be maintained. Additional lengths of trail would require snow removal during winter weather events. Under Alternative 3, stormwater management (bioretention facilities and/or bioswales) would be constructed. Maintenance of the new facilities would be necessary and would be conducted by NPS. The overall effect of these additional maintenance needs would not have an appreciable impact on park operations.

Also, trail improvement under Alternative 3 would result in small, site specific trail maintenance needs. For instance, the two-foot vegetated buffer proposed between the Broad Branch/Grove 2 North parking area and trail would need to be trimmed separately from the larger grassed area that is mowed by a large tractor. Maintenance of the bridge over Rock Creek would occur in the form of spot improvements and snow removal, as needed. Striping at the Porter Street underpass would need to be replaced periodically, when worn down. Where raised pavement is installed to calm motorized traffic at trail crossings, the raised pavement would eventually wear down from usage and snow removal and would have to be replaced by NPS staff. Once incorporated into routine maintenance activities, these site specific needs would be addressed without an appreciable effect on park operations.

In sum, Alternative 3 would help to reduce some of the current maintenance needs of the Rock Creek Park multi-use trail. Other aspects of the trail improvement would add new maintenance needs including some site specific tasks. Overall, resurfacing and widening of the trail would result in a long-term beneficial impact, because the effect of the new maintenance needs would not have a noticeable adverse impact on park operations.

Cumulative Impacts

The Rock Creek Park GMP would have a beneficial impact on park operations and maintenance as the plan calls for rehabilitating deteriorated trail sections. In addition, the plan involves upgrades to facilities which would provide improved working conditions for park administrative staff and Park Police. Park operations would be disrupted during construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. The beneficial impact of Alternative 3 on park operations and maintenance would contribute to overall beneficial cumulative impacts in Rock Creek Park.

Conclusion

Once constructed, there would be a reduction in the maintenance needed throughout the trail, resulting in a long-term beneficial impact on park operations and management. The cumulative impact of Alternative 3 combined with the impacts of regional projects would result in a long-term beneficial impact.

4.13.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B proposes to pave the Peirce Mill trail spur. DDOT would construct the new trail, and maintain safe conditions for the duration of construction. Overall, the work to be done would be relatively simple, would be completed by small groups of workers, and would require relatively small equipment and machinery. Based on these factors, Option B would have no short-term impact on park operations and management.

Paving the trail would add a maintenance responsibility that currently does not exist as the unpaved social trail is not under NPS maintenance. Snow removal, spot improvements, and debris removal would be required for the new paved surface. Further, grass mowing using large tractors between the new trail spur and Rock Creek would no longer be possible, making grass and vegetation trimming slightly more time consuming for maintenance staff. Option B would have a long-term minor adverse impact on park operations and maintenance.

Cumulative Impacts
The Rock Creek Park GMP proposes to restore trails and facilities, providing an overall benefit to park operations and maintenance. Disruptions would occur during the construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. Peirce Mill Trail Spur Option B would contribute a minor adverse impact, by way of the increasing maintenance needs of the trail. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect of the No Action Alternative would be a long-term negligible adverse impact.

Conclusion
Peirce Mill Trail Spur Option B would have long-term minor adverse impacts based on the increase in maintenance required by the new trail. Cumulative impacts of Option B and regional projects would be long-term negligible adverse impacts.

4.13.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Under Rose Park Trail Option B, the existing trail would be resurfaced to a standard width of six feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. DDOT would construct the new trail and conduct temporary trail closing and maintenance of traffic as needed. Because the trail rehabilitation would be conducted by DDOT, there would be no short-term impacts to park operations and management.

Resurfacing of the Rose Park trail would reduce the need for patching of the trail, and removal of sediment and debris. Also, the paving of new trail connections would add maintenance responsibilities that currently do not exist. Snow removal, spot improvement, and debris removal would be required for the new paved surfaces. Overall, the new maintenance needs would not have an appreciable effect on maintenance activities. Resurfacing of the trail would provide a long-term beneficial impact on park operations and maintenance.

Cumulative Impacts
The Rock Creek Park GMP proposes to restore trails and facilities, providing an overall benefit to park operations and maintenance. Disruptions would occur during the construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. Rose Park Trail Option B would contribute a beneficial impact, by way of the reducing maintenance needs of the trail. When combined with the

beneficial impacts of cumulative impact projects, the cumulative effect of the No Action Alternative would be a long-term beneficial impact.

Conclusion
Rose Park Trail Option B would result in short-term moderate adverse impacts, based on construction periods. Long-term beneficial impacts would result from a resurfaced trail, which would reduce current maintenance needs. Cumulative impacts of Option B and regional projects would be long-term beneficial impacts.

4.13.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Under Rose Park Trail Option C, the existing trail would be resurfaced to a standard width of eight feet, trail connections would be improved to P Street and M Street, and the social trail would be paved. DDOT would construct the new trail and conduct temporary trail closing and maintenance of traffic as needed. Because the trail rehabilitation would be conducted by DDOT, there would be no short-term impacts to park operations and management.

Widening and resurfacing of the Rose Park trail would reduce the need for patching of the trail, and removal of sediment and debris. Also, the paving of new trail connections would add maintenance responsibilities that currently do not exist. Snow removal, spot improvement, and debris removal would be required for the new paved surfaces. Overall, the new maintenance needs would not have an appreciable effect on maintenance activities. Widening and resurfacing of the trail would provide a long-term beneficial impact on park operations and maintenance.

Cumulative Impacts
The Rock Creek Park GMP proposes to restore trails and facilities, providing an overall benefit to park operations and maintenance. Disruptions would occur during the construction of upgrades, but in the long-term park maintenance and operations would largely benefit from the upgrades. Rose Park Trail Option B would contribute a beneficial impact, by way of the reducing maintenance needs of the trail. When combined with the beneficial impacts of cumulative impact projects, the cumulative effect of the No Action Alternative would be a long-term beneficial impact.

Conclusion
Rose Park Trail Option C would result in short-term moderate adverse impacts, based on construction periods. Long-term beneficial impacts would result from a widened and resurfaced trail, which would reduce current maintenance needs. Cumulative impacts of Option B and regional projects would be long-term beneficial impacts.

4.14. TRAFFIC AND TRANSPORTATION

Methodology and Assumptions
For traffic and transportation impacts, sources of information include analysis of current Rock Creek Park access conditions and traffic in the study area and a comparison of current trail use and traffic patterns to proposed post construction conditions. This section includes analysis of the proposed improvements to the Rock Creek Park multi-use trail and its impacts on trail use and connectivity, and the park roadway network and motorized traffic.

Study Area
The project area includes a 3.7-mile section of the Rock Creek Park multi-use trail from Broad Branch Road to P Street, NW; a 4,300-foot (0.8 mile) section of the Piney Branch Parkway trail from Beach Drive to Arkansas Avenue, NW; ***a 1,929-foot (0.4 mile) section of the Rose Park trail from P Street, NW to M Street, NW; and a 363-foot ramp connecting the Rose Park trail to P Street, NW.*** The study area for traffic and transportation impacts includes the larger area of the Rock Creek Park. Traffic and Transportation encompasses vehicular traffic and trail use.

Impact Thresholds
The following thresholds were used to determine the magnitude of impacts on transportation.

Negligible: Any change to travel time, convenience, or benefit would not be perceptible or would be barely perceptible by trail and roadway users.

Minor: The change to travel time, convenience, or benefit would be noticeable to a small number of trail and roadway users; however, the effect would be slight.

Moderate: The resulting change in travel time, convenience, or benefit would be noticeable for a large number of trail and roadway users.

Major: There would be a substantial and highly noticeable change in travel time, convenience, or benefit for a large number of trail and roadway users.

Duration: **Short-term** – would be immediate during implementation of the alternative; **Long-term** –would persist, following implementation of the alternative.

4.14.1. IMPACTS OF THE NO ACTION ALTERNATIVE AND OPTIONS

4.14.1.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 1: NO ACTION

The No Action Alternative represents a continuation of the current Rock Creek Park multi-use trail system. The system would continue to be maintained by the NPS, and would continue to be used by bicyclists, pedestrians and other park visitors. Under the No Action Alternative, several limiting aspects of the current system would remain.

The system would remain limited where high volumes of vehicle traffic are in proximity to the trail. These areas include the Broad Branch/Grove 2 North parking area, the Beach Drive tunnel, and the Beach Drive Bridge over Rock Creek. The existing Rock Creek Park multi-use trail system also includes multiple intersections between the trail and roadways which present potential user conflicts. Potential conflicts between trail users and motorists would remain at Broad Branch Road, Jewett Street, the National Zoo Entrance, Shoreham Drive, and P Street, NW. Under the No Action Alternative, the potential for disruptions or accidents between trail users and motorists would persist in these areas.

Connectivity is needed in order to maximize the use of the trail system as a transportation route. Current conditions in the project area include gaps between the trail and the overall bicycle and pedestrian network surrounding Rock Creek Park. Along the 3.7 miles of the Rock Creek Park multi-use trail, there are seven access points. Three of the access points are associated with vehicle parking areas, and one of the access points is closed regularly (the National Zoo Bridge). In addition many of the existing access points are unmarked and

unpaved. Due to these conditions, use the trail as a transportation route would be impractical to a number of commuters living in the vicinity of Rock Creek Park. Under the No Action Alternative, there would be no changes to the overall connectivity of the trail system.

With no improvements to the Rock Creek Park multi-use trail, use of the trail as a transportation route would continue to present several limitations. Sections of the trail are in proximity to vehicle traffic, user conflicts persist at trail and roadway intersections, and connectivity of the trail with surrounding trail networks is limited. Based on these conditions, the No Action Alternative would result in a long-term moderate adverse impact on traffic and transportation.

Cumulative Impacts

Proposed trail improvement projects within the vicinity would have beneficial effects on traffic and transportation throughout Rock Creek Park. Construction of the Blagden Avenue Hike/Biker trail would occur at the northern extents of the Rock Creek Park multi-use trail project area (NPS 2008). Construction of the Klingle Valley Trail would occur in the corridor of Klingle Creek, connecting with the Rock Creek Park multi-use trail at Porter Street and Rock Creek (DDOT 2010b). Implementation of these projects would enhance connectivity throughout Rock Creek Park, providing additional commuter options.

Proposed roadway improvement projects would also have beneficial effects throughout Rock Creek Park. Three rehabilitation projects are proposed in the vicinity of Rock Creek Park which would repair deteriorating roadway conditions; the projects are proposed for Oregon Avenue (DDOT 2011), Broad Branch Road, and Beach Drive and the RCPP (NPS 2006b). The rehabilitation projects would improve the overall road conditions of the region, providing traffic and transportation benefits.

In addition to these projects, regional management plans address the problems of traffic congestion due to the high volume of visitors to Rock Creek Park. The National Zoological Park Facilities Master Plan (Smithsonian 2008) calls for improvement of the National Zoo's road network, in order to accommodate high volumes of visitors. And, the Rock Creek GMP calls for traffic-calming and speed enforcement measures to maintain safe circulation throughout the Park (NPS 2007).

Overall, cumulative impact projects would result in beneficial impacts to Rock Creek Park. Proposed trail improvements, roadway improvements, and management plans are aimed at providing effective maintenance of traffic and transportation. The Rock Creek Park multi-use trail plays a critical role in transportation throughout Rock Creek Park. Under the No Action Alternative, the trail would continue to attract pedestrians and bicyclists. There would be an adverse incremental effect on the cumulative impact of regional projects, based on the limitations of the existing trail. Therefore, a cumulative long-term minor adverse impact on traffic and transportation would occur.

Conclusion

The No Action Alternative would result in a long-term moderate adverse impact on traffic and transportation. Limiting conditions of the trail would persist including gaps in the trail, user conflicts at intersections, proximities of the trail to roadways, and poor connectivity to surrounding trail networks. A cumulative long-term minor adverse impact would occur.

4.14.1.2. PEIRCE MILL TRAIL SPUR OPTION A: NO ACTION

Peirce Mill Spur Option A proposes no changes to the existing social trail between Broad Branch Road and Peirce Mill. There would be no impacts to traffic and transportation under Option A.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. Because the Peirce Mill Trail Spur Option A would have no impacts, there would be no cumulative impacts.

Conclusion
No impacts to traffic and transportation would occur under Peirce Mill Trail Spur Option 1. There would be no cumulative impacts.

4.14.1.3. ROSE PARK TRAIL OPTION A: NO ACTION

Rose Park Option A proposes no changes to the existing trail conditions at Rose Park. Existing conditions require pedestrians and bicyclists to use an unpaved social trail to connect to M Street. The absence of a formal trail in this area contributes to the overall lack of connectivity throughout the trail system. As a result, continuation of the existing conditions at Rose Park would have a long-term minor adverse impact on traffic and transportation.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. The Rose Park Trail Option A would have an adverse incremental effect in combination with proposed regional projects. However, the adverse impact associated with existing conditions at Rose Park would be small due to the relative magnitude of Rock Creek Park and proposed regional projects. Therefore, a cumulative long-term negligible adverse impact would occur under Option A.

Conclusion
Rose Park Trail Option A would result in long-term minor adverse impacts, based on the existing lack of connectivity at Rose Park. There would be a cumulative long-term negligible adverse impact under Option A.

4.14.2. IMPACTS OF THE ACTION ALTERNATIVES AND OPTIONS

4.14.2.1. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 2: TRAIL RESURFACING

Alternative 2 proposes to rehabilitate the Rock Creek Park multi-use trail through resurfacing of the trail. The proposed actions also include improvement measures which would enhance the trail system as a transportation route.

Construction associated with the implementation of Alternative 2 would require detours and temporary road closures of trail sections and roadways. Advance notifications of temporary closures or changes in traffic patterns would be implemented. At various locations, such as the Beach Drive tunnel, work would be scheduled to avoid times of peak traffic volumes. Although these actions would mitigate the effects of construction, a large number of trail users and motorists would experience inconveniences such as extended travel times. Therefore, Alternative 2 would result in short-term moderate adverse impacts to traffic and transportation due to detours, and temporary trail and roadway closures.

Under Alternative 2, trail user and vehicular traffic separation improvements would be constructed at the Broad Branch/Grove 2 North parking area, the Beach Drive tunnel, and the Beach Drive Bridge over Rock Creek. Separation methods in these locations include paving of a social trail, widening of the trail, and installation of traffic barriers. Alternative 2 would also construct roadway crossing improvements where

existing conditions generate the potential for conflicts between trail users and motorists. Two new roadway crossings are proposed at Broad Branch Road, and P Street, NW. Existing roadway crossings at Jewett Street, the National Zoo entrance, and Shoreham Drive would be modified in order to provide enhanced safety and circulation. The proposed improvements would result in long-term beneficial impacts based on fewer conflicts between trail users and motorists.

Implementation of Alternative 2 includes construction of five new connections along the Rock Creek Park multi-use trail. Entirely new trail sections would connect the trail to Beach Drive north of Blagden Avenue, the Porter Street ramp, and P Street, NW. New connections are proposed at the Piney Branch Parkway Trail and Arkansas Avenue which would consist of paved trail surfaces in place of existing social trails. Based on the increase in connectivity provided by the proposed actions, the trail would provide more options to commuters living in the vicinity of Rock Creek Park. Because the trail would be enhanced as a transportation route, Alternative 2 would have long-term beneficial impacts.

Overall, Alternative 2 would reduce conflicts between trail users and motorists, and enhance the connectivity between the trail system and surrounding bicycle and pedestrian networks. Long-term beneficial impacts to traffic and transportation would result from better circulation throughout the trail system and additional options for commuters provided by the improvements.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. Alternative 2 would provide a beneficial impact to the cumulative effect by reducing trail user and motorist conflicts and providing greater connectivity within Rock Creek Park. As a result, cumulative impacts would be beneficial under Alternative 2.

Conclusion
Under Alternative 2, construction activities would result in short-term moderate adverse impacts to traffic and transportation. Once constructed, Alternative 2 would provide long-term benefits to Rock Creek Park by reducing user conflicts and enhancing connectivity. A cumulative long-term beneficial impact would occur.

4.14.2.2. ROCK CREEK PARK MULTI-USE TRAIL ALTERNATIVE 3 (*PREFERRED ALTERNATIVE*): TRAIL RESURFACING AND WIDENING

Alternative 3 proposes to rehabilitate the Rock Creek Park multi-use trail through resurfacing and widening of the trail. The proposed actions also include improvement measures which would enhance the trail system as a transportation route.

Construction associated with the implementation of Alternative 3 would require detours and temporary road closures of trail sections and roadways. Advance notifications of temporary closures or changes in traffic patterns would be implemented. At various locations, such as the Beach Drive tunnel, work would be scheduled to avoid times of peak traffic volumes. Although these actions would mitigate the effects of construction, a large number of trail users and motorists would experience inconveniences such as extended travel times. Therefore, Alternative 3 would result in short-term moderate adverse impacts to traffic and transportation due to detours, and temporary trail and roadway closures.

Under Alternative 3, trail user and vehicular traffic separation improvements would be constructed at the Broad Branch/Grove 2 North parking area, the Beach Drive tunnel, and the Beach Drive Bridge over Rock

Creek. Separation methods in these locations include paving of a social trail, widening of the trail, and installation of traffic barriers. Alternative 3 would also construct roadway crossing improvements where existing conditions generate the potential for conflicts between trail users and motorists. Two new roadway crossings are proposed at Broad Branch Road, and P Street, NW. Existing roadway crossings at Jewett Street, the National Zoo entrance, and Shoreham Drive would be modified in order to provide enhanced safety and circulation. The proposed improvements would result in long-term beneficial impacts based on fewer conflicts between trail users and motorists.

Implementation of Alternative 3 includes construction of five new connections along the Rock Creek Park multi-use trail. Entirely new trail sections would connect the trail to Beach Drive north of Blagden Avenue, the Porter Street ramp, and P Street, NW. New connections are proposed at the Piney Branch Parkway Trail and Arkansas Avenue which would consist of paved trail surfaces in place of existing social trails. Based on the increase in connectivity provided by the proposed actions, the trail would provide more options to commuters living in the vicinity of Rock Creek Park. Because the trail would be enhanced as a transportation route, Alternative 3 would have long-term beneficial impacts.

Overall, Alternative 3 would reduce conflicts between trail users and motorists, and enhance the connectivity between the trail system and surrounding bicycle and pedestrian networks. Long-term beneficial impacts to traffic and transportation would result from better circulation throughout the trail system and additional options for commuters provided by the improvements.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. Alternative 3 would provide a beneficial impact to the cumulative effect by reducing trail user and motorist conflicts and providing greater connectivity within Rock Creek Park. As a result, cumulative impacts would be beneficial under Alternative 3.

Conclusion
Under Alternative 3, construction activities would result in short-term moderate adverse impacts to traffic and transportation. Once constructed, Alternative 3 would provide long-term benefits to Rock Creek Park by reducing user conflicts and enhancing connectivity. A cumulative long-term beneficial impact would occur.

4.14.2.3. PEIRCE MILL TRAIL SPUR OPTION B (*PREFERRED ALTERNATIVE*): EIGHT-FOOT PAVED TRAIL SPUR

Option B proposes to pave the Peirce Mill trail spur. Construction activities would have no impacts to traffic and transportation, because this section of the trail is currently outside of the trail system. This option would have long-term beneficial impacts on traffic and transportation by providing trail users with added access to Rock Creek, within Rock Creek Park.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. The Peirce Mill Trail Spur Option B would provide a small beneficial impact to the cumulative effect by providing trail users with added access to Rock Creek As a result, cumulative impacts would be beneficial under Option B.

Conclusion
Peirce Mill Trail Spur Option B would have a long-term beneficial impact on traffic and transportation by providing trail users with added access to Rock Creek. A cumulative long-term beneficial impact would occur.

4.14.2.4. ROSE PARK TRAIL OPTION B (*PREFERRED ALTERNATIVE*): SIX-FOOT RESURFACED TRAIL

Option B would result in the resurfacing of the existing Rose Park trail and the construction of a new connection between the Rose Park trail and M Street. ***Option B would also provide a new connection to the Rock Creek Trail at P Street.*** Construction activities would result in short-term moderate adverse impacts to traffic and transportation due to detours and temporary trail and roadway closure. Option B would have long-term beneficial impacts on traffic and transportation by providing trail users with access to M Street.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. The Rose Park Trail Option B would provide a small beneficial impact to the cumulative effect by providing trail users with ***improved*** access to M Street ***and the Rock Creek Trail***. As a result, a cumulative long-term beneficial impact would occur under Option B.

Conclusion
Under Rose Park Trail Option B, construction activities would result in short-term moderate adverse impacts to traffic and transportation. Option B would result in a long-term beneficial impact by providing access to M Street. A cumulative long-term beneficial impact would occur.

4.14.2.5. ROSE PARK TRAIL OPTION C: EIGHT-FOOT RESURFACED TRAIL

Option C would result in the resurfacing and widening of the existing Rose Park trail and the construction of a new connection between the Rose Park trail and M Street. ***Option C would also provide a new connection to the Rock Creek Trail at P Street.*** Construction activities would result in short-term moderate adverse impacts to traffic and transportation due to detours and temporary trail and roadway closure. Option C would have long-term beneficial impacts on traffic and transportation by providing trail users with access to M Street.

Cumulative Impacts
The effect of cumulative impact projects is described under Alternative 1. Trail improvements, roadway improvements, and regional management plans would result in beneficial impacts to traffic and transportation. The Rose Park Trail Option C would provide a small beneficial impact to the cumulative effect by providing trail users with ***improved*** access to M Street ***and the Rock Creek Trail***. As a result, a cumulative long-term beneficial impact would occur under Option C.

Conclusion
Under Rose Park Trail Option C, construction activities would result in short-term moderate adverse impacts to traffic and transportation. Option C would result in a long-term beneficial impact by providing access to M Street. A cumulative long-term beneficial impact would occur.

4.15. SECTION 4(F) OF THE U.S. DOT ACT OF 1966

Rock Creek Park is a national public park and as such, is afforded special protection by legislation including Section 4(f) of the U.S. DOT Act of 1966, the National Park Service Organic Act, and the 1890 Rock Creek Enabling Legislation.

Section 4(f) of the U.S. DOT Act states that, "special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and with the States in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of the lands traversed." Furthermore, it states that the FHWA may not approve the use of land from a significant publically owned public park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that there is no feasible and prudent alternative to the use of land from the property, and the action includes all possible planning to minimize harm to the property resulting from such use.

Section 4(f) ***(23 CFR 774.17***) defines "use" of a protected resource in three ways:

- Land from a 4(f) site is permanently incorporated into a transportation facility;
- There is a temporary occupancy of land that is adverse in terms of the Section 4(f) statute's preservation purposes ***as determined by the criteria in 23 CFR 774.13(d)***; or
- When there is a constructive use of land ***as determined by the criteria in 23 CFR 774.15***.

Although the Rock Creek Park Multi-Use Trail Rehabilitation Project will involve temporary occupancy of park resources, the project has been determined to have "No Adverse Effect under Section 106; therefore, it does not involve the use of a Section 4(f) resource. Moreover, the following exceptions to Section 4(f) approvals, as listed in 23 CFR 774.1, are applicable to the Rock Creek Park Multi-Use Trail Rehabilitation Project:

- ***Under 23 CFR 774.13(a), Section 4(f) approval is not required for the restoration, rehabilitation, or maintenance of transportation facilities that are on or eligible for the National Register, when:***
  - ***The FHWA Administrator concludes, as a result of the consultation under 36 CFR 800.5, that such work will have no adverse effect on the historic qualities of the facility that caused it to be on or eligible for the National Register; and***
  - ***The official(s) with jurisdiction over the Section 4(f) resources have not objected to the Administration conclusion of no adverse effect.***

- ***Under 23 CFR 774.13(d), Section 4(f) approval is not required for*** temporary occupancies of protected resources so long as the following conditions are met:
  - Duration must be temporary and there should be no change in ownership of the land;
  - Scope of work must be minor;
  - There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
  - The land being used must be fully restored to a condition which is at least as good as that which existed prior to the project; and,
  - There must be documented agreement of the officials with jurisdiction over the Section 4(f) resource regarding the above conditions.

- ***Under 23 CFR 774.13(f), Section 4(f) approval is not required for certain trails, paths, bikeways, and sidewalks, in the following circumstances:***
  - ***Trail-related projects funded under the Recreational Trails Program, 23 U.S.C. 206(h)(2);***
  - ***National Historic Trails and the Continental Divide National Scenic Trail, designated under the National Trails System Act, with the exception of those trail sections that are historic sites as defined in 23 CFR 774.17;***
  - ***Trails, paths, bikeways, and sidewalks that occupy a transportation facility right-of-way without limitation to any specific location within that right-of-way, so long as the continuity of the trail, path, bikeway, or sidewalk is maintained; and***
  - ***Trails, paths, bikeways, and sidewalks that are part of the local transportation system and which function primarily for transportation.***

Rock Creek Trail is an existing trail and will continue to be owned and maintained by NPS. ***The trail is a contributing element to the Rock Creek Park and Rock Creek and Potomac Parkway historic district. For the Rock Creek Park Multi-Use Trail Rehabilitation Project, no*** land will be permanently incorporated into a transportation facility with either of the action alternatives, ***including the Preferred Alternative***. ***Additionally, under the Section 106 evaluation and consultation, the project was determined to have no adverse effect on the historic Rock Creek Park and Rock Creek and Potomac Parkway.*** Furthermore, according to the *2004 Cooperative Agreement* between the National Park Service, the DC Department of Transportation and the DC Department of Parks and Recreation for the rehabilitation of Rock Creek Park multi-use trail and the Rose Park trail, this project is funded through the Recreational Trails Program. ***Under 23 CFR 774.13 and 23 CFR 774.17, the Rock Creek Park Multi-Use Rehabilitation Project will not use a Section 4(f0 resource and is applicable for an exception; therefore the project i***s legislatively exempt from the requirements of Section 4(f).

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