4.0 ENVIRONMENTAL CONSEQUENCES

According to the Council on Environmental Quality (CEQ) guidelines (40 CFR Sections 1500-1508), "the determination of a significant impact is a function of both context and intensity." Significance of an action is analyzed within the setting of the action, or context, including regional, local, and site-specific. Intensity refers to the severity of an impact which is analyzed in terms of type, quality, and sensitivity of a particular resource. The appropriate class of environmental documentation is determined by the level of significance, which is established through impact analysis of each resource. *As stated in 40 CFR 1508.27, the analysis of significance as used in NEPA requires consideration of both the context and intensity of an action:*

(a) Context: This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

(b) Intensity: This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

- *Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.*
- *The degree to which the proposed action affects public health or safety.*
- *Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.*
- *The degree to which the effects on the quality of the human environment are likely to be highly controversial.*
- *The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.*
- *The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.*
- *Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.*
- *The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.*
- *The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.*
- *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.*
- *Intensity durations are provided throughout the analysis for negligible, minor, moderate, and major impacts. Beneficial impacts are addressed qualitatively.*
- *Long-term and short-term durations are defined for each impact category.*

Impact thresholds are established for each environmental category to assist in classifying the level of impact as it relates to each resource. The thresholds for this EA were developed with attention to the guidance on developing impact thresholds in NPS' *Technical Assistance Manual: Compliance with the National Environmental Policy Act and 106 of the National Historic Preservation Act* (2009). These thresholds are developed using: existing literature, existing standards (e.g. state water quality standards), consultation with subject matter experts, consultation with other agencies, and scientists' best professional judgment.

4.1 Natural Resources

4.1.1 Soils

The DDOE reviews and approves all construction and grading plans for compliance with the DC Erosion and Sedimentation Control Act of 1977, as amended (D.C. Law 2-23, 24 DCR 792 (July 22, 1977)). Inspections are conducted to make sure that control devices are constructed at construction sites in accordance with approved plans. The District program also investigates erosion, drainage, and related complaints and works to resolve any issues.

Impacts to soils are assessed for each alternative based on investigations of the current conditions of the Study Area.

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 and areas of affected soil 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. 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.

No Build Alternative

The No Build Alternative would not include construction or disturbance to the Study Area. Therefore, there would be no short or long-term impacts to soils at the site.

Build Alternative 1 – Revised Square Alternative

Under Build Alternative 1, there would be a net increase of approximately 0.09 acres of parkland compared to the No Build Alternative. The net increase in parkland would positively impact soils and geology in the Study Area as there would be an increase in usable soils. The majority of land within the Study Area has been previously graded and paved over from the construction and maintenance of the existing roadway at the intersection, and is expected to represent completely or partially disturbed soil sequences. The soil would support grass and other landscaping materials with the Build Alternative 1 as the area does today.[58] Minimal grading and filling would be required as the area is generally flat and has limited elevation change. Adequate construction techniques would be adhered to so as to not increase the potential for soil erosion and loss of topsoil during construction. Therefore, Build Alternative 1 would have negligible long-term impacts to soils and would only present minor short-term adverse impacts resulting from soil erosion during construction. Based on the analysis summarized above, the impacts to soil do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Under Build Alternative 2, there is a net decrease of approximately 0.02 acres of parkland. The majority of land within the Study Area has been previously graded and paved over from the construction and maintenance of the existing roadway at the intersection. Build Alternative 2 would result in similar impacts as described for Build Alternative 1. Therefore, Build Alternative 2 would have negligible long-term impacts to soils and may only present minor short-term adverse impacts resulting from soil erosion during construction. The impacts to soil do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

4.1.2 Water Resources

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.

No Build Alternative

Groundwater

The No Build Alternative includes no additional impervious surface, which could locally impact groundwater recharge. Therefore, there would be no impacts to groundwater volume or quality as a result of the No Build Alternative.

Water Quality

The No Build Alternative includes no construction and no change in impervious surfaces. Storm water runoff volumes would not change from existing conditions and therefore, there would be no impacts to water quality due to runoff in the vicinity of the Study Area.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 includes removing the impervious roadways which bisect the NPS-owned parcels on either side of Pennsylvania Avenue, SE. Build Alternative 1 includes recommendations to use pervious pavement and unit pavers wherever possible, including the pedestrian walkways and bus stops. Build Alternative 1 also includes planted medians between the Pennsylvania Avenue, SE roadway and the pedestrian pathways that run parallel to the roadway which will help to absorb additional rainwater and storm water runoff. Although landscape design has not been finalized, continuous tree zones would also help to absorb rainwater and storm water runoff.

The existing storm and sanitary sewer system is a municipal separate storm sewer system (MS4) in the Study Area.. As is the case currently, during storm events, rainfall runoff and surface pollutants would transport into the adjacent storm water system, and ultimately into the tributaries and storm water system that empty into the Anacostia River. The Anacostia River is under tidal influence and therefore, DDOE does not require water quantity control. Additionally, storm water quantity control would not be required because less than a 10% increase in impervious pavement area is anticipated (approximate net increase of 0.09 acres of parkland).

The proposed and existing storm sewer systems that would receive additional flows from the project site may be evaluated for pipe capacity and hydraulic grade energy with the starting backwater conditions where there are riverine or confluences with the combined system. Connections and computations to larger sewers and the combined system would be reviewed by DC Water and coordinated with the *Combined Sewer System Long Term Control Plan*.

Groundwater

Impacts to groundwater recharge are unlikely. The net increase in pervious surface would be beneficial to groundwater recharge; however, any short-term or long-term impacts to groundwater recharge are expected to be negligible due to the minimal increase in pervious surface (0.09 acres) compared to the No Build Alternative. Based on the analysis summarized above, impacts to groundwater do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of “significance” as defined by CEQ.

Water Quality

Build Alternative 1 would include the removal of existing roadways that bisect the Twining Square park land, as well as reconfiguration of the intersection. Minor short-term adverse impacts to water quality may result during construction due to soil disturbance and potential clearing of vegetation. BMPs would be used during construction in accordance with DDOE and District standards to avoid increased soil erosion. This would help to prevent an increase in storm water runoff volume that could degrade water quality in the nearby tributaries and Anacostia River. The net increase in pervious surface (0.09 acres) under Build Alternative 1 would be beneficial to surface water; however, it is anticipated to have negligible impacts to surface water in the long term given the small change in storm water runoff volumes. Storm water quality requirements will be based on providing water quality improvements for the pavement areas within the project site. This requirement will be met using a variety of BMP facilities and LID strategies such as DDOT/DC Water quality control structures and other features. Therefore, long-term impacts to water quality are expected to be negligible. Impacts to water quality do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

The impacts to water resources from Build Alternative 2 development would be similar under both Build Alternative 1 and Build Alternative 2. The primary difference would be the slight difference in impervious surface in the Study Area. Build Alternative 2 would result in a net decrease of 0.02 acres of pervious surface compared to the No Build Alternative. There would be slightly more storm water runoff as a result.

Groundwater

Impacts to groundwater recharge are unlikely. Build Alternative 2 would result in a net decrease of approximately 0.02 acres of pervious surface in the Study Area. Any short-term or long-term impacts to groundwater recharge are expected to be negligible due to the minimal decrease in pervious surface compared to the current Study Area. Impacts to groundwater do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

Water Quality

Build Alternative 2 would include the removal of existing roadways that bisect the Twining Square park land, as well as reconfiguration of the intersection. Minor short-term adverse impacts to water quality may result during construction due to soil disturbance and potential clearing of vegetation. BMPs would be used during construction in accordance with DDOE and District standards to avoid increased soil erosion. This would help to prevent an increase in storm water runoff volume that could degrade water quality in the nearby tributaries and Anacostia River. The net decrease in pervious surface under Build Alternative 2 (0.02 acres) is anticipated to have negligible impacts to surface water quality in the long term given the minimal change in pervious surface. Storm water quality requirements will be based on providing water quality improvements for the pavement areas within the project site. This requirement will be met using a variety of BMP facilities and LID strategies such as DDOT/DC Water quality control structures and other features. Therefore, long-term impacts to water quality are expected to be negligible. Impacts to water quality do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

4.1.3 Wildlife

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 lifestages, 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 Study Area. 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.

No Build Alternative

The No Build Alternative includes no construction. Therefore, there would be no impacts to wildlife or wildlife habitat under the No Build Alternative.

Build Alternative 1 – Revised Square Alternative

Due to the urban nature of the Study Area, and the fact that the proposed development under Build Alternative 1 would be located entirely within previously disturbed or maintained landscapes, no impacts to wildlife or wildlife habitat are anticipated. Additionally, the Study Area does not include habitat favored by migratory birds. Therefore, any short-term or long-term impacts to terrestrial organisms would be negligible as there would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations. Impacts to wildlife do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Impacts to wildlife or wildlife habitat under Build Alternative 2 would be negligible, as discussed under the Build Alternative 1 analysis. Impacts to wildlife do not meet the CEQ criteria for either context or intensity; therefore these impacts do not rise to a level of "significance" as defined by CEQ.

4.1.4 Vegetation

The project intersection right-of-way is currently owned by DDOT and NPS; the majority of the vegetative land in the Study Area is owned by NPS, known as Twining Square in the Study Area. Management of NPS lands is guided by numerous congressional acts and executive orders, including the 1916 Organic Act which created the NPS and the General Authorities Act of 1970 which established the management of the national park system.

While the NPS currently owns and operates the vegetative open space within the Study Area, the land jurisdiction could transfer to DDOT if the Proposed Action is implemented. Therefore, the impacts to the vegetation in these areas would be coordinated and discussed with NPS; however development and maintenance of the vegetated areas would be under DDOT if the transfer of jurisdiction is approved.

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 segment 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.

No Build Alternative

Under the No Build Alternative, there would be no development to the Study Area and no disturbance to the existing vegetation. The intersection configuration would remain as it is, with the fragmented green spaces on both sides of Pennsylvania Avenue, SE continuing under ownership of the NPS. The No Build Alternative would not result in impacts to vegetation in the Study Area.

Build Alternative 1 – Revised Square Alternative

The reconfiguration of the intersection would include the conversion of the roadways, which fragment the currently NPS-owned reservations, into green space. The existing street trees and vegetation would be preserved where possible. Pending final design, an estimated six or seven trees may be removed to accommodate additional roadway to the north of the square, and one or two trees may need to be removed

due to the roadway configuration to the south of the square. Street trees line the roadway median to the west of the square; the proposed design of Build Alternative 1 may require removal of one or two trees near the intersection where the median width is reduced to accommodate a wider sidewalk and bus stop area across the street. Upon project implementation, DDOT would develop a landscape plan and provide the appropriate vegetation to replace any trees removed. Additionally, LID principles would be applied to the development and the existing tree canopy in the Study Area would be preserved and enhanced wherever possible to maximize pavement shading.

Short-term minor adverse impacts to vegetation may occur during construction as soils are disturbed and trees potentially impacted during the intersection development. BMPs would be used during construction to minimize soil erosion and impacts to vegetation. Although there is not a substantial amount of additional park area or vegetation being added under Build Alternative 1, the consolidation of the green space and potential for enhanced landscape design would result in minor long-term benefits under this alternative. Changes to the intersection under Build Alternative 1 would provide the opportunity to enhance the green space as usable park area for residents and visitors to this intersection. Given the analysis and use of BMPs, the impacts to vegetation do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

As discussed in *Section 4.8, Mitigation*, landscaping and replacement of trees will be conducted in accordance with the DDOT Design and Engineering Manual.

Build Alternative 2 – Conventional Intersection Alternative

Build Alternative 2 would result in similar impacts to vegetation, as described under Build Alternative 1. Depending on final design of the intersection, six or seven trees in the northern reservation may need to be removed to accommodate pedestrian pathways. Three trees in the southern reservation would be impacted by roadway development under Build Alternative 2, and three to four trees would be impacted to accommodate the pedestrian pathway in the southern reservation. As with Build Alternative 1, short-term minor adverse impacts may occur to vegetation during construction and would be mitigated by using BMPs. The overall consolidation of green space and potential for enhanced landscape design under this Alternative would result in minor long-term benefits. Given the analysis and use of BMPs, the impacts to vegetation do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.2 Cultural and Historic Resources

In this EA, impacts to historic structures, cultural landscapes, and archaeological resources are described in terms of intensity, duration, context, and type, which is consistent with the CEQ regulations for implementing NEPA. These impact analyses are intended to comply with the requirements of both the NEPA and Section 106 of the NHPA. In accordance with the Advisory Council on Historic Preservation's (ACHP) regulations implementing Section 106 (36 CFR Part 800, Protection of Historic Properties), impacts to historic structures, cultural landscapes, and archaeological resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the NRHP; and (4) considering ways to avoid, minimize, or mitigate adverse effects. To assist in the assessment,

FHWA and DDOT consulted with the DC SHPO with regards to the APE (direct and indirect), cultural resources present, and the potential effects on historic properties.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must be made for affected NRHP eligible or listed cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register (e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects of the Preferred Alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects).

As stated in 36 CFR §800.5(a)(1), "[A]dverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." An alternative is considered to have the potential for *direct* effects if it alters the property or its character defining features in a manner that diminished is integrity, or its ability to convey its significance. An alternative is considered to have the potential for *indirect* effects if it may result in long-term deterioration, or if it has the potential to alter views from nearby historic resources. A detailed *Archaeological Assessment of Potential* has been prepared for the Pennsylvania and Minnesota Avenues, SE intersection (see *Appendix E*); this EA summarizes the findings of this report.

**Note that Build Alternative 1 – Revised Square Alternative is often referred to as the "Modified Square Alternative" in the cultural resources reports and correspondence.*

4.2.1 Historic Structures

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.

No Build Alternative

Under the No Build Alternative, there would be no reconfiguration of roadway in the Study Area and no disturbance to the existing buildings or resources. Therefore, the No Build Alternative would have no direct or indirect effects on nearby historic properties eligible for listing in the NRHP such as the Morton's Department Store Building, the Highland Theater Building, or the lot previously occupied by the Little Tavern Building; no historic structures are listed in the NHRP in the Study Area.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 would include the reconfiguration of roadway into a traffic square concept that would require all turning vehicles to go around the expanded center park area. Build Alternative 1 does not include the acquisition or use of any buildings, structures or properties; therefore there would be no direct effects on nearby historic properties eligible for listing in the NRHP.

Any changes to the view from nearby buildings would not be substantially changed from the No Build Alternative and would not impact the historic identity of those eligible buildings; therefore long-term indirect effects would be negligible. The improvements to the intersection would not diminish the integrity of the structures and would not jeopardize the eligibility of the structures for the NRHP. Any indirect effects, such as visual impacts due to construction would be short-term and negligible with the use of BMPs. Noise and vibration BMPs would be used during construction to minimize any disturbance to nearby businesses and residences during construction.

The DC SHPO reviewed the Proposed Action in accordance with Section 106 of the NHPA and issued a finding of *Conditional* No Adverse Effect for this undertaking with associated conditions to be fulfilled regarding the historic built environment:

- The alternative selected is the Revised Square Alternative, which most closely reestablishes the original configuration of the streets and reservations.

According to the DC SHPO, "Reestablishment of the square as it was originally planned when the streets were laid out is most compatible historically and would not constitute an adverse effect on the built environment." Additionally, continued consultation with the SHPO on the project is requested if there are any changes to the project footprint as the designs are finalized. Refer to *Appendix E* for the *DC SHPO Section 106 Review Form*, dated April 17, 2013.

Given the conditions in the *Section 106 Review Form* for the historic built environment are followed, the effects on historic structures do not meet the CEQ criteria for either context or intensity, and would not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Under Build Alternative 2, the intersection would be reconfigured into a typical, at-grade intersection. The impacts to historic structures from Build Alternative 2 would be similar to Build Alternative 1.

As discussed under Build Alternative 1, the DC SHPO issued a *Conditional* No Adverse Effect for this undertaking if Build Alternative 1 is selected as the Preferred Alternative. If Build Alternative 2 is selected as the Preferred Alternative, additional consultation with the DC SHPO would likely be necessary. Given the conditions in the *Section 106 Review Form* for the historic built environment are followed, the effects on historic structures do not meet the CEQ criteria for either context or intensity, and would not rise to a level of "significance" as defined by CEQ.

4.2.2 Cultural Landscape

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.

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

No Build Alternative

Under the No Build Alternative, there would be no reconfiguration of roadway in the Study Area and no disturbance to the existing cultural landscape. Therefore the No Build Alternative would have no direct or indirect effects on cultural landscapes in the Study Area vicinity.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 would result in the reconfiguration of the roadway and park area at the intersection; however the existing cultural landscape consisting of an urban mix of commercial and residential development with roadway and park area within the intersection would remain the same. Build Alternative 1 would not impact any businesses or residential uses in the area and would maintain a similar amount of park area and roadway, however the park area would be more contiguous than it is currently. Any long-term effects to the cultural landscape in the vicinity of the intersection would be negligible.

Any adverse short-term visual impacts to the cultural landscape due to construction would be or short duration and negligible. Based on the analysis summarized above, impacts to cultural landscapes do not meet the CEQ criteria for either context or intensity, and would not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Build Alternative 2 would also reconfigure the roadway and park area in the intersection; impacts to the cultural landscape would be negligible similar to Build Alternative 1. Any adverse short-term visual impacts to the cultural landscape due to construction would be negligible. Based on the analysis summarized above, impacts to cultural landscapes do not meet the CEQ criteria for either context or intensity, and would not rise to a level of "significance" as defined by CEQ.

4.2.3 Archaeological Resources

Based on archival research and coordination with the DC SHPO City Archaeologist, it was determined that archaeological investigations were needed for the Proposed Action. Geoarchaeological coring was conducted in November of 2012 to determine whether intact soil columns are present in the Study Area and would need subsequent archaeological testing. The associated report, *Geoarchaeological Interpretations in the Vicinity of the Intersection of Pennsylvania and Minnesota Avenues in the Anacostia Section of Washington, D.C.* and the findings of the investigation are included in *Appendix E, Cultural Resources*. Note that Build Alternative 1 – Revised Square Alternative is often referred to as the "Modified Square Alternative" in the cultural resources reports and correspondence.

Impact Thresholds

Impacts to archaeological 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 archaeological 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 archaeological 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 archaeological 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 archaeological 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 nor 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 archaeological 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 archaeological site is stabilized in its current condition to maintain its existing level of integrity or when an archaeological site is preserved in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. 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; L**ong-term-** Impacts last beyond the proposed construction activities. All impacts to archaeological sites are considered long-term impacts.

No Build Alternative

Under the No Build Alternative, there would be no ground disturbance and no impact to archaeological resources within the APE-Direct.

Build Alternative 1 – Revised Square Alternative

Project activities under Build Alternative 1 would result in ground disturbance including removal of existing pavement and sidewalks, construction of new traffic lanes and sidewalks, relocation of traffic control signals, street lights, landscaping and utilities. The northern and southern reservations, as well as the area under existing roadway would be disturbed during construction of the Revised Square.

It is not anticipated that any archaeological resources would be impacted by Build Alternative 1 in the northern reservation or in areas under existing roadbeds, as they appear to have little potential for archaeological resources. The potential for impacts to archaeology under Build Alternative 1would be to the southern reservation.

The southern reservation is considered a zone of high potential for prehistoric resources, as well as historic resources associated with nineteenth century residences. Further archaeological investigation is recommended in the southern reservation area within the APE-Direct (Figure 3-2). Therefore Phase IB/II testing of this small area is recommended prior to final design decisions and construction of the proposed improvements.

The DC SHPO has issued a finding of *Conditional* No Adverse Effect for this undertaking with the following conditions related to archaeological resources:

- Conduct Phase IB/II/ archaeological testing of an area within Res. 487 near geoarchaeological boring # 4 where an intact historic surface was identified at approximately 0.7 feet below ground surface (see Figure 3-5);

- Continued consultation with the SHPO on the project if there are any changes to the project footprint as the designs are finalized and for treatment of any NRHP eligible archaeological resources identified during Phase IB/II testing; and
- Completion of archaeological reporting requirements for the project following District and federal guidelines, curation of resulting collections, records, images, and geospatial data.

Given the conditions in the *Section 106 Review Form* for archaeology (also outlined above) are followed, the effects on archaeological resources would not rise to a level of "significance" as defined by CEQ.

Refer to *Appendix E* for the *DC SHPO Section 106 Review Form*, dated April 17, 2013.

Build Alternative 2 – Conventional Intersection Alternative

As with Build Alternative 1, the northern and southern reservations, and area under the existing roadway would all be disturbed by the construction of Build Alternative 2. Refer to Build Alternative 1 for a description of stipulations associated with the DC SHPO's finding of *Conditional* No Adverse Effect. Given the conditions in the *Section 106 Review Form* for archaeology (also outlined above) are followed, the effects on archaeological resources would not rise to a level of "significance" as defined by CEQ.

4.2.4 Cultural Resources Summary

No cultural landscapes exist in the Study Area and therefore would not be impacted by the Build or No Build Alternatives. No impacts would occur to any cultural resources with the No Build Alternative since no construction would occur.

The DC SHPO issued a finding of ***Conditional* No Adverse Effect** for this undertaking on April 17, 2013 with the following conditions (Refer to *Appendix E* for the *DC SHPO Section 106 Review Form*):

1) Per Andrew Lewis letter to FHWA/ DDOT 10/26/2011, the alternative selected is the modified/ revised square that reestablishes most closely the original configuration of the streets and reservations (see letter attached);

2) Conduct Phase IB/II/ archaeological testing of an area within Res. 487 near geoarchaeological boring # 4 where an intact historic surface was identified at approximately 0.7 feet below ground surface (see attached map);

3) Continued consultation with the SHPO on the project if there are any changes to the project footprint as the designs are finalized and for treatment of any NRHP eligible archaeological resources identified during Phase IB/II testing; and

4) Completion of archaeological reporting requirements for the project following District and federal guidelines, curation of resulting collections, records, images, and geospatial data.

In summary, no adverse impacts to the historic built environment would occur with the implementation of Build Alternative 1; however, additional consultation with the DC SHPO would likely be required if Build Alternative 2 is selected as the Preferred Alternative.

Further archaeological investigation (Phase IB/II Survey) is recommended in the southern reservation area within the APE-Direct prior to final design decisions and construction of either Build Alternative 1

or Build Alternative 2. The southern reservation area has been classified as having a high potential for prehistoric resources and historic resources associated with nineteenth century farmsteads and early twentieth century residential development of Twining City.

Given the conditions in the *Section 106 Review Form* for cultural resources are followed, the effects on cultural resources do not meet the CEQ criteria for either context or intensity, and would not rise to a level of "significance" as defined by CEQ.

4.3 Socioeconomic Resources

Impact Thresholds

The following thresholds were used to determine the magnitude of effects to the socioeconomic environment.

Negligible: Little or no noticeable change in economic activity, employment and income levels, or population migration or immigration.

Minor: Local changes in economic activity, employment and income levels, or population migration or immigration.

Moderate: Regional changes in overall economic activity, employment and income levels, or population migration or immigration.

Major: Widespread, significant changes in overall economic activity, employment and income levels, or population migration or immigration.

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

4.3.1 Land Use

The potential for impacts to land use was evaluated based on the potential for implementation of the Build Alternatives to result in changes to land use.

No Build Alternative

The No Build Alternative would result in the parcels of Twining Square located within the Study Area (U.S. Reservation 487) remaining under the ownership of the NPS and the roadway remaining under DDOT right-of-way. No short-term impacts would occur because no construction would occur at the intersection and no direct impacts to land use would occur under the No Build Alternative.

It is unknown whether the No Build Alternative (keeping the intersection as it is today) would impact any potential land use decisions by the District. However, the No Build Alternative would not improve the intersection in furtherance of the Great Streets Initiative and would not serve as a catalyst for positive land use change at the intersection in the long term. The No Build Alternative would have no impact on future land use at the intersection.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 is consistent with the District's planning documents, aligning with the *Great Streets Framework Plan – Pennsylvania Avenue, SE*, and the *Revitalization of Pennsylvania Avenue, SE for the Great Initiative Concept Design.* As a result of Build Alternative 1, the NPS land parcels (U.S. Reservation 487) would transfer to DDOT. This land transfer would facilitate the reconfiguration of the intersection to improve safety, mobility, and connectivity for pedestrians and motorists at the intersection in keeping with the District's Great Streets Initiative. No private right-of-way would be impacted or acquired by the implementation of Build Alternative 1.

The land uses in the Study Area would not change as a result of Build Alternative 1 and would be only temporarily affected during construction by road closures to reconfigure the intersection. The proposed intersection improvements would not affect any land uses directly. However, Build Alternative 1 could indirectly affect future land use in the long term by functioning as a catalyst for redevelopment. As part of the Great Streets Initiative, improvements to this intersection would work toward the project mission to revitalize the District's Great Streets, which could ultimately lead to attracting new investment in the community. Indirect impacts to land use would be minor and beneficial given the potential to generate local changes in land use and economic activity. Land use impacts in the short term would be negligible during construction. The impacts to land use do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

As a result of Build Alternative 2, the NPS owned land parcels (U.S. Reservation 487) would transfer to DDOT. This land transfer would facilitate the reconfiguration of the intersection. The land uses surrounding the Study Area would not be directly impacted as a result of Build Alternative 2 and would be only temporarily affected during construction by road closures to reconfigure the intersection. Indirect impacts to land use would be negligible given the fact that the design of Build Alternative 2 maintains the current priority of moving vehicles through the intersection. Land use impacts under Build Alternative 2 would be negligible and temporary during construction. The impacts to land use do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.2 Zoning

No Build Alternative

There would be no change in zoning and therefore no impact to zoning under the No Build Alternative.

Build Alternative 1 – Revised Square Alternative

Implementation of Build Alternative 1 includes acquisition of NPS lands by DDOT to facilitate reconfiguration of the intersection; however no changes to zoning in the vicinity of the project would result due to Build Alternative 1. As with Land Use, in the long term, the proposed improvements could influence zoning decisions in the future indirectly if the intersection improvements serve as a catalyst for economic development in the Study Area. There would be no direct impacts to zoning in the short term or long term as a result of Build Alternative 1. The current zoning in most of the Study Area, Zone C-2-A, encompasses a wide range of land uses, including office employment centers, shopping centers, medium-

bulk mixed use centers, and housing. Just north of the square, lining L'Enfant Square, SE (street) is zoned R-4, which permits a range of single-family residential uses (including detached, semi-detached, row dwellings, and flats), churches and public schools. Because the existing zoning classifications are inclusive of many land use types, it is unlikely that any rezoning would be necessary in the Study Area. However, a potential benefit to Build Alternative 1 is the furtherance of economic development and local investment in the area; therefore, zoning may change over time as there is growth and changeover in local economic activity. It is anticipated that any indirect impacts to zoning as a result of Build Alternative 1 would be minor and beneficial given the potential to generate local changes in land use and economic activity. No impacts to zoning would occur in the short term. The impacts to zoning do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Implementation of Build Alternative 2 also includes acquisition of NPS lands by DDOT to facilitate reconfiguration of the intersection; however no changes to zoning in the vicinity of Build Alternative 2 would directly result from the alternative. Impacts to zoning would be negligible as a result of Build Alternative 2 in the long term. No impacts to zoning would occur in the short term. The impacts to zoning do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.3 Demography

No Build Alternative

Under the No Build Alternative, the reconfigured intersection would not be constructed and existing conditions would remain unchanged. Therefore, there would be no impact to demography in the Study Area.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 would be constructed within existing DDOT right-of-way and with the acquisition of NPS lands. Community residents and commuters through the area would be temporarily impacted by road closures during construction to reconfigure the project intersection under Build Alternative 1. Closures at the intersection could require traffic to be re-routed, bus stops to be relocated, and may require changes to on-street parking during construction; however temporary impacts due to construction is not expected to eliminate access to any residences or businesses in the Study Area. Short term impacts under Build Alternative 1 would be minor.

Build Alternative 1 would not result in any displacement or relocation of populations, nor would it affect access to residences or businesses within the Study Area in the long term. Travel patterns for residents and users of the intersection would be modified by Build Alternative 1 for motorists making a left turn from Pennsylvania Avenue heading northbound onto Minnesota Avenue. These motorists will no longer be able to make a direct left turn onto Minnesota Avenue and will have to make a right turn at L'Enfant Square, SE/ Minnesota Avenue and circumvent the "square" to travel northbound on Minnesota Avenue. The left-turn movement was eliminated to remove conflicts between vehicles and crossing pedestrians. Although this new travel pattern could increase travel time for residents and commuters traveling by car, the proposed travel patterns improve motorist *safety* by reducing left-turn conflicts and reducing

confusion at the intersection. Other pedestrian improvements will benefit the local population, such as new, shorter crosswalks to reduce the time walking in the street to enhance safety. Expanded sidewalks at the southwest and northwest corners of Pennsylvania Avenue, SE and L'Enfant Square, SE would also minimize the conflict between pedestrians waiting at the bus stop and bicyclists traveling on the sidewalk.

The L'Enfant Square, SE roadway to the north of the "square" would be increased to three lanes and will remove the one-hour on-street parking that exists today on the south side of the street. The residential (Zone 7 permit) on-street parking on the north side of the street nearest to the residences will remain. A grassed strip is proposed between the sidewalk and the on-street parking as an additional buffer between the roadway and the houses.

Three of the five WMATA bus stops in the Study Area would likely need to be permanently relocated to locations near their current locations to accommodate the proposed intersection configuration. The change would be needed to accommodate safe bus movement through the intersection. See *Section 4.4.3, Transit* for more detailed discussion of changes to transit users due to Build Alternative 1. The potential bus stop relocations will work in tandem with the revised intersection configuration to improve safety for transit riders using this intersection. Importantly, the proposed travel patterns and changes to bus stop locations are critical to improving pedestrian and bicyclist safety at this intersection, as well as the safety of transit riders and park users. Impacts to demography due to Build Alternative 1 would therefore be minor and beneficial.

Additionally, due to the proposed aesthetic enhancements under this alternative, along with improved accessibility and mobility to and through the area, Build Alternative 1 has the potential to generate investment in the community and to attract quality retail and jobs. This would result in indirect impacts to demography that would be minor and beneficial, defined by local changes in economic activity, and employment and income levels. Therefore the impact is minor in context and intensity, and does not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

As with Build Alternative 1, during construction, Build Alternative 2 would require traffic to be re-routed, bus stops to be relocated, and may require changes to on-street parking during construction; however temporary impacts due to construction are not expected to eliminate access to any residences or businesses in the Study Area. Short term impacts under Build Alternative 2 would be minor.

Build Alternative 2 maintains the available street parking along L'Enfant Square, SE to the north of the "square" and has the potential to reduce the traffic volume adjacent to those residences, depending on which way traffic flows along this roadway stretch. Build Alternative 2 has two options for the movement of one-way traffic to the north and west of the "square" on L'Enfant Square, SE. Option 1 would maintain the traffic flow in a one-way direction to the west and south on L'Enfant Square, SE. Commuter traffic could continue to cut-through the "square" to avoid the Pennsylvania/Minnesota Avenues, SE intersection and the right-turning vehicle/pedestrian conflict to the west of the square would remain. Option 2 would change traffic flow to one-way to the north and east on this roadway. Cut-through traffic would be minimized and the vehicle/pedestrian conflict would be reduced, which would be a benefit to residents living on L'Enfant Square SE.

Pedestrian improvements are included under Build Alternative 2 as compared to the No Build Alternative. However, given the typical intersection design, traffic speeds would not be reduced with Build

Alternative 2 and the intersection would continue to favor motorists in vehicles over pedestrians as a whole.

As with Build Alternative 1, WMATA bus stops in the Study Area would likely be permanently relocated. Two of the bus stops would be relocated near their current locations. The change would be needed to accommodate safe bus movement through the intersection. See *Section 4.4.3, Transit* for more detailed discussion of changes to transit users due to Build Alternative 1. The potential bus stop relocations will work in tandem with the revised intersection configuration to improve safety for transit riders using this intersection.

Safety will be improved over the No Build Alternative under Build Alternative 2; however, overall, this alternative maintains the current priority of moving vehicles through the intersection and is unlikely to promote Great Streets principles, as defined by local changes in economic activity, employment and income levels, or population migration or immigration. Therefore, impacts to demography under Build Alternative 2 would be negligible in the long term. The impacts to demography do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.4 Environmental Justice

No Build Alternative

Under the No Build Alternative, the reconfigured intersection would not be constructed and existing conditions would remain unchanged. Therefore, the No Build Alternative would result in no impacts to low-income or minority populations.

Build Alternative 1 – Revised Square Alternative

As described in Section 3.3.4, Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations" requires federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse human health or environmental effects of their actions on minority and low-income communities or populations, and directs federal agencies not discriminate on the basis of race, color, or national origin.

Section 3.3.4 identified a high percent of minority residents in the Study Area vicinity; Census tracts (CTs) and block groups in the vicinity of the Study Area have between 96 and 99% minority populations.

Potential construction impacts would have the greatest effect on the residential population bordering L'Enfant Square, SE and along Minnesota Avenue, SE, adjacent to construction areas. These residential areas consist of rowhouses and single-family homes. The construction impacts on nearby residents would not be considered a disproportionately high or adverse impact due to the fact that Build Alternative 1 cannot avoid construction along these streets in order to improve the project intersection, and other residents and workforce populations near the Study Area, regardless of income and race, would experience the same construction impacts. Short-term air quality and noise level impacts may occur during construction; however the impacts would be temporary and would not disproportionately affect low income or minority populations, as all alternatives involve the same percentage of minority population.

Under Build Alternative 1, there would be minor short-term adverse impacts to WMATA bus service along the Study Area corridor during some construction periods at the intersection. Three of the five bus Stops would need to be relocated to locations near their current locations to accommodate the new intersection configuration; however the proposed relocation of bus stops would be very close to the existing stops. Impacts would also be minor in the short term as adjustments to new bus stop locations are made by bus users at the intersection. However, long-term impacts after project implementation are anticipated to be negligible. The impacts on nearby residents of relocating bus stops would not be considered a disproportionately high or adverse impact on low-income or minority populations due to the fact that all residents and workforce populations in the vicinity of the Study Area would be affected by any bus stop changes needed for the implementation of Build Alternative 1.

Under Build Alternative 1, there would be many long-term improvements to the Study Area that would benefit the community, including low income and minority populations. These benefits include: improved intersection design and efficiency; increased mobility; improved safety for all modes of travel; and improved physical appearance including the availability of a larger open park space.

While Study Area residents include low-income and minority populations, these populations would not experience disproportionately high and adverse effects resulting from Build Alternative 1 or any of the associated construction activities. Therefore, short-term and long-term impacts would be negligible under Build Alternative 1. The impacts to environmental justice do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

NPS, DDOT and other cooperating agencies actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors. Public scoping was initiated with a comment period via the Internet in the Fall of 2012. Additionally, information was distributed to local residents and businesses, and a presentation with project information was given at an Advisory Neighborhood Commission (ANC) 7B Meeting on May 16, 2013 to solicit citizen feedback. Prior public participation was extensive for the Great Streets Project, and is discussed in the *Scoping* section of this EA.

Build Alternative 2 – Conventional Intersection Alternative

As with Build Alternative 1, while Study Area residents include low-income and minority populations, these populations would not experience disproportionately high and adverse effects resulting from Build Alternative 2 or any of the associated construction activities. For the reasons listed under Build Alternative 1, Build Alternative 2 would also result in negligible short and long-term impacts to minority or low-income populations in the Study Area. The impacts to environmental justice do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.5 Economics and Development

No Build Alternative

Under the No Build Alternative, the reconfigured intersection would not be constructed and no acquisition of NPS lands would occur. Therefore, the No Build Alternative would not directly impact existing economics and development. However, the No Build Alternative would not help revitalize the intersection in furtherance of the Great Streets Initiative and would not serve as a catalyst for new

development and jobs at the intersection in the long term. Therefore, the No Build Alternative could indirectly have minor adverse impacts to economics and community revitalization in the long term.

Build Alternative 1 – Revised Square Alternative

The economic and social characteristics of the residential areas or businesses in and surrounding the project intersection, including the NPS-owned land could be temporarily impacted by road closures to reconfigure the project intersection under Build Alternative 1. Closures at the intersection could require traffic to be re-routed; however temporary impacts due to construction are not expected to eliminate access to any businesses, attractions, or residential areas in the Study Area. Impacts to economics and development in the short term during construction would be minor.

Build Alternative 1 is based on the Great Streets Initiative Concept Design which supports local demand for goods and services through economic revitalization. In the long term, the NPS and DDOT exchange of land jurisdiction and intersection improvements may have a positive influence in the Study Area due to a potential increase in economic activity for businesses resulting from various improvements proposed as part of the Great Streets Initiative. According to the 2008 Market Assessment in the Pennsylvania Avenue, SE Corridor Development Plan, Twining Square (L'Enfant Square) is "the natural location for the largest retail concentration…given the strong visibility and access created by the intersection of Pennsylvania and Minnesota Avenue, to the proximity to I-295, and its role as a gateway to the east side of the River neighborhoods."[59] Build Alternative 1 would enhance the appeal and quality of the area which could help attract retail and jobs. Indirect impacts to economics and development would therefore be minor and beneficial, defined by local changes in economic activity, employment and income levels, or population migration or immigration. The impacts to economics and development are minor in context and intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

As with Build Alternative 1, short-term closures at the intersection could require traffic to be re-routed, however temporary impacts due to construction is not expected to eliminate access to any businesses, attractions, or residential areas adjacent to Pennsylvania and Minnesota Avenues, SE. Impacts to economics and development in the short term during construction would be minor. Build Alternative 2 maintains the current priority of moving vehicles through the intersection and is unlikely to promote Great Streets Principles at this intersection, as defined by local changes in economic activity, employment and income levels, or population migration or immigration. Therefore, impacts to economics and development under Build Alternative 2 would be negligible in the long term. The impacts to economics and development do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.6 Joint Development

No Build Alternative

There are no existing or proposed joint development projects in the Study Area; therefore, the No Build Alternative would have no impact on joint development.

Build Alternative 1 – Revised Square Alternative

Economic development plans are ongoing along the 2300 Block of Pennsylvania Avenue, SE immediately west of Twining Square. The District aims to help implement the goals of the Great Streets Initiative by redeveloping this key corridor to eliminate blight, provide quality neighborhood-serving retail and potential job creation. These economic development plans are not "joint development" projects and there are no joint development projects in the Study Area. Therefore Build Alternative 1 would have no impact on joint development in the short term or long term. The impacts to joint development do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

As under Build Alternative 1, there are no existing or proposed joint development projects in the Study Area; therefore Build Alternative 2 would have no impact on joint development in the short term or long term. The impacts to joint development do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.7 Aesthetics and Visual Quality

NEPA requires the examination of environmental impacts of a Federal proposed action including those associated with visual and aesthetic quality.

No Build Alternative

Under the No Build Alternative, there would be no development to the Study Area and no changes to the existing visual quality or aesthetics in the Study Area. The intersection configuration would remain as it is, with the fragmented green spaces on both sides of Pennsylvania Avenue, SE continuing under ownership of the NPS. The No Build Alternative would not result in impacts to aesthetics or visual quality in the Study Area.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 involves primarily changes at ground level and there are no significant views or vistas in the vicinity of the Study Area. It is anticipated that indirect visual effects/changes in view in the long term would be limited to those areas directly fronting the streets involved and from the traffic lanes of the roadway in the vicinity of the intersection. The only anticipated above ground element, the relocation and improvement of traffic control lights, represents a restricted visual change. Build Alternative 1 is compatible with the existing environment and could potentially improve aesthetics and visual quality in the area in the long term. The project was designed to create a place of distinction in keeping with the goals of the Great Streets Improvement Project, and would provide more contiguous parkland and new roadway infrastructure. Therefore, impacts to aesthetic and visual quality in the immediate Study Area vicinity would be minor and beneficial in the long term as a result of Build Alternative 1. Minor short-term adverse impacts to views may occur within the intersection during construction while the area temporarily is used as a construction site, but the impacts would be of limited duration. Therefore, the impact is minor in context and intensity and does not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Build Alternative 2 design changes would result in a typical at-grade intersection, new grass and additional green space. Therefore as with Build Alternative 1, implementation of Build Alternative 2 would result in minor short-term adverse impacts on views during construction, but in the long term, could result in minor beneficial aesthetic and visual quality impacts. Therefore, the impact is minor in context and intensity and does not rise to a level of "significance" as defined by CEQ.

4.3.8 Health and Safety

No Build Alternative

The No Build Alternative would have no direct impact on health in the community. However, without the exchange of land jurisdiction between NPS and DDOT and implementation of design improvements and operations at the intersection, the vehicular and pedestrian safety issues would not be addressed. Therefore, the No Build Alternative would result in minor long-term negative impacts on safety of the pedestrians and motorists in the Study Area because existing safety issues would not be resolved.

Build Alternative 1 – Revised Square Alternative

Improved signage, traffic-calming measures, and relocated crosswalks with more effective crossing signals would improve visibility and operations at the Pennsylvania and Minnesota Avenues, SE intersection. Therefore Build Alternative 1 would result in safer navigation of the intersection for pedestrians and motorists. Pedestrian and bicycle safety would improve and vehicle-pedestrian conflicts would be reduced as a result of improvements under Build Alternative 1. Improvements would increase bicycle and pedestrian safety in the Study Area due to geometry upgrades and traffic management measures, including new bulb-outs, sidewalk expansion, crosswalk configuration, traffic movement restrictions and traffic signalization. For example, Build Alternative 1 would prohibit left turn movements from southbound L'Enfant Square, SE and northbound Minnesota Avenue, SE into the center of the square and would control the southbound right-turning vehicular traffic from L'Enfant Square, SE by traffic signals to minimize the existing vehicle-pedestrian conflicts. The improvements would also result in improved access to bus stops and other destinations at the intersection. For a complete list of improvements to the pedestrian and bicycle network, see Section 4.4.1

General motorists would be prohibited from making left turns from both directions on Pennsylvania and Minnesota Avenues and would be forced around the square; however, emergency response vehicles would be permitted to make all turns at this intersection. Autoturn™ simulation determined that the Build Alternative 1 design provides ample room for emergency vehicles to safely navigate the turns at the intersection.

Americans with Disabilities Act (ADA)-compliable ramps and sidewalks would be provided and/or improved in the Study Area where they do not exist currently, which would encourage pedestrians' use of these safety features. Build Alternative 1 would also consolidate park area that would be larger, more accessible and safer than the existing medians for pedestrian and visitor use

Under Build Alternative 1, the improvements to the intersection would result in minor beneficial impacts to health and safety in the long term in the local area. Short-term impacts would be negligible; motorists, pedestrians, bicyclists and transit users that frequently use the intersection may need to become familiar

with new traffic patterns; however, this period would be of short duration. Therefore, the impact is minor in context and intensity and does not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Build Alternative 2 does not reduce traffic speed for pedestrian use or make the intersection notably safer for pedestrians, however, it would improve the intersection operationally for motorists since visibility would likely improve and confusion would be reduced. Changes to the intersection to improve pedestrian safety include new bulb-outs, shorter crosswalks in some locations, and enhanced traffic signalization. However, the crossing distances between medians, vehicle turning movements, and the number of lanes at this intersection would not advance the pedestrian and bicycle network. In addition, the crosswalk across Pennsylvania Avenue, SE connecting Minnesota Avenue, SE to the north and south of the eastside intersection is a long crossing distance for pedestrians. Due to the design of Build Alternative 2 and the turning radius needed to make a left turn on Pennsylvania Avenue from southbound Minnesota Avenue, there is no median or refuge area breaking up the crosswalk. Therefore, the crosswalk crosses all lanes of Pennsylvania Avenue, SE without a median or refuge area.

Impacts to emergency services would be similar to Build Alternative 1. Autoturn™ was used to confirm that emergency vehicles could navigate the intersection with Build Alternative 2 design as well.

Build Alternative 2 would result in negligible impacts to health and safety in the long term because safety for motorists may improve due to operational improvements, but pedestrian safety issues would not be addressed to the extent needed and many of the existing safety conflicts would still remain. Similar to Build Alternative 1, impacts to pedestrian and motorist health and safety during construction would be negligible. The impacts to health and safety do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.9 Community Resources

No Build Alternative

Emergency Response

Under the No Build Alternative, the reconfigured intersection would not be constructed and existing conditions would remain. The No Build Alternative would have no impact on emergency response services in the Study Area.

Schools

Under the No Build Alternative, the reconfigured intersection would not be constructed and existing conditions would remain, therefore the No Build Alternative would have no direct impact on schools in the Study Area. The intersection and vehicular and pedestrian safety issues would remain unchanged.

Parks and Recreation Areas

The No Build Alternative would have no direct impact on NPS land in the Study Area; the NPS reservations would remain under NPS jurisdiction and would not transfer to DDOT as they would under the Build Alternatives. In the long-term, the No Build Alternative would result in indirect, minor adverse

impacts since the parcels would remain fragmented by the current intersection configuration and provide no recreational purpose to the community.

Places of Worship

Under the No Build Alternative, the reconfigured intersection would not be constructed and existing conditions would remain, therefore the No Build Alternative would have no direct impact on places of worship in the Study Area. The intersection and vehicular and pedestrian safety issues would remain unchanged.

Build Alternative 1 – Revised Square Alternative

Emergency Services

Under Build Alternative 1, turns for general motorists would be prohibited from making left turns from both directions on Pennsylvania and Minnesota Avenues and would be forced around the square; however emergency response vehicles would be permitted to make all turns at this intersection. Autoturn™ simulation was used in order to ensure that emergency vehicles (fire trucks) would be able to make the proposed turns (new turning radii) at the intersection. The two closest fire stations to the project site, Engine Company 19 and 8 are both operating with Seagrave 1250 gallons per minute (gpm) pumper trucks.[60] As a conservative estimate, the vehicle used to confirm the turning radii in the simulation was a Simon Duplex AS 110 Ladder Truck, which has a longer overall body length and longer wheelbase than the trucks being used by the nearby fire stations. The simulation determined that the Build Alternative 1 design provides ample room for emergency vehicles to navigate the turns at the intersection.

The roadway width for vehicles traveling westbound straight through the intersection on Pennsylvania Avenue would be reduced from 4 lanes to 3 lanes within the square, and the designated left-turn lanes traveling eastbound on Pennsylvania Avenue (turning north onto Minnesota Avenue) would be removed under Build Alternative 1. However the number of lanes and lane widths are maintained to the east and west of the intersection.

During periods of construction, emergency vehicles may be forced to take alternate routes to avoid temporary closures at this intersection; therefore minor short-term impacts for emergency services may result. DDOT would work with emergency services to inform them of any closures and to help develop maintenance of traffic routes. Impacts would be negligible in the long term.

Schools

Build Alternative 1 would have no direct impact on schools in the Study Area. The reconfigured intersection under Build Alternative 1 would improve vehicular and pedestrian safety concerns, which would benefit students and school faculty who may utilize the intersection when traveling to and from school. Minor short-term adverse impacts during construction may occur as students and faculty may be re-routed temporarily; long-term impacts would be beneficial and minor in the local area.

Parks and Recreation Areas

Under Build Alternative 1, the reconfigured intersection would include removal of the roadways which bisect the NPS-owned reservations on either side of Pennsylvania Avenue, SE. The result would be consolidated green space which would promote park area continuity. Under current conditions, the green

space is fragmented and is not sufficient for recreational use by the community. Build Alternative 1 would benefit the community by providing more contiguous green space to be used as park space for passive recreational activity. In the long term, Build Alternative 1 would result in a minor beneficial impact to park operations and management in the local area because the Study Area would be less fragmented and easier to maintain for mowing and any other maintenance functions. Additionally the new, larger areas of green space and reduced travel speeds around the "square" would improve visitors' ability to use the parks for activities. Build Alternative 1 would include minor short-term adverse impacts to the park area during construction. The impacts would be limited to the period of construction.

Places of Worship

Build Alternative 1 would have no direct impact on places of worship in the Study Area. The reconfigured intersection under Build Alternative 1 would improve vehicular and pedestrian safety concerns, which would benefit those who may utilize the intersection when traveling to and from places of worship. Minor short-term adverse impacts during construction may occur as pedestrians and motorists may be re-routed temporarily; long-term impacts would be beneficial and minor in the local area.

Summary

The impacts to community resources do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

Emergency Services

Impacts to emergency services would be similar to Build Alternative 1. Autoturn™ was used to confirm that emergency vehicles could navigate the intersection with Build Alternative 2 design as well. During periods of construction, emergency vehicles may be forced to take alternate routes to avoid temporary closures at this intersection; therefore minor short-term impacts for emergency services may result. DDOT would work with emergency services to inform them of any closures and to help develop maintenance of traffic routes. Impacts would be negligible in the long term.

Schools

Build Alternative 2 would have no direct impact on schools in the Study Area. The reconfigured intersection under Build Alternative 2 would improve some traffic operations for motorists using this intersection, which would benefit students and school faculty who may utilize the intersection when walking or driving to and from school. Minor short-term adverse impacts during construction may occur as students and faculty may be re-routed temporarily; long-term impacts would be negligible.

Parks and Recreation Areas

Under Build Alternative 2, the reconfigured intersection would include removal of the roadways which bisect the NPS-owned reservations on either side of Pennsylvania Avenue, SE. The result would be consolidated green space which would promote park area continuity. Under current conditions, the green space is fragmented and is not sufficient for recreational use by the community. Build Alternative 2 would enhance the park and recreation areas by providing more contiguous green space. Vehicle speeds

would remain the same through the intersection, however, and it may be difficult for visitors to the intersection to use the park area for recreational purposes. Overall impacts to park and recreation areas under Build Alternative 2 would be minor and beneficial in the long term due to the addition of contiguous park space. Build Alternative 2 would result in minor short-term adverse impacts to the park area during construction.

Places of Worship

Build Alternative 2 would have no direct impact on places of worship in the Study Area. The reconfigured intersection under Build Alternative 2 would improve some traffic operations for motorists using this intersection, which would benefit those who may utilize the intersection when traveling to and from places of worship. Minor short-term adverse impacts during construction may occur as pedestrians and motorists may be re-routed temporarily; long-term impacts would be negligible.

Summary

The impacts to community resources do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.3.10 Utilities and Infrastructure

The differences in utility design between the Build Alternatives are negligible. Either design would involve the relocation of overhead facilities as the intersection is approached. It appears that the grade would be similar in either design, as would the drainage design.

No Build Alternative

Under the No Build Alternative, there would be no disturbance to the Study Area. Therefore, there would be no impacts to utilities located in the Study Area.

Build Alternative 1 – Revised Square Alternative

In Build Alternative 1, utility poles would have to be moved back to accommodate the intersection improvements. Existing overhead services from the pole lines to the buildings would have to be reworked, as well as the connection from pole to pole at the intersection corners.

Underground utility lines, including storm drains, sewer drains, electric, gas and telephone lines are located throughout the project intersection. Implementation of Build Alternative 1 would require consultation with all utility companies in order to determine the exact locations and depths to the utilities in the project intersection. There is potential for minor short-term impacts to utilities if utility lines need to be relocated due to construction or changes to the intersection layout. However, long-term impacts after project implementation are anticipated to be negligible. The impacts to utilities and infrastructure do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ. A more detailed survey, including subsurface utility locating and mapping would be performed as design development advances.

Impacts to WMATA (transit) infrastructure are addressed in *Section 4.4, Transportation*.

Build Alternative 2 – Conventional Intersection Alternative

Impacts to utilities under Build Alternative 2 would be negligible in the long term and could be minor in the short term if utility line relocation is necessary, similar to those described under Build Alternative 1. The impacts to utilities and infrastructure do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.4 Transportation

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 roadway, bicycle and pedestrian, or transit users.

Minor: The change to travel time, convenience, or benefit would be noticeable to a small number of roadway, bicycle and pedestrian, or transit 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 roadway, bicycle and pedestrian, or transit users.

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

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

4.4.1 Bicycle and Pedestrian Network

Methodology

A qualitative analysis was performed for the bicycle and pedestrian network at the subject intersection to identify deficiencies of the current configuration based on the existing field observations and discuss the improvements proposed by the Build Alternatives.

No Build Alternative

Under the No Build Alternative, no transfer of jurisdiction between NPS and DDOT would occur and no improvements would be made to the existing intersection configuration. This would result in continuation of the existing pedestrian and bicycle safety issues, inefficiencies, and dangerous interaction with vehicles at the intersection. Pedestrians and bicyclists would continue using existing sidewalks and crosswalks that are available or navigating the intersection illegally by jaywalking, for example.

The No Build Alternative would have minor short-term and long-term adverse impacts to the bicycle and pedestrian network due to continuing safety issues and inefficient bicycle and pedestrian infrastructure.

Build Alternative 1 – Revised Square Alternative

Pedestrian and bicycle safety were given high priority in Build Alternative 1 and vehicle-pedestrian conflicts were reduced as much as possible. Build Alternative 1, shown in **Figure 4-1**, would have the following pedestrian and bicyclist improvements (numbers correspond to the figure):

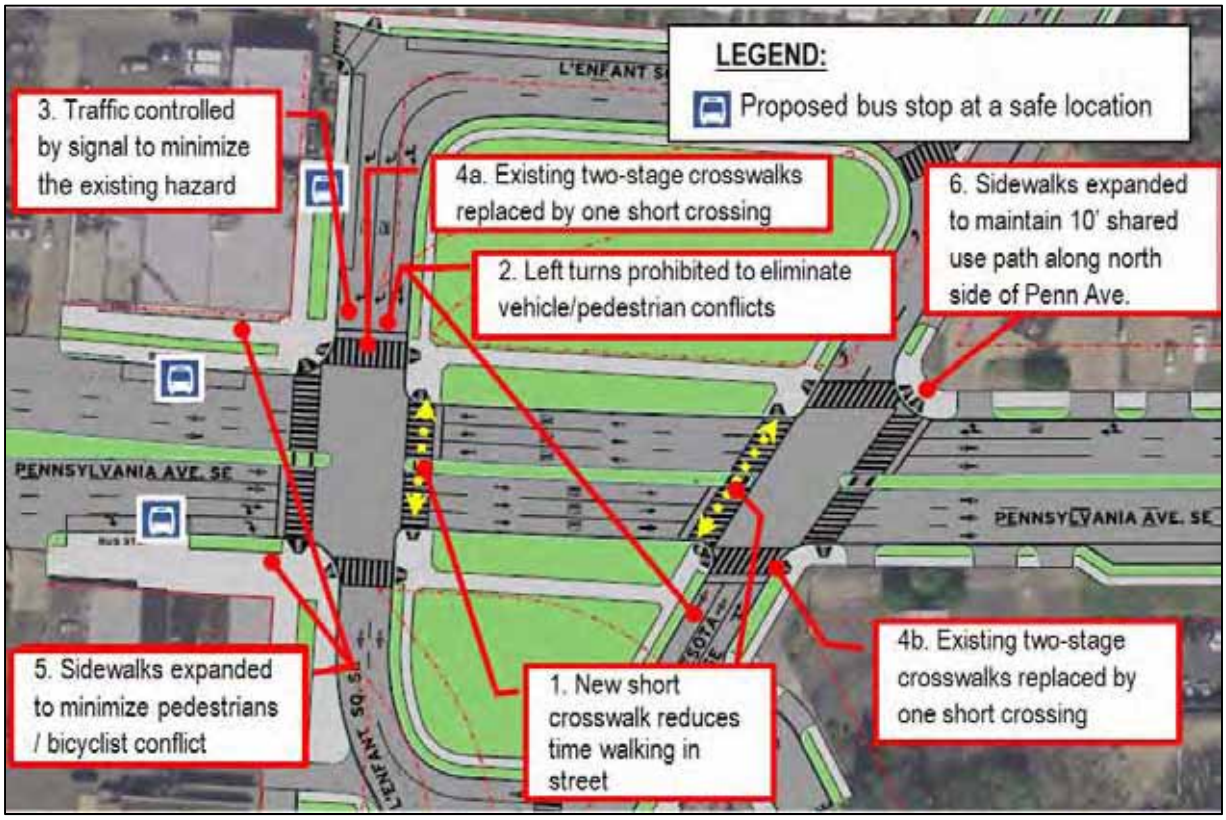
1. A new short crosswalk would be provided in the center of the square for pedestrians to cross Pennsylvania Avenue, SE;
2. Left turn movements from southbound L'Enfant Square, SE and northbound Minnesota Avenue, SE into the center of the square would be prohibited to eliminate conflicts between vehicles and crossing pedestrian;
3. The southbound right-turning vehicular traffic from L'Enfant Square, SE would be controlled by traffic signals to minimize the existing vehicle-pedestrian conflict;
4. New short crosswalks would replace the existing two-step crosswalks on northbound Minnesota Avenue, SE and southbound L'Enfant Square, SE to reduce the time walking in the street therefore enhance safety;
5. The expanded sidewalks at the southwest and northwest corners of Pennsylvania Avenue, SE and L'Enfant Square, SE would minimize the conflict between pedestrians waiting at the bus stop and bicyclists traveling on the sidewalk; and
6. Sidewalks would be expanded along the north side of Pennsylvania Avenue, SE to the northeast of the intersection to maintain 10' shared use path for bicycle and pedestrian convenience to and through the intersection.

During construction, temporary disruption would occur to users of the intersection; however, detour routes and alternate paths would be dedicated during this time. In general, the intersection would be improved with minimal disruption and ample mitigation to offset any negative effects; therefore, Build Alternative 1 would have negligible short-term impacts on the bicycle and pedestrian network.

In the long term, the Build Alternative 1 improvements would benefit the bicycle and pedestrian network in the Study Area due to geometry upgrades and traffic management measures, including new bulb-outs, sidewalk expansion, crosswalk configuration, traffic movement restrictions and traffic signalization. The improvements would also result in improved access to bus stops and other destinations at the intersection. Therefore, Build Alternative 1 would have moderate long-term beneficial impacts to the pedestrian and bicycle network both for local residents and for commuters to and through the Study Area, which would have noticeable benefits for a large number of intersection users. This includes benefits for the local community, including residents, visitors, and commuters through the Study Area. The impacts to the bicycle and pedestrian network do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Figure 4-1

Pedestrian Improvements – Build Alternative 1



Source: HNTB Corporation, 2013.

Build Alternative 2 – Conventional Intersection Alternative

Build Alternative 2, shown in **Figure 4-2**, would improve pedestrian and bicyclist safety in the following ways (numbers correspond to figure):

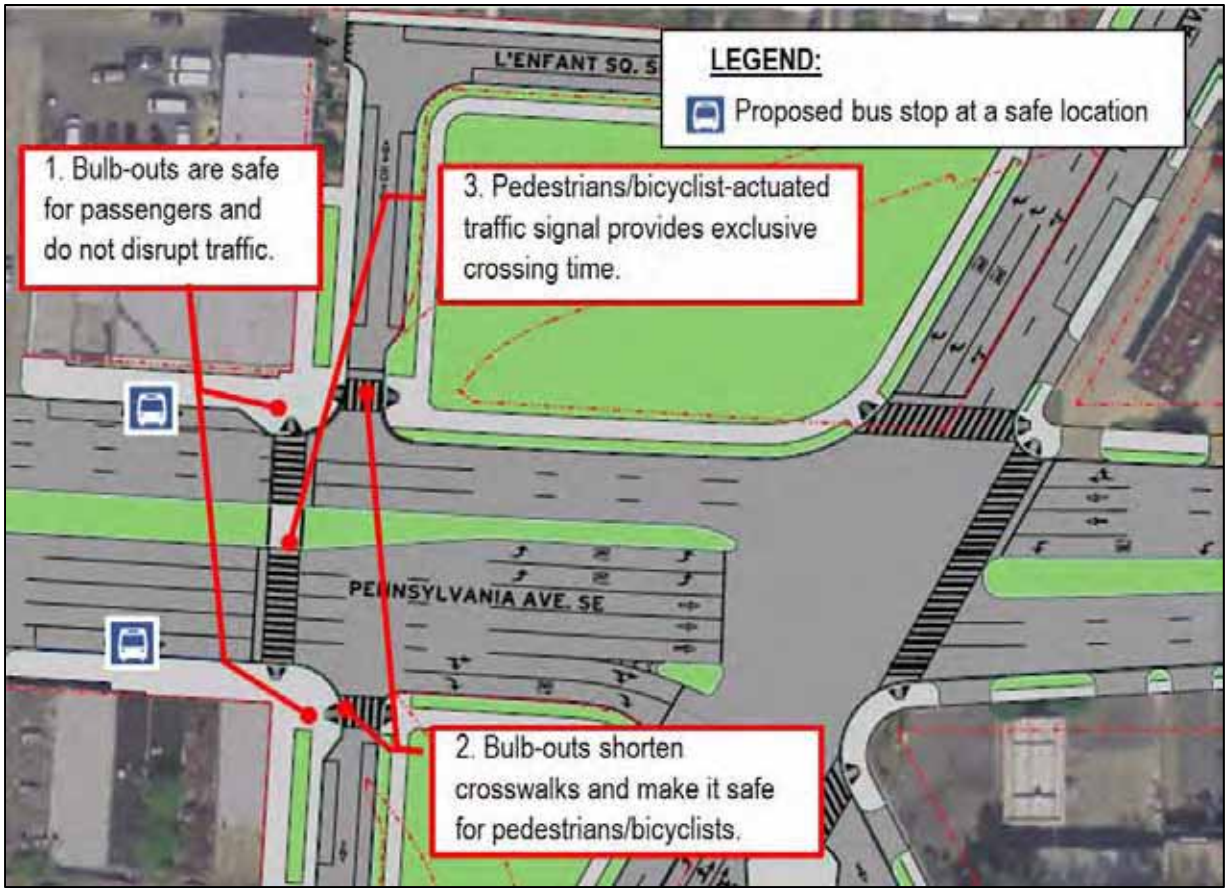
1. Proposed bulb-outs would provide exclusive bus bays that eliminate interruption to traffic on travel lanes and allow safe boarding and alighting for passengers;
2. Proposed bulb-outs will shorten the crosswalk therefore reduce the time that pedestrian walk in street; and
3. A proposed pedestrian/bicyclist activated traffic signal at the crosswalk would provide exclusive walk time for pedestrians and bicyclists to safely cross Pennsylvania Avenue without vehicular traffic conflict.

During construction, temporary disruption would occur to users of the intersection; however, detour routes and alternate paths would be dedicated during this time. In general, the intersection would be improved with minimal disruption and ample mitigation to offset any negative effects; therefore, Build Alternative 2 would have negligible short-term impacts on the bicycle and pedestrian network.

In the long term, the Build Alternative 2 improvements would provide an overall benefit to the bicycle and pedestrian network in the Study Area over the No Build Alternative. Changes to the intersection to improve the pedestrian network include new bulb-outs, shorter crosswalks in some locations, and enhanced traffic signalization. However, the crossing distances between medians, vehicle turning movements, and the number of lanes at this intersection would not advance the pedestrian and bicycle network. In addition, the crosswalk across Pennsylvania Avenue, SE connecting Minnesota Avenue, SE to the north and south of the eastside intersection is a long crossing distance for pedestrians. Due to the design of Build Alternative 2 and the turning radius needed to make a left turn on Pennsylvania Avenue from southbound Minnesota Avenue, there is no median or refuge area breaking up the crosswalk. Therefore the crosswalk crosses all lanes of Pennsylvania Avenue, SE without a median or refuge area. However, given the overall improvement for pedestrians and bicyclists over the No Build Alternative, Build Alternative 2 would have minor beneficial impacts in the long term to the pedestrian and bicycle network. The impacts to the bicycle and pedestrian network do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Figure 4-2

Pedestrian Improvements – Build Alternative 2



Source: HNTB Corporation, 2013.

4.4.2 Roadway Network and Traffic

Methodology

This study analyzes traffic operations during AM and PM peak hours when vehicular and pedestrian traffic reach the highest levels and most accidents occur. It is important to capture these study periods, as it represents the most intense period of use for the Study Area. Based on the data and field observations, the peak hours of traffic are identified as 7:30-8:30 AM in the morning and 4:30-5:30 PM in the evening.

Per FHWA and DDOT requirements, the following years were included in the analysis for all alternatives:

- 2012 (Existing Year)
- 2015 (Opening Year)
- 2040 (Future Design Year)

Table 4.1 summarizes the scenarios included in the analysis.

Table 4.1
List of Scenarios included in the Traffic Analysis

Scenario	Analysis Year					
	2012		2015		2040	
	AM	PM	AM	PM	AM	PM
Existing Condition	X	X	-	-	-	-
No Build Alternative	-	-	X	X	X	X
Build Alternative 1 - Revised Square	-	-	X	X	X	X
Build Alternative 2 - Conventional Intersection	-	-	X	X	X	X

Notes: X : included in the analysis.
- : not included in the analysis.

Source: HNTB Corporation, 2013.

As described previously in Section 3.4.2, Intersection ID's 2 through 5 are intersections that are adjacent to the project intersection that would not be modified by any of the Build Alternatives. However, nearby impacts to these adjacent intersections due to each of the Build Alternatives were considered in the evaluation of alternatives for this EA.

To evaluate and compare the vehicular traffic operations of all alternatives, the following measures of effectiveness (MOE's) were selected for this study:

- Intersection Delay
- Intersection Level of Service (LOS)
- Approach Delay
- Approach LOS
- Queues on key approaches
- Travel times

Per FHWA guidance[61], traffic simulation was used to model, analyze and compare the traffic operations of the alternatives. Synchro software (version 8.0) was used to model and analyze the traffic signal operations including delays, LOS and queues. VISSIM software (version 5.3) was used to provide the travel time results.

For more detailed methodology, data collection methods, traffic volume development, and traffic simulation model calibration techniques, refer to *Appendix F, Traffic Analysis Report*. The peak hour turning movement volumes used in the EA are also presented in *Appendix F*.

No Build Alternative

Vehicular Delays and LOS

LOS is an estimate of the performance efficiency and quality of an intersection or roadway as established by the *Highway Capacity Manual (HCM)*[62] methodology. The HCM methodology measures the degree of delay at intersections using a letter scale from A to F, A being the free flow condition and F being the total gridlock. LOS D or better is desirable for urban corridors.

2015 AM

As shown in **Table 4.2**, the No Build Alternative would operate at an acceptable LOS for the project intersections (1A and 1B) during the 2015 AM peak hour.

The adjacent intersections (2 through 5) would operate at acceptable levels with the exception of the Pennsylvania Avenue and 27th Street (ID 3), the intersection just east of the project intersection, which would operate at LOS F due to increased traffic.

2040 AM

As shown in **Table 4.3**, the increased traffic demand in 2040 would cause the LOS to deteriorate to LOS F from LOS D in 2015 at the L'Enfant Square, SE and Pennsylvania Avenue (1A) intersection under the No Build Alternative. The No Build alternative would experience delay at nearly 158 sec/veh at LOS F. The east side intersection (1B) in the No Build Alternative would operate adequately at LOS C.

Of the adjacent intersections, Pennsylvania and 27th Street (ID 3) would continue to operate at LOS F and the Pennsylvania Avenue and northbound 295 Ramp (ID 5) to the west of the project intersection would deteriorate to LOS F as well. The other two adjacent intersections would operate at A or B.

2015 PM

In 2015, shown in **Table 4.4**, all intersections in the No Build Alternative would operate at an acceptable LOS D or better.

2040 PM

In 2040, shown in **Table 4.5**, the increased traffic volumes would cause the two signals (1A and 1B) at Pennsylvania Avenue at Minnesota Avenue and L'Enfant Square, SE to deteriorate to LOS F in the No Build Alternative.

The adjacent intersections (2 through 5) would operate at acceptable levels with the continued exception of the Pennsylvania Avenue and 27th Street (ID 3), the intersection just east of the project intersection, which would operate at LOS F with 144.6 sec/veh delay.

Vehicular Queues

Tables 4.6 and 4.7 show the queuing analysis results on key movements at the intersections for all three alternatives in the AM and PM peak hours.

AM Peak Hour

During the AM peak hour, the northwest bound Pennsylvania Avenue carries heavy commuter traffic towards the District. In the 2015 AM, the longest queue is traveling northwest with 667 feet. Queues at the intersection 2015 in the AM are slightly longer than the existing condition (2012).

PM Peak Hour

In the PM peak hour, similar queue results were found. The longest average queue length in the PM is 804 feet traveling in the southeast direction at the L'Enfant Square, SE and Pennsylvania Avenue (1A) intersection in 2015 and greater than 1,970 feet at the same intersection in the southeast direction in 2040.

Vehicular Travel Times

Travel time, the amount of time it takes for a motorist to travel from point A to point B, is a direct reflection of motorist experience. Therefore it is a critical and effective measure when comparing the traffic impact of alternatives. The AM and PM peak hour results of travel time analysis for the Build Alternatives and the existing condition are shown in **Tables 4.8 and 4.9** respectively.

AM Peak Hour

Under the No Build Alternative, travel times at the intersection would remain similar to existing conditions, ranging from 1 minute traveling from Pennsylvania Avenue and 27th Street to Minnesota Avenue and 23rd Street to 6.3 minutes traveling from Minnesota Avenue and23rd St to Pennsylvania Avenue and the I-295 northbound Ramp in the AM. Travel times increase in 2040, but show a similar pattern to 2015.

PM Peak Hour

Similar to the AM comparison, in the PM peak hour, the travel times are similar to existing conditions (2012), and range from 1.8 minutes traveling from Pennsylvania Avenue and 27th St to Minnesota Ave and 23rd St to 4.8 minutes traveling from Pennsylvania Avenue and the 295 northbound Ramp to Minnesota Avenue and 23rd St. in 2015. Travel times increase in the 2040 No Build Alternative in the PM, but show similar patterns to 2015.

Summary of No Build Alternative

Under the No Build Alternative, the roadway configuration and traffic operational characteristics would remain unchanged from the existing condition, as shown in Figure 3-12 above.

In the opening year (2015), the No Build Alternative would operate adequately (LOS D or better) at the intersections of Pennsylvania at Minnesota Avenues and L'Enfant Square, SE. In 2040, due to the increased traffic demand, the No Build Alternative would operate at an undesirable LOS F at the Pennsylvania Avenue at L'Enfant Square intersection (1A) with heavy congestion. In general, vehicular delays and queue lengths would increase due to projected increases in traffic volumes.

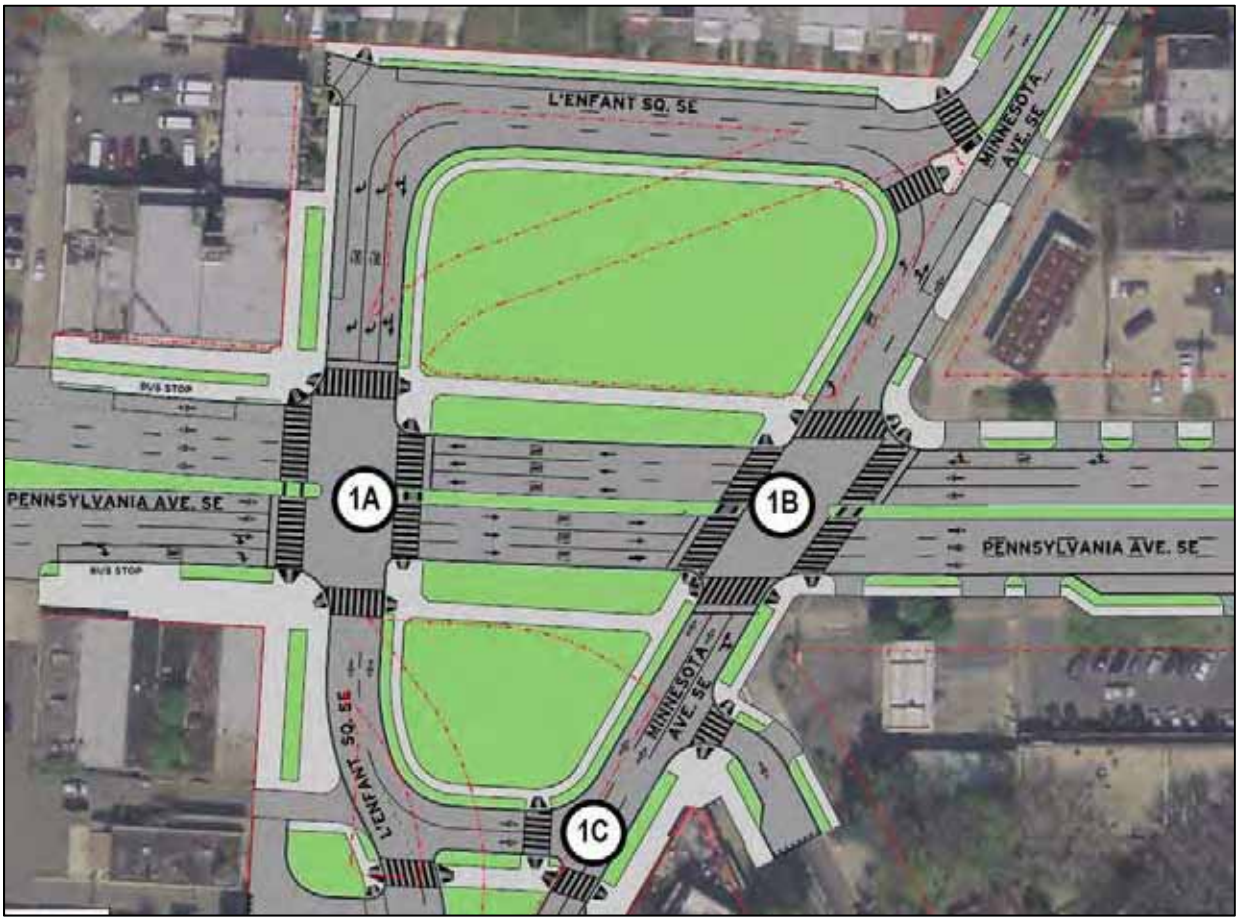
The No Build Alternative would have no short-term impacts because no construction would occur at the intersection. As traffic congestion and back-ups build in the future due to projected increases in volume, deteriorating conditions would occur on the roadway network and traffic under the No Build Alternative. As a result, the No Build Alternative would result in long-term minor adverse impacts to the roadway network and traffic; changes in travel time would be noticeable to motorists.

Build Alternative 1 – Revised Square Alternative

The intersections modeled in Build Alternative 1 are illustrated on **Figure 4-3.**

Figure 4-3

Key Traffic Intersections Analyzed – Build Alternative 1



Source: HNTB Corporation, 2013.

Vehicular Delays and LOS

2015 AM

As shown in Table 4.2, all three intersections (1A, 1B and 1C) in Build Alternative 1 would operate at an LOS B or C.

The four adjacent intersections (2 through 5) would operate similarly under all Build Alternatives; as with the No Build Alternative, Pennsylvania Avenue and 27th Street, the intersection just east of the subject intersection, would operate at LOS F due to increased traffic.

2040 AM

As shown in Table 4.3, the increased traffic demand in 2040 would cause the LOS to deteriorate to LOS F at the L'Enfant Square, SE and Pennsylvania Avenue (1A) intersection under Build Alternative 1, with a 116 sec/veh delay, which is slightly better than the 2040 No Build Alternative (158 sec/veh). The east intersection (1B) and south intersection would operate adequately at LOS D and C, respectively.

The LOS at the adjacent intersections would be the same as the No Build Alternative; Pennsylvania/27th Street (ID 3) would continue to operate at LOS F and the Pennsylvania Avenue and northbound 295 Ramp (ID 5) to the west of the subject intersection would deteriorate to LOS F as well. The other two adjacent intersections would operate at A or B.

2015 PM

In 2015, as shown in Table 4.4, all intersections in Build Alternative 1 would operate at an acceptable LOS C or better.

2040 PM

In 2040, as shown in Table 4.5, Build Alternative 1 would reduce the delays as compared to the No Build Alternative at the east signal (1B) from 105 sec/veh under the No Build in 2040 to 62 sec/veh and improve the LOS from F to E. The west intersection (1A) would operate at LOS F, as with the No Build Alternative.

The adjacent intersections (2 through 5) would operate at acceptable levels with the continued exception of the Pennsylvania Avenue and 27th Street (ID 3), the intersection just east of the subject intersection, which would operate at LOS F.

Vehicular Queues

Tables 4.6 and 4.7 compare the queuing analysis results on key movements at the intersections for all alternatives analyzed for the AM and PM peak hours, respectively.

AM Peak Hour

During the AM peak hour, the northwest bound Pennsylvania Avenue carries heavy commuter traffic towards the District. Compared to the No Build Alternative, Build Alternative 1 would have longer queues at the Pennsylvania Avenue and northbound Minnesota Avenue intersection (1B). This increase is attributed to the rerouted traffic around the square in Build Alternative 1 that would significantly increase

the volumes on the northeast bound approach. Additional green signal time would have to be taken away from the northwest bound traffic on Pennsylvania Avenue to meet the traffic demand of Minnesota Avenue. The queue on westbound Pennsylvania Avenue could be almost 760 feet long in 2015, reaching the 27th Street intersection, and would be even longer in 2040 AM.

PM Peak Hour

Similar queue results were found in the PM peak hour as the AM peak, however, the increase would not be as large as in the AM peak hour. Build Alternative 1 would have an average queue length of 64 feet in 2015, which would not reach the I-295 northbound ramp intersection. Some average queue lengths are reduced under Build Alternative 1 as compared to the No Build Alternative.

Vehicular Travel Times

The AM and PM peak hour results of travel time analysis for all alternatives analyzed and the existing condition are shown in Tables 4.8 and 4.9, respectively.

AM Peak Hour

In the AM peak hour, more than half of all approaches would take longer than the No Build Alternative because all left-turning vehicles would be required to go around the square to reach their destinations. Travel times under Build Alternative 1 range from 1.1 minutes traveling from Pennsylvania Avenue and 27th St to Minnesota Avenue and 23rd St to 7.1 minutes traveling from Minnesota Avenue and 23rd St to Pennsylvania Avenue and the I-295 northbound ramp in 2015. Travel times increase in 2040, but results show a similar pattern to 2015.

PM Peak Hour

Similar to the AM comparison, in the PM peak hour, the travel times would increase with Build Alternative 1 for most approaches, especially for northbound Minnesota Avenue traffic which could see travel times as high as 10 minutes due to the high volumes and congestion in the square. Travel times typically increase from 2015 and 204.

Summary of Build Alternative 1 – Revised Square Alternative

Under Build Alternative 1, the intersection would operate adequately (LOS D or better) in the opening year 2015. As with the No Build Alternative, due to increased traffic demand, this alternative would operate at an undesirable LOS F at the Pennsylvania and L'Enfant Square, SE intersection (1A) with heavy congestion in 2040. Compared to the No Build Alternative, Build Alternative 1 would cause longer queues on Pennsylvania at Minnesota Avenues, SE in the peak travel direction during AM and PM peak hours, and would increase travel times on most vehicular trips due to traffic being re-routed around the square.

During construction, temporary disruption could occur to vehicles using the intersection; however detour routes and alternate routes would be dedicated during this time, which help to offset impacts. It is anticipated that the intersection could be improved without major disruptions to commuters either through re-routing vehicles or by implementing the project in phases. Build Alternative 1 would have minor short-term impacts on the roadway network and traffic for short durations during construction.

Maintenance of traffic assumptions are included in *Section 4 8, Mitigation Measures*. Potential Maintenance of Traffic plans for Build Alternative 1 are included in *Appendix F, Traffic Analysis*.

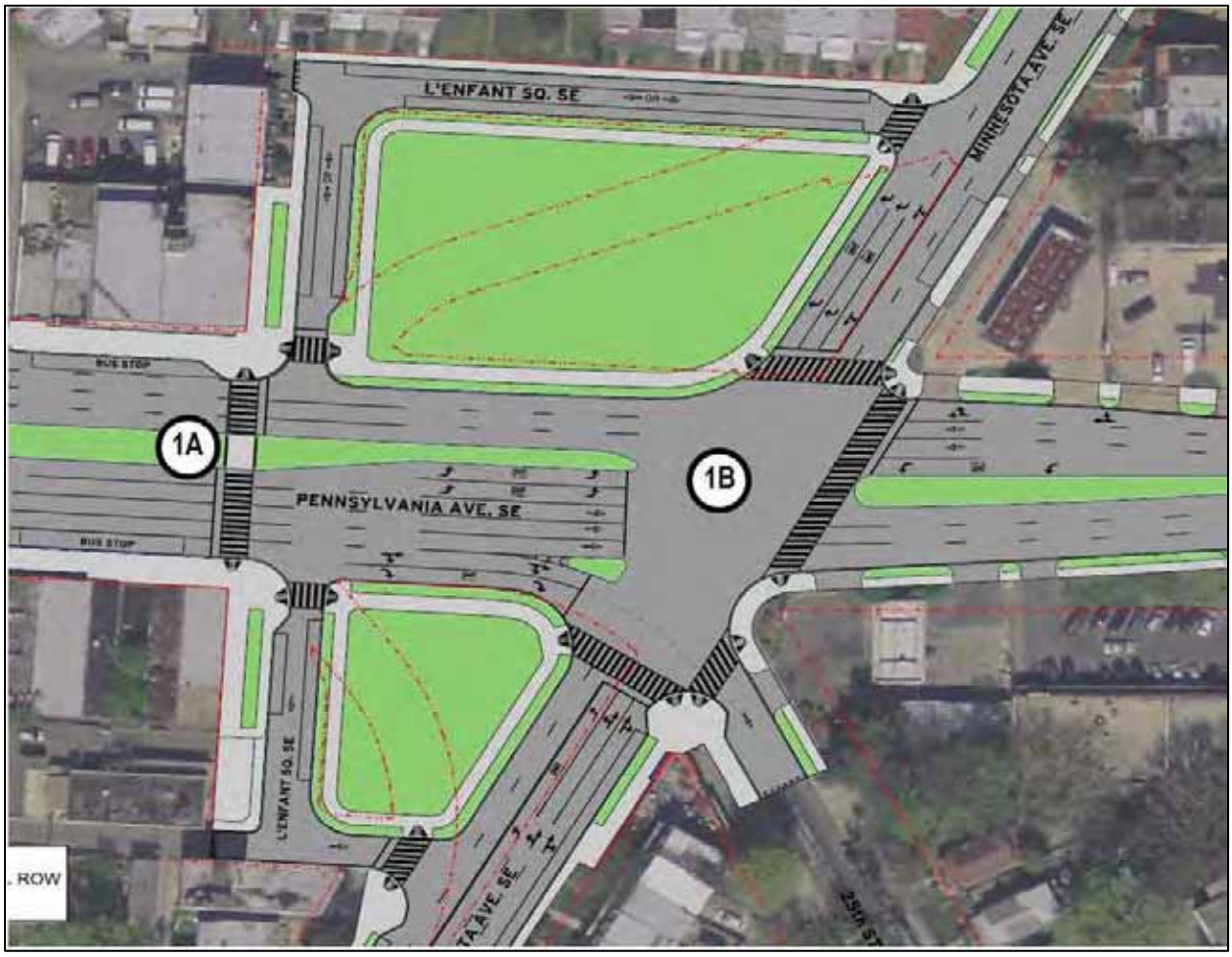
In the long term, Build Alternative 1 would result in minor adverse impacts to the roadway network and traffic due to the increase in queue length and vehicle trip time due to the design improvements and the traffic being re-routed around the square; changes in travel time would be noticeable to motorists. Build Alternative 1 is intended to slow down traffic and minimize interaction between vehicles and pedestrians. Although the technical findings of the traffic analysis show adverse impacts to the intersection by 2040 for LOS, queue lengths and travel times, the intended benefits at this intersection align with the Purpose and Need for the project. The impact to the roadway network and traffic is minor in context and intensity and therefore does not rise to a level of "significance" as defined by CEQ.

Build Alternative 2 – Conventional Intersection Alternative

The intersections modeled in Build Alternative 2 are illustrated on **Figure 4-4.**

Figure 4-4

Key Traffic Intersections Analyzed – Build Alternative 2



Source: HNTB Corporation, 2013.

Vehicular Delays and LOS

2015 AM

As shown in Table 4.2, the Pennsylvania and Minnesota Avenues, SE intersection (1B) would deteriorate to LOS F under Build Alternative 2 in the 2015 AM, as all movements would be accommodated at the reconfigured Pennsylvania Avenue and Minnesota Avenue intersection. The new pedestrian activated signal (1A) would operate at LOS A.

The four adjacent intersections (2 through 5) would operate similarly to the No Build Alternative, Pennsylvania Avenue and 27th Street, the intersection just east of the subject intersection, would operate at LOS F due to increased traffic.

2040 AM

As shown in Table 4.3, the LOS would deteriorate to an unacceptable LOS E with a 58 sec/veh delay at the L'Enfant Square, SE and Pennsylvania Avenue (1A) intersection and LOS F with a 274 sec/veh delay at the Pennsylvania and Minnesota Avenues, SE intersections (1B), which is worse than under the No Build and Build Alternative 1, which would operate at LOS D or C, respectively, at the same intersection.

LOS at the adjacent intersections would be the same as the No Build Alternative; Pennsylvania Avenue and 27th Street (ID 3) would continue to operate at LOS F and the Pennsylvania Avenue and northbound 295 Ramp (ID 5) to the west of the subject intersection would deteriorate to LOS F as well. The other two adjacent intersections would operate at A or B.

2015 PM

In 2015, shown in Table 4.4, all intersections in Build Alternative 2 would operate at an acceptable LOS D or better.

2040 PM

In the 2040 PM, as shown in Table 4.5, Build Alternative 2 would eliminate the heavy delays at the west signal (1A) by moving all vehicular traffic to the east side signal (1B). The west signal (1A) would operate at LOS A and the east signal (1B) would remain LOS F with comparable delays to the No Build Alternative; however, all four approaches at the east side signal (1B) would experience LOS F, while there is only one approach at LOS F in the No Build Alternative.

The adjacent intersections (2 through 5) would operate at acceptable levels with the continued exception of the Pennsylvania Avenue and 27th Street (ID 3), the intersection just east of the project intersection, which would operate at LOS F.

Vehicular Queues

Tables 4.6 and 4.7 compare the queuing analysis results on key movements at the intersections for all alternatives for the AM and PM peak hours, respectively.

AM Peak Hour

During the AM peak hour, the northwest bound Pennsylvania Avenue, SE carries heavy commuter traffic towards the District. Compared to the No Build Alternative, Build Alternative 2 would have longer queues at the Pennsylvania Avenue and northbound Minnesota Avenue intersection (1B). This increase can be attributed to the fact that all traffic crossing Minnesota Avenue, SE would be rerouted to one intersection (1B); this would cause higher demand on all approaches and more delays and queues in all directions. The westbound Pennsylvania Avenue queue could be over 1,000 feet long in 2015 and reach the 28th Street intersection, and would be slightly longer in 2040.

PM Peak Hour

Similar queue results were found in the PM peak hour as the AM peak hour, however, the increase would not be as large as in the AM peak hour. Build Alternative 2 would have an average queue length of 562 feet in 2015, greater than the Revised Square and No Build Alternatives, but would still not reach the I-295 northbound ramp intersection. Some average queue lengths are reduced under this alternative as compared to the No Build Alternative.

Vehicular Travel Times

The AM and PM peak hour results of travel time analysis for all alternatives and the existing condition are shown in Tables 4.8 and 4.9, respectively.

AM Peak Hour

Under Build Alternative 2 in the AM peak hour, most approaches in 2015 would experience shorter travel times than under the No Build Alternative due to simplified design configuration. Travel times range from 1.4 minutes traveling from Pennsylvania Avenue and 27th Street to Pennsylvania Avenue and I-295 northbound Ramp to 4.7 minutes traveling from Minnesota Avenue and 27th Street to Minnesota Avenue and 23rd Street in 2015. However, in 2040, over half of the travel times are longer with Build Alternative 2 than with the No Build Alternative.

PM Peak Hour

Similar to the AM comparison, in the PM peak hour, in 2015, Build Alternative 2 would reduce travel times for most approaches in 2015. However in 2040, this alternative would cause longer travel times than under the No Build Alternative for most approaches.

Summary of Build Alternative 2 – Conventional Intersection Alternative

Under Build Alternative 2, the intersection would experience heavy congestion (LOS F) in the AM peak period at the Pennsylvania and Minnesota Avenues, SE intersection (1B). By 2040, due to increased traffic demand, this alternative would continue to operate at undesirable LOS F at the east intersection (1B). Compared to the No Build Alternative, Build Alternative 2 would cause longer queues on Pennsylvania Avenue at Minnesota Avenue, SE in the peak travel direction during AM and PM peak hours. In the 2015 PM, travel times would be reduced as compared to the No Build Alternative for the majority of trips in 2015 under this alternative; however in the 2040 PM, the travel times are comparable to the No Build Alternative.

During construction, temporary disruption could occur to vehicles using the intersection; however detour routes and alternate routes would be dedicated during this time, which help to offset impacts. It is anticipated that the intersection could be improved without major disruptions to commuters either through re-routing vehicles or by implementing the project in phases. Build Alternative 2 would have minor short-term impacts on the roadway network and traffic for short durations during construction. Maintenance of Traffic assumptions are included in *Section 4.8,Mitigation Measures*.

In the long term, Build Alternative 2 would result in minor adverse impacts to the roadway network and traffic; changes in travel time would be noticeable to motorists. Queues lengths during the AM and PM peak hours in 2040 would be longer than the No Build Alternative, and by 2040, travel times would also be comparable to the No Build Alternative. The impact to the roadway network and traffic is minor in context and intensity and therefore does not rise to a level of "significance" as defined by CEQ.

Table 4.2

Traffic Delay (in Second/Vehicle) and LOS Results – 2015 AM

ID	INTERSECTION	APPROACH	2015 NO BUILD				2015 REVISED SQUARE				2015 CONV. INTERSECTION			
			APPROACH		INTERSECTION		APPROACH		INTERSECTION		APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq. & Pennsylvania Ave	SWB	295.2	F	40.7	D	74.7	E	25.7	C	-		0.1	A
		SWR (L'Enfant Sq.)	0.4	A			-	-			-	-		
		SEB	12.7	B			14.2	B			0.1	A		
		NWB	13.1	B			4.8	A			0.2	A		
1B	Pennsylvania Ave & Minnesota Ave	SEB	18.6	B	19.1	B	4.2	A	23.4	C	46.8	D	117.5	F
		NWB	20.2	C			23.9	C			97.1	F		
		NEB	15.5	B			35.2	D			124.4	F		
		SWB	-				-				292.4	F		
1C*	L'Enfant Sq South & Minnesota Ave NB	NET	-		-		19.9	B	18.8	B	-		-	
		SEL					17.4	B						
2	Minnesota Ave & 23rd St	EB	4.6	A	10.8	B	4.6	A	10.8	B	4.6	A	10.8	B
		WB	4	A			4	A			4	A		
		NB	29.3	C			29.3	C			29.3	C		
3	Pennsylvania Ave & 27th St	WB	367	F	86.3	F	367	F	86.6	F	367	F	86.1	F
		NB	158.1	F			158.1	F			158.1	F		
		SEB	14.3	B			15.8	B			13.3	B		
		NWB	62.2	E			62.2	E			62.2	E		
4	Minnesota Ave & 27th St	NB	10.4	B	0.9	A	10.4	B	0.9	A	10.4	B	0.9	A
		NEB	0	A			0	A			0	A		
		SWB	0	A			0	A			0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	26	C	26.6	C	26	C	29.6	C	26	C	31.1	C
		NWB	27.4	C			32.2	C			34.5	C		

Note: * Intersection 1C only exists in the Revised Square Alternative.

Source: HNTB Corporation, 2013.

Table 4.3

Traffic Delay (in Second/Vehicle) and LOS Results – 2040 AM

ID	INTERSECTION	APPROACH	2040 NO BUILD				2040 REVISED SQUARE				2040 CONV. INTERSECTION			
			APPROACH		INTERSECTION		APPROACH		INTERSECTION		APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq. & Pennsylvania Ave	SWB	932.9	F	158.1	F	296.5	F	115.9	F	-		58.4	E
		SWR (L'Enfant Sq.)	1.3	A			-	-			-	-		
		SEB	14.2	B			19.5	B			0.1	A		
		NWB	17.6	B			18.9	B			80.4	F		
1B	Pennsylvania Ave & Minnesota Ave	SEB	29.7	C	32.7	C	4.4	A	48.6	D	47.7	D	274.1	F
		NWB	21.8	C			70.5	E			153.1	F		
		NEB	70.7	E			23.3	C			309.1	F		
		SWB	-				-				696.1	F		
1C*	L'Enfant Sq South & Minnesota Ave NB	NET	-		-		21.7	C	23.4	C	-		-	
		SEL					25.4	C						
2	Minnesota Ave & 23rd St	EB	6.2	A	12	B	6.2	A	12	B	6.2	A	12	B
		WB	5.9	A			5.9	A			5.9	A		
		NB	30.4	C			30.4	C			30.4	C		
3	Pennsylvania Ave & 27th St	WB	404.5	F	103.5	F	404.5	F	103.7	F	404.5	F	102.6	F
		NB	178.9	F			178.9	F			178.9	F		
		SEB	14.7	B			15	B			10.7	B		
		NWB	89.7	F			89.7	F			89.7	F		
4	Minnesota Ave & 27th St	NB	11.2	B	0.6	A	11.2	B	0.6	A	11.2	B	0.6	A
		NEB	0	A			0	A			0	A		
		SWB	0	A			0	A			0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	59.1	E	101.9	F	59.1	E	109.2	F	59.1	E	106.9	F
		NWB	128.6	F			140.3	F			136.5	F		

Note: * Intersection 1C only exists in the Revised Square Alternative.

Source: HNTB Corporation, 2013.

Table 4.4

Traffic Delay (in Second/Vehicle) and LOS Results – 2015 PM

ID	INTERSECTION	APPROACH	2015 NO BUILD				2015 REVISED SQUARE				2015 CONV. INTERSECTION			
			APPROACH		INTERSECTION		APPROACH		INTERSECTION		APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq. & Pennsylvania Ave	SWB	193.9	F	37	D	51	D	33.2	C	-		0.3	A
		SWR (L'Enfant Sq.)	0.2	A			-				-	-		
		SEB	29.6	C			36.6	D			0.4	A		
		NWB	4.2	A			1.9	A			0.1	A		
1B	Pennsylvania Ave & Minnesota Ave	SEB	3.6	A	25	C	3.6	A	24.2	C	33.1	C	45.2	D
		NWB	73.6	E			8.8	A			38.5	D		
		NEB	49.6	D			65.9	E			78.6	E		
		SWB	-				-				91.8	F		
1C*	L'Enfant Sq. South & Minnesota Ave NB	NET	-		-		39.3	D	27.7	C	-		-	
		SEL					22.3	C						
2	Minnesota Ave & 23rd St	EB	4.7	A	8.1	A	4.7	A	8.1	A	4.7	A	8.1	A
		WB	4.5	A			4.5	A			4.5	A		
		NB	29	C			29	C			29	C		
3	Pennsylvania Ave & 27th St	WB	57.1	E	17.8	B	57.1	E	19	B	57.1	E	13.1	B
		NB	52	D			52	D			52	D		
		SEB	11.5	B			13.3	B			4.4	A		
		NWB	20.1	C			20.1	C			20.1	C		
4	Minnesota Ave & 27th St	NB	14.9	B	1.1	A	14.9	B	1.1	A	14.9	B	1.1	A
		NEB	0	A			0	A			0	A		
		SWB	0	A			0	A			0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	5.9	A	7.4	A	5.9	A	10.7	B	5.9	A	13.2	B
		NWB	12.1	B			25.3	C			35.4	D		

Note: * Intersection 1C only exists in the Revised Square Alternative.

Source: HNTB Corporation, 2013.

Table 4.5

Traffic Delay (in Second/Vehicle) and LOS Results – 2040 PM

ID	INTERSECTION	APPROACH	2040 NO BUILD				2040 REVISED SQUARE				2040 CONV. INTERSECTION			
			APPROACH		INTERSECTION		APPROACH		INTERSECTION		APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq. & Pennsylvania Ave	SWB	160.2	F	176.3	F	53.9	D	170.4	F	-		1.4	A
		SWR (L'Enfant Sq.)	0.2	A			-	-			-	-		
		SEB	247.7	F			245.3	F			2	A		
		NWB	7.7	A			3.1	A			0	A		
1B	Pennsylvania Ave & Minnesota Ave	SEB	11.5	B	105.3	F	41.5	D	61.7	E	104.3	F	119.4	F
		NWB	328.7	F			8.6	A			151.9	F		
		NEB	46.4	D			172.2	F			179	F		
		SWB	-				-				103.2	F		
1C*	L'Enfant Sq. South & Minnesota Ave NB	NET	-		-		36.9	D	29.1	C	-		-	
		SEL					27.1	C						
2	Minnesota Ave & 23rd St	EB	4.2	A	7.6	A	4.2	A	7.6	A	4.2	A	7.6	A
		WB	5.2	A			5.2	A			5.2	A		
		NB	28.8	C			28.8	C			28.8	C		
3	Pennsylvania Ave & 27th St	WB	55.8	E	144.6	F	61.1	E	147.4	F	61.1	E	147.4	F
		NB	83.7	F			106.2	F			106.2	F		
		SEB	205.5	F			205.8	F			205.8	F		
		NWB	39.7	D			39.6	D			39.6	D		
4	Minnesota Ave & 27th St	NB	34.3	D	3.9	A	34.3	D	3.9	A	33.8	D	3.9	A
		NEB	0	A			0	A			0	A		
		SWB	0	A			0	A			0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	14.4	B	16.6	B	14.4	B	23.1	C	14.4	B	30.1	C
		NWB	23.3	C			49.4	D			77.1	E		

Note: * Intersection 1C only exists in the Revised Square Alternative.

Source: HNTB Corporation, 2013.

Table 4.6

Queuing Analysis Results (in Feet) – AM

ID	INTERSECTION	DIRECTION	EXISTING	2015			2040		
				NO BUILD	REVISED SQ.	CONV. INT.	NO BUILD	REVISED SQ.	CONV. INT.
1A	L'Enfant Sq.	SWT	~333	~344	~328	-	~857	~1165	-
	&	SET	165	169	151	-	243	257	-
	Pennsylvania Ave	NWT	619	667	73	106	842	~113	~1538
1B		SEL	136	138	-	~176	~194	-	~216
		SET	5	6	25	99	9	29	150
	Pennsylvania Ave	NWL	-	-	-	5	-	-	4
	&	NWT	338	360	758	~1037	363	~1009	~1114
	Minnesota Ave	NEL	~102	~109	-	~316	~481	-	~559
		NET	0	1	280	191	55	323	~308
		SWL	-	-	-	128	-	-	~372
		SWT	-	-	-	127	-	-	~372
1C*	L'Enfant Sq. South &	NET	-	-	191	-	-	263	-
	Minnesota Ave NB	SEL	-	-	39	-	-	150	-

Note: * Intersection 1C only exists in the Revised Square Alternative.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Source: HNTB Corporation, 2013.

Table 4.7

Queuing Analysis Results (in Feet) – PM

ID	INTERSECTION	DIRECTION	EXISTING	2015			2040		
				NO BUILD	REVISED SQ.	CONV. INT.	NO BUILD	REVISED SQ.	CONV. INT.
1A	L'Enfant Sq	SWT	~314	~323	260	-	~279	241	-
	&	SET	775	804	845	-	~1970	~2016	-
	Pennsylvania Ave	NWT	79	80	13	0	154	38	73
1B		SEL	179	180	-	288	359	-	~579
		SET	12	13	64	562	~1149	~1179	~1298
	Pennsylvania Ave	NWL	-	-	-	4	-	-	4
	&	NWT	250	256	101	293	~733	186	~805
	Minnesota Ave	NEL	172	175	-	193	135	-	~192
		NET	170	173	~417	197	134	~624	~184
		SWL	-	-	-	~208	-	-	~265
		SWT	-	-	-	~208	-	-	~265
1C*	L'Enfant Sq South &	NET	-	-	236	-	-	180	-
	Minnesota Ave NB	SEL	-	-	420	-	-	574	-

Note: * Intersection 1C only exists in the Revised Square Alternative.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Source: HNTB Corporation, 2013.

Table 4.8
Travel Time Analysis Results (in Minutes) – AM

FROM	TO	EXISTING	2015			2040		
			NO BUILD	REVISED SQ.	CONV. INT.	NO BUILD	REVISED SQ.	CONV. INT.
Penn Ave/ 295NB Ramp	Minn Ave/ 27th St	2.6	2.6	3.0	4.3	4.5	7.5	7.1
Penn Ave/ 295NB Ramp	Penn Ave/ 27th St	1.8	1.8	1.8	1.8	3.3	4.3	3.8
Penn Ave/ 295NB Ramp	Minn Ave/ 23rd St	2.3	2.3	3.1	2.2	3.9	8.1	4.0
Penn Ave/ 295NB Ramp	Minn Ave/ 25th St	1.8	1.8	3.0	1.6	3.3	7.5	3.6
Penn Ave/ 27th St	Penn Ave/ 295NB Ramp	1.3	1.3	1.2	1.4	1.3	1.4	1.5
Penn Ave/ 27th St	Minn Ave/ 23rd St	1.0	1.0	1.1	1.5	1.1	1.1	1.4
Minn Ave/ 23rd St	Penn Ave/ 295NB Ramp	6.1	6.3	7.1	3.2	7.0	9.1	6.4
Minn Ave/ 23rd St	Minn Ave/ 27th St	3.8	4.1	4.6	2.1	4.5	5.2	4.4
Minn Ave/ 23rd St	Penn Ave/ 27th St	4.3	4.6	5.0	2.4	5.2	5.2	5.2
Minn Ave/ 23rd St	Minn Ave/ 25th St	3.7	3.8	4.0	1.8	4.0	4.0	4.3
Minn Ave/ 27th St	Minn Ave/ 25th St	4.4	4.1	3.2	4.1	5.5	5.5	3.9
Minn Ave/ 27th St	Minn Ave/ 23rd St	4.5	4.3	3.5	4.7	5.6	5.7	4.5
Minn Ave/ 27th St	Penn Ave/ 295NB Ramp	4.9	5.0	3.9	4.0	5.7	5.4	3.6

Source: HNTB Corporation, 2013.

Table 4.9
Travel Time Analysis Results (in Minutes) – PM

FROM	TO	EXISTING	2015			2040		
			NO BUILD	REVISED SQ.	CONV. INT.	NO BUILD	REVISED SQ.	CONV. INT.
Penn Ave/ 295NB Ramp	Minn Ave/ 27th St	3.4	3.9	7.9	2.9	5.2	6.7	5.2
Penn Ave/ 295NB Ramp	Penn Ave/ 27th St	3.4	3.9	5.4	2.2	5.4	4.9	5.5
Penn Ave/ 295NB Ramp	Minn Ave/ 23rd St	4.2	4.8	8.1	2.6	5.9	6.7	5.0
Penn Ave/ 295NB Ramp	Minn Ave/ 25th St	4.1	4.6	8.0	2.2	5.3	6.5	4.7
Penn Ave/ 27th St	Penn Ave/ 295NB Ramp	2.2	2.2	1.3	1.9	3.2	1.8	2.6
Penn Ave/ 27th St	Minn Ave/ 23rd St	1.8	1.8	1.2	1.4	2.6	1.2	1.8
Minn Ave/ 23rd St	Penn Ave/ 295NB Ramp	2.3	2.3	11.1	2.4	2.3	11.1	3.2
Minn Ave/ 23rd St	Minn Ave/ 27th St	2.4	2.6	10.9	1.9	2.1	10.3	2.3
Minn Ave/ 23rd St	Penn Ave/ 27th St	3.2	3.2	11.6	2.5	2.7	10.5	3.1
Minn Ave/ 23rd St	Minn Ave/ 25th St	2.4	2.3	10.4	1.7	1.6	10.1	1.9
Minn Ave/ 27th St	Minn Ave/ 25th St	3.0	3.3	1.8	2.5	2.8	2.2	4.1
Minn Ave/ 27th St	Minn Ave/ 23rd St	3.0	3.2	2.3	3.0	2.6	2.6	4.5
Minn Ave/ 27th St	Penn Ave/ 295NB Ramp	1.8	1.8	2.2	1.3	2.0	2.2	1.9

Source: HNTB Corporation, 2013.

4.4.3 Transit

No Build Alternative

The No Build Alternative would have no impact on transit operations or the public's ability to use transit in the Study Area. No changes to the configuration of the intersection or traffic movements would occur; all five bus stops and the existing bus routes would remain at their current locations. See Figure 3-14 in Section 3.4.3.

Build Alternative 1 – Revised Square Alternative

As shown in **Figure 4-5**, Bus Stop 1 and Bus Stop 5 would remain at their existing locations. Bus Stop 2, located just west of the intersection on eastbound Pennsylvania Avenue, SE, would have to be pulled back farther west of the Pennsylvania Avenue and L'Enfant Square intersection to ensure enough space for buses to change lanes and continue traveling eastbound on Pennsylvania Avenue, SE.

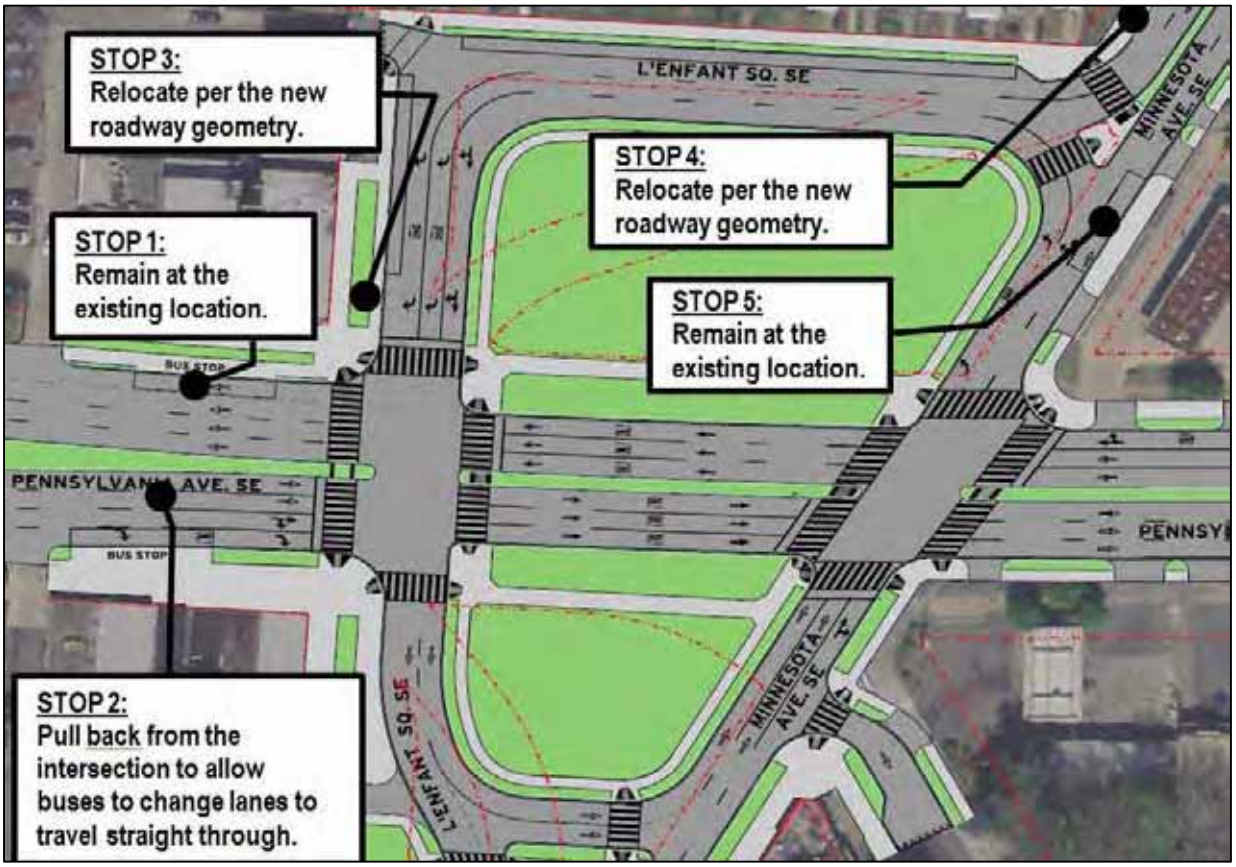
Bus Stop 3 and Bus Stop 4 would also have to be moved to new locations due to their existing location along the cut-through road north of the square (and Pennsylvania Avenue, SE), which would be removed and filled in with park land under Build Alternative 1. All three bus routes that Bus Stop 3 serves, V7, V8 and V9, use the cut-through road from Minnesota Avenue, SE to turn right at Pennsylvania Avenue, SE; therefore Bus Stop 3 could be relocated on L'Enfant Square, SE near Pennsylvania Avenue, SE headed westbound.

The only route Stop 4 serves (U2) continues southbound on Minnesota Avenue, SE through the intersection. Due to the reconfiguration with Build Alternative 1, Stop 4 could be relocated further back, just prior to entering the intersection at the corner of Minnesota Avenue, SE and L'Enfant Square, SE so that U2 buses would not have to cross two lanes in a short distance to continue straight through the intersection.

Under Build Alternative 1, there would be minor short-term impacts to WMATA bus service along the Study Area corridor as a result of construction at the intersection. Three of the five Bus Stops would need to be relocated to locations near their current locations to accommodate the new intersection configuration. WMATA would have to adjust their bus routes to accommodate these minor bus stop relocations and bus routes would have to be adjusted to account for the revised intersection design and operations. Impacts would also be minor in the short term as adjustments to bus routes and bus stop locations are being made by WMATA bus drivers and bus users at the intersection. However, long-term impacts after project implementation are anticipated to be negligible. The impacts to transit do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Figure 4-5

Possible Bus Stop Locations – Build Alternative 1



Source: HNTB Corporation, 2013.

Build Alternative 2 – Conventional Intersection Alternative

As shown in **Figure 4-6**, Bus Stops 1, 2 and 5 would remain at their existing locations under Build Alternative 2. A bulb-out would be added to Bus Stop 1 to accommodate buses using this bus stop.

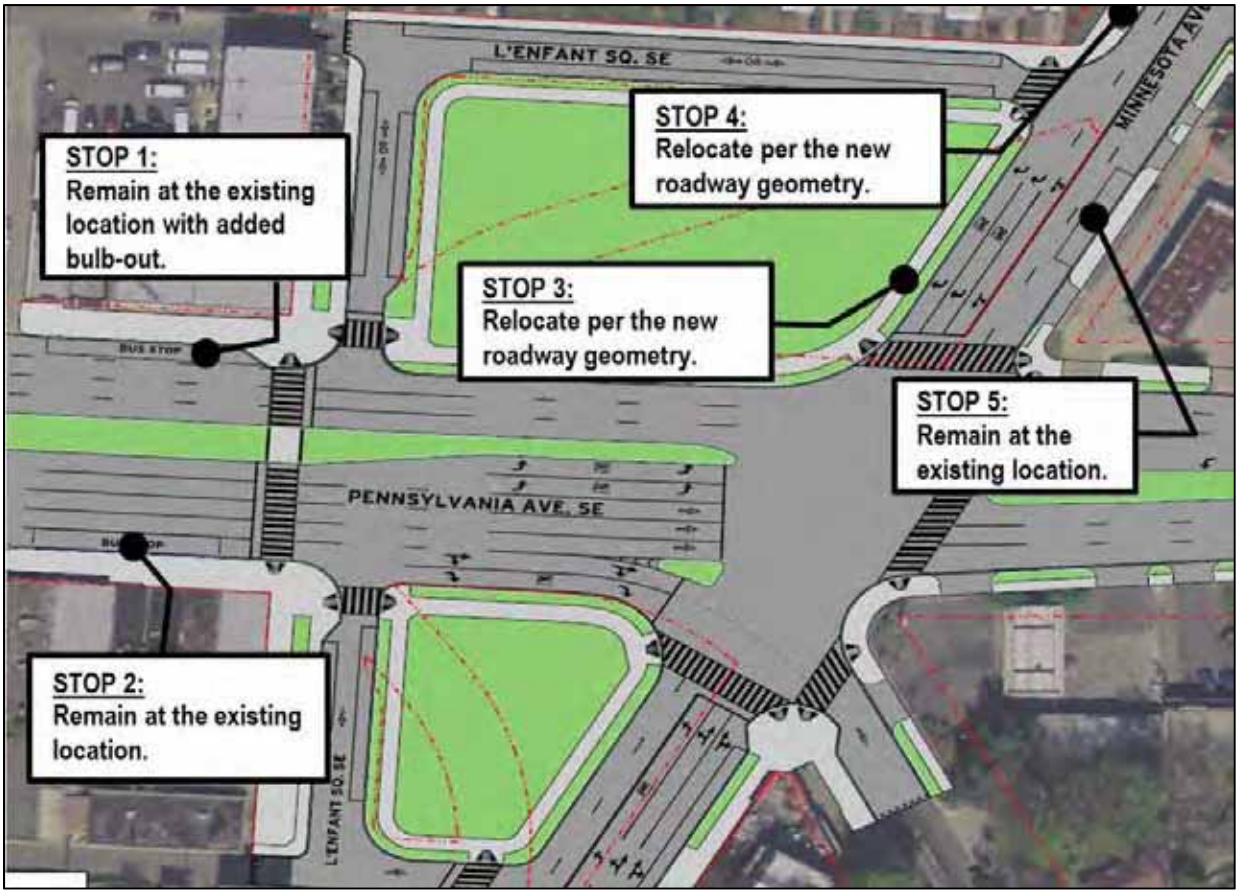
Bus Stop 3 and Bus Stop 4 would have to be moved to new locations due to their existing location along the cut-through road north of the square (and Pennsylvania Avenue, SE), which would be removed and filled in with park land under Build Alternative 2. All three bus routes that Bus Stop 3 serves, V7, V8 and V9, use the cut-through road from Minnesota Avenue, SE to turn right at Pennsylvania Avenue, SE; therefore Bus Stop 3 could be relocated to Minnesota Avenue, SE, just prior to the right-turn onto Pennsylvania Avenue, SE.

The only route Stop 4 serves (U2) continues southbound on Minnesota Avenue, SE through the intersection. Due to the reconfiguration under Build Alternative 2, Stop 4 could be relocated to Minnesota Avenue, SE, just prior to entering the north side of the intersection at the corner of Minnesota Avenue, SE and L'Enfant Square, SE and would then have to move to the far left lane to continue southbound on Minnesota Avenue.

As with Build Alternative 1, impacts to the bus routes and bus stops would be minor in the short term during construction. Impacts would also be minor in the short term as adjustments to bus routes and bus stop locations are made by WMATA bus drivers and bus users at the intersection. However, long-term impacts after project implementation are anticipated to be negligible. The impacts to transit do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Figure 4-6

Possible Bus Stop Locations – Build Alternative 2



Source: HNTB Corporation, 2013.

4.5 Air Quality

The air quality analyses addresses the results of a CO-hot-spot analysis for the existing condition (2012) and No-Build (2015 and 2040), along with the Build Alternatives (2015 and 2040), comparing the results to the NAAQS. The proposed opening year is 2015 and the design year is 2040. The analysis also presents a discussion on ozone, $PM_{2.5}$, and Mobile Source Air Toxics (MSATs).

Refer to *Appendix G, Air Quality Report* for detailed air quality analysis and results.

Impact Thresholds

The following thresholds were used to determine the magnitude of effects to the air quality environment:

Impact: An impact would result if the alternative would contribute to a violation of the NAAQS or result in any increase in MSAT emissions.

Duration: **Short-term –** Impact would be a result of construction emissions; **Long-term –** Impact would be a result of a change in emissions due to the fully constructed alternative.

4.5.1 Regional Conformity

Regional level transportation conformity is addressed through the approval of the LRP and the TIP. *The Air Quality Conformity Update of The 2012 Constrained Long Range Plan and The Fy2013-2018 Transportation Improvement Program* for the Washington Metropolitan Region was published on March 20, 2013. The Pennsylvania Avenue/Minnesota Avenue Great Streets Improvements project is identified as TIP ID: 2743 in the Constrained LRP. The project does not appear in the *Air Quality Conformity Update* since only projects that are "regionally significant" are listed and specifically modeled.[63] However, emissions from all projects are included in the regional emissions analysis.[64]

4.5.2 Project Level Conformity

Project level conformity analysis evaluates whether there are air quality impacts on a smaller scale than an entire nonattainment or maintenance area. It relates a project to the NAAQS on a more localized basis. The project level analyses address the results of a CO hot-spot analysis for the existing condition (2012) and No Build Alternative (2015 and 2040), along with the Revised Square and Conventional Intersection Build Alternatives (2015 and 2040), comparing the results to the NAAQS. The proposed opening year is 2015 and the design year is 2040. The analysis also presents a discussion on ozone and $PM_{2.5}$.

4.5.3 CO Hot-Spot (Microscale) Analysis

CO emissions are greatest from vehicles operating at low speeds and prior to complete engine warm-up (within approximately eight minutes of starting). Congested urban roads, therefore, tend to be the principal problem areas for CO. Because the averaging times associated with the CO standards are relatively short (1 and 8 hours), CO concentrations can be modeled using simplified "worst-case" meteorological assumptions. Modeling is also simplified considerably by the stable, non-reactive nature of CO.

4.5.4 Methodology

The CO hot-spot analysis followed the modeling guidelines presented in EPA's "Guideline for Modeling Carbon Monoxide from Roadway Intersections"[65] and EPA's "Using MOVES in Project-Level Carbon Monoxide Analyses."[66] The EPA's MOVES2010b (MOVES) and EPA's approved CAL3QHC 2.0 (CAL3QHC)[67] computer models were used to analyze vehicular emissions and the hourly dispersion of CO adjacent to the intersection of Pennsylvania and Minnesota Avenues, SE. Traffic and emissions for the existing (2012) condition, No Build (2015 and 2040), and the anticipated first year of operation (2015) and design year (2040) for the two Build alternatives were modeled. EPA's MOVES2010b was used to develop vehicular emission rates. MWCOG provided District specific input variables for MOVES.[68]

CAL3QHC is a pollutant dispersion-modeling program for predicting pollutant concentrations from motor vehicles under free-flow conditions, or in the vicinity of roadway intersections. Peak traffic volumes and average operating speeds from the traffic analysis Synchro 8 Reports were used to analyze

the intersection.[69] Thirty-one (31) air quality receptors, A1 – A31, were placed 10 feet away from the edge of pavement, at the stop line paralleling the traffic lanes and at 82 foot intervals as shown in **Figures 4-7**, **4-8**, and **4-9**. Two of the 31 receptors were located at the nearest entry doors to daycare facilities along Pennsylvania Avenue, southeast of the intersection of Pennsylvania Avenue, SE and Minnesota Avenue, SE. In accordance with EPA procedure, average speeds for each link were used to develop the CO emission factors with MOVES. Worst-case meteorological variables and an urban background CO concentration obtained from U.S. EPA AirData for the monitoring site at 420 34th Street N.E. were used in the CAL3QHC model. The 1-hour and 8-hour background concentration were the highest second maximum values at the three CO monitoring sites in the District for 2012.

4.5.5 Impact Assessment

No Build Alternative

The maximum 1-hour CO concentrations were 4.4 ppm for the 2015 No Build Alternative and 5.7 ppm for the 2040 No Build Alternative. The maximum 8-hour CO concentrations were 3.6 ppm for the 2015 No Build Alternative, and 4.5 ppm for the 2040 No Build Alternative. The 1-hour concentrations include a background concentration of 2.9 ppm and the 8-hour concentrations include a background concentration of 2.5 ppm.

Under the No Build Alternative, no changes to the Study Area would occur and there would be no impacts in the short term or long term.

Build Alternative 1 – Revised Square Alternative

Under Build Alternative 1, as shown in **Table 4.10**, the maximum 1-hour CO concentrations were 5.7 ppm in 2015 and 4.9 ppm in 2040. The maximum 8-hour CO concentrations, shown in **Table 4.11**, were 4.5 ppm in 2015 and 3.9 ppm in 2040. The 1-hour concentrations include a background concentration of 2.9 ppm and the 8-hour concentrations include a background concentration of 2.5 ppm. The results of the CO microscale air quality modeling indicates that none of these concentrations at the 31 receptors modeled exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS under Build Alternative 1.

Construction of Build Alternative 1 would likely take place over two construction seasons. During each construction season there would be localized increased emissions from construction equipment and particulate emissions from construction activities. Particulate emissions, whether from construction equipment diesel exhaust or dust from the construction activities, will be controlled as well as possible. Contractors will follow all DDOT Standard Construction Specification Sections that address the control of construction equipment exhaust or dust during construction. Impacts to air quality due to construction would be temporary and localized. Even though construction mitigation measures are not required, appropriate BMPs will be used to reduce engine activity or reduce emissions per unit or operating time. See *Section 4.8, Mitigation* for additional information on air quality mitigation measures.

Based on the air quality analysis completed for Build Alternative 1, the Proposed Action would not contribute to any violation of the NAAQS and meets the project level CO conformity requirements of 40 CFR 94.

Build Alternative 2 – Conventional Intersection Alternative

Under Build Alternative 2, the maximum 1-hour CO concentrations, shown in Table 4.10, were 4.8 ppm in 2015 and 5.8 ppm in 2040. The maximum 8-hour CO concentrations, shown in Table 4.11, were 3.8 ppm in 2015 and 4.5 ppm in 2040. The 1-hour concentrations include a background concentration of 2.9 ppm and the 8-hour concentrations include a background concentration of 2.5 ppm. The results of the CO microscale air quality modeling indicate that none of these concentrations at the 31 receptors modeled exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS under Build Alternative 2.

Short-term impacts during construction under Build Alternative 2 would be similar to Build Alternative 1.

Based on the air quality analysis completed for Build Alternative 2, the Proposed Action would not contribute to any violation of the NAAQS and meets the project level CO conformity requirements of 40 CFR 94.


Minnesota Ave SE
L'Enfant St SE
25th St
Pennsylvania Ave SE
Pennsylvania Ave SE
Vicholson St SE
LEGEND
Air Receptor Location
Figure 4-7
CO Hot Spot Analysis – No Build Alternative
Environmental Assessment
Source: HNTB Corporation, 2013

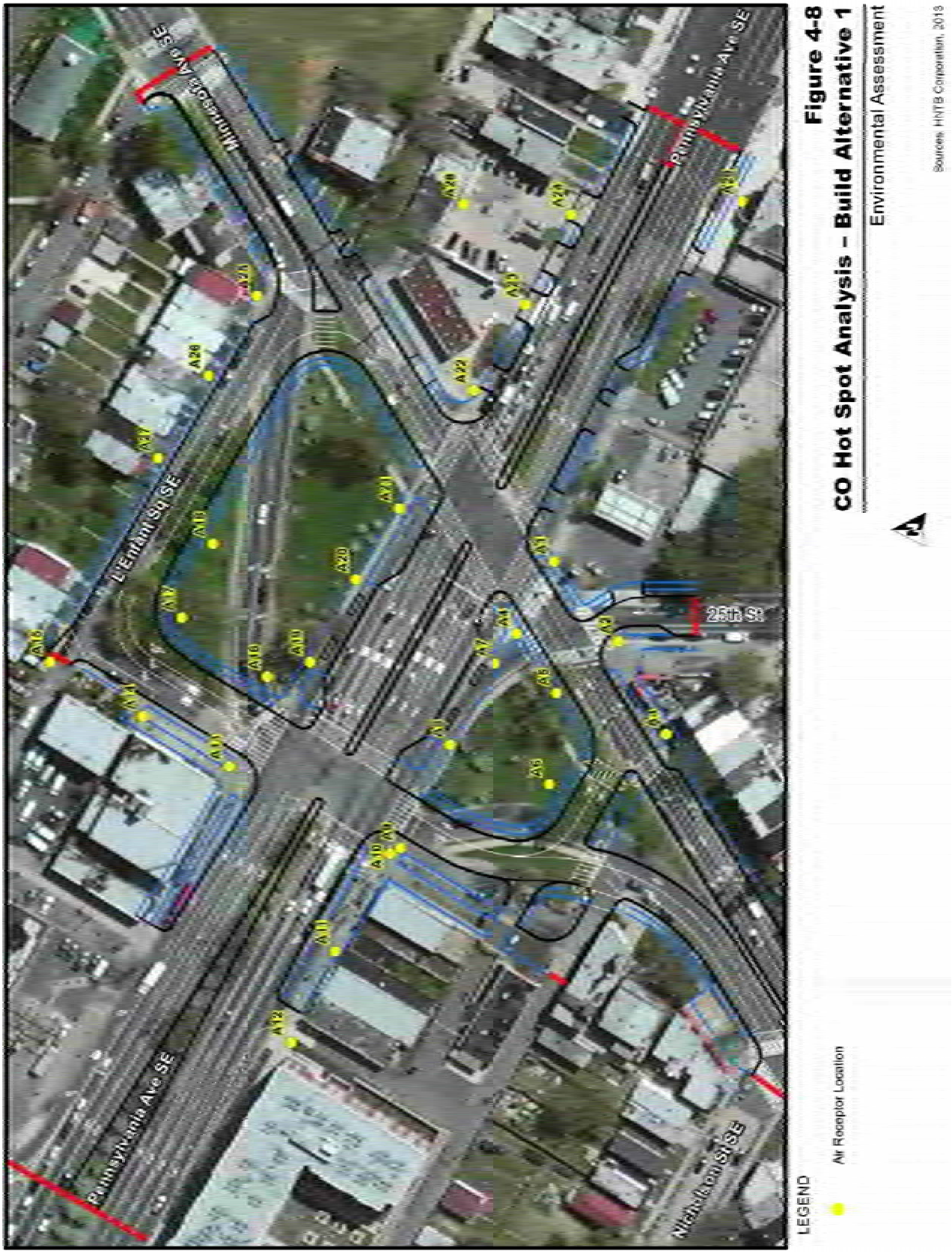


Figure 4-8
CO Hot Spot Analysis – Build Alternative 1
Environmental Assessment

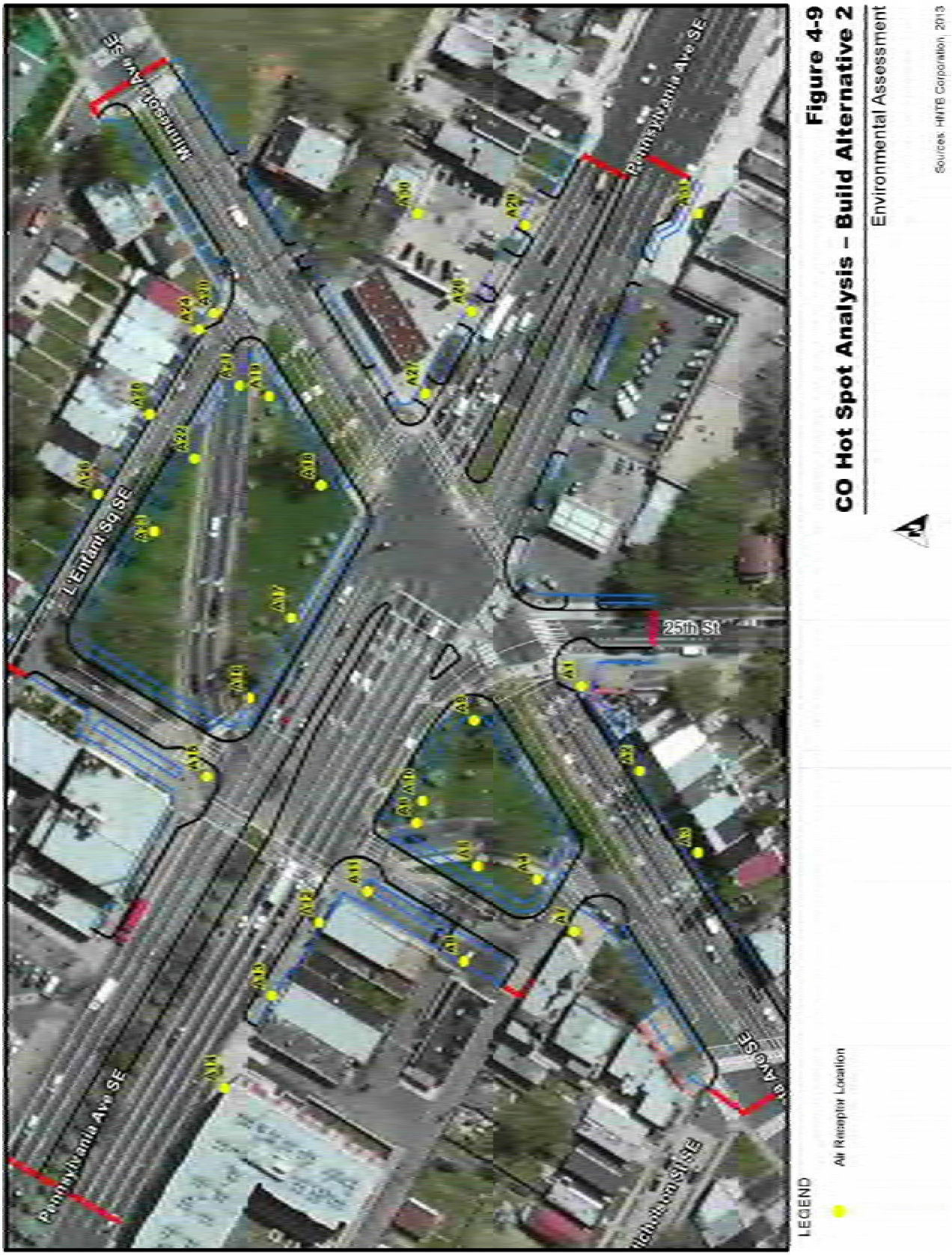


Figure 4-9
CO Hot Spot Analysis – Build Alternative 2
Environmental Assessment

Table 4.10
Microscale Air Quality Analysis
Maximum 1-Hour CO Concentrations (ppm)*

Air Quality Receptor ID	2012	2015			2040		
	Existing	No Build	Revised Square	Conventional Intersection	No Build	Revised Square	Conventional Intersection
	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour
A1	3.9	3.6	4.0	3.9	4.1	3.6	3.9
A2	3.8	3.6	3.9	3.6	3.8	3.6	3.8
A3	3.8	3.6	3.8	3.7	3.7	3.5	3.7
A4	3.7	3.5	3.9	3.9	4.2	3.4	3.5
A5	3.8	3.6	4.0	3.6	3.7	3.4	3.6
A6	3.9	3.7	4.1	3.5	3.7	3.7	3.8
A7	4.0	3.8	4.1	4.0	4.2	3.3	3.4
A8	3.9	3.8	4.1	3.9	4.3	3.4	3.5
A9	4.0	3.7	4.1	3.9	4.6	3.7	3.9
A10	4.1	3.9	4.4	3.9	4.5	3.7	3.9
A11	3.7	3.5	3.9	3.8	4.5	3.6	3.9
A12	3.6	3.4	3.6	3.8	4.5	3.8	4.1
A13	4.3	4.1	4.3	4.1	4.9	3.8	4.1
A14	3.9	3.6	3.9	3.7	5.2	3.9	4.2
A15	4.5	4.1	4.3	3.6	4.6	4.9	5.8
A16	4.4	4.0	4.4	4.4	5.7	4.6	5.3
A17	4.5	4.1	4.6	3.9	5.2	4.4	4.9
A18	4.5	4.4	5.3	3.8	5.0	4.2	4.4
A19	4.6	4.4	5.0	4.8	5.4	4.1	4.2
A20	4.6	4.3	4.7	4.3	4.8	4.3	4.4
A21	4.8	4.4	5.7	4.2	4.4	3.9	4.1
A22	4.5	4.3	5.3	4.4	4.3	3.7	3.6
A23	4.6	4.4	5.1	4.2	4.2	3.6	3.6
A24	4.5	4.2	4.8	4.3	4.2	3.8	4.0
A25	4.3	4.0	4.4	3.9	5.5	3.5	3.6
A26	4.0	3.9	4.2	3.9	5.3	3.5	3.5
A27	4.4	4.0	4.5	3.8	5.2	4.2	4.6
A28	3.8	3.6	4.0	3.6	3.9	4.2	4.6
A29	3.7	3.5	3.7	3.7	3.8	4.4	4.7
A30	3.7	3.6	3.8	-	-	3.7	3.9
A31	3.7	3.6	3.9	-	-	3.6	3.8

*The National Ambient Air Quality Standard for CO is 35 ppm for a one hour average.

Concentrations include an ambient background level of 2.9 ppm (1 hour)

Indicates maximum concentration for each alternative and year of analysis.

Source: HNTB Corporation, May 2013

Table 4.11
Microscale Air Quality Analysis
Maximum 8-Hour CO Concentrations (ppm)*

Air Quality Receptor ID	2012	2015			2040		
	Existing	No Build	Revised Square	Conventional Intersection	No Build	Revised Square	Conventional Intersection
	8 hour	8 hour	8 hour	8 hour	8 hour	8 hour	8 hour
A1	3.2	3.0	3.3	3.2	3.3	3.0	3.2
A2	3.1	3.0	3.2	3.0	3.1	3.0	3.1
A3	3.1	3.0	3.1	3.1	3.1	2.9	3.1
A4	3.1	2.9	3.2	3.2	3.4	2.9	2.9
A5	3.1	3.0	3.3	3.0	3.1	2.9	3.0
A6	3.2	3.1	3.3	2.9	3.1	3.1	3.1
A7	3.3	3.1	3.3	3.3	3.4	2.8	2.9
A8	3.2	3.1	3.3	3.2	3.5	2.9	2.9
A9	3.3	3.1	3.3	3.2	3.7	3.1	3.2
A10	3.3	3.2	3.6	3.2	3.6	3.1	3.2
A11	3.1	2.9	3.2	3.1	3.6	3.0	3.2
A12	3.0	2.9	3.0	3.1	3.6	3.1	3.3
A13	3.5	3.3	3.5	3.3	3.9	3.1	3.3
A14	3.2	3.0	3.2	3.1	4.1	3.2	3.4
A15	3.6	3.3	3.5	3.0	3.7	3.9	4.5
A16	3.6	3.3	3.6	3.6	4.5	3.7	4.2
A17	3.6	3.3	3.7	3.2	4.1	3.6	3.9
A18	3.6	3.6	4.2	3.1	4.0	3.4	3.6
A19	3.7	3.6	4.0	3.8	4.3	3.3	3.4
A20	3.7	3.5	3.8	3.5	3.8	3.5	3.6
A21	3.8	3.6	4.5	3.4	3.6	3.2	3.3
A22	3.6	3.5	4.2	3.6	3.5	3.1	3.0
A23	3.7	3.6	4.0	3.4	3.4	3.0	3.0
A24	3.6	3.4	3.8	3.5	3.4	3.1	3.3
A25	3.5	3.3	3.6	3.2	4.3	2.9	3.0
A26	3.3	3.2	3.4	3.2	4.2	2.9	2.9
A27	3.6	3.3	3.6	3.1	4.1	3.4	3.7
A28	3.1	3.0	3.3	3.0	3.2	3.4	3.7
A29	3.1	2.9	3.1	3.1	3.1	3.6	3.8
A30	3.1	3.0	3.1	-	-	3.1	3.2
A31	3.1	3.0	3.2	-	-	3.0	3.1

*The National Ambient Air Quality Standard for CO is 35 ppm for a one hour average.

Concentrations include an ambient background level of 2.5 ppm (8 hour)

Indicates maximum concentration for each alternative and year of analysis.

Source: HNTB Corporation, May 2013

4.5.6 Ozone

Ozone project level conformity is addressed through the approval of the LRP and the TIP. As stated in Section 4.5.1 Regional Conformity, *The Air Quality Conformity Update of The 2012 Constrained Long Range Plan and The Fy2013-2018 Transportation Improvement Program* for the Washington Metropolitan Region was approved by the FHWA and FTA. Therefore, the Pennsylvania Avenue/Minnesota Avenue *Great Streets* Improvements project meets the project level conformity requirements in 40 CFR Part 93.[70]

4.5.7 $PM_{2.5}$ Determination

The Proposed Action, as stated previously, is located within a nonattainment area for $PM_{2.5}$. The transportation conformity rule, 40 CFR 93.123(b)(1) requires a PM hot-spot analysis only for projects of local air quality concern. The proposed project is an intersection improvement project at individual intersections that is being designed to improve traffic flow and operational efficiencies, does not involve any increases in idling, and the No Build and Build Alternative volumes through the intersection are the same. The project would be expected to have a neutral or positive influence on $PM_{2.5}$ emissions. Therefore, the project is not one of local air quality concern and a hot-spot analysis is not required.

4.5.8 Mobile Source Air Toxics (MSAT)

In addition to the criteria air pollutants presented in Table 3.14, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

"Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://cfcpub.epa.gov/ncea/iris/index.cfm). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles traveled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050…"[71]

The purpose of the Proposed Action is to improve traffic flow and operating efficiencies through the intersection by redirecting traffic, improving pedestrian safety and in some cases eliminating left turn conflicts. As noted in FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA* in reference to Exempt Projects, "This project has been determined to generate minimal air quality impacts for CAAA criteria pollutants and has not been linked with any special MSAT concerns. As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause an increase in MSAT impacts of the project from that of the no-build alternative."[72]

The *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA* also states the following: "Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOVES model forecasts a combined reduction of over 80 percent in the total annual emission rate for the priority MSAT from 2010 to 2050 while vehicle-miles of travel are projected to increase by 100 percent. This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from this project."[73]

4.6 Noise

Impact Thresholds

The following thresholds were used to determine the magnitude of effects to the noise environment:

Substantial Impact: A substantial impact would result if the predicted noise levels approach or exceed the Noise Abatement Criteria (NAC) value for the appropriate activity category or if noise levels increase by 10 decibels or more over existing noise levels.[74]

Duration: **Short-term –** Impact would be a result of construction noise; **Long-term –** Impact would be a result of a change in noise due to the fully constructed alternative.

4.6.1 Noise Modeling

The latest version of the FHWA's Traffic Noise Model, TNM®2.5[75], was used to model existing (2012), No Build (2040), Build Alternative 1 (2040), and Build Alternative 2 (2040) for the peak noise hour noise levels within the Study Area. Twenty-two (22) representative noise receivers (representing 35 dwelling units), numbered N1 through N18, plus the four field sites, FS-1 through FS-4, as shown on Figure 3-15 and Figure 3-16, were modeled. Modeled receivers are identical on Figure 3-15 and Figure 3-16, except for Field Site 4 (FS-4). The Revised Square Alternative alignment results in FS-4 being on the pavement. Thus, FS-4 was moved approximately 70 feet northeast for the Build Alternative 1 model. These receivers were selected to model representative noise impacts at areas consisting of residential, daycare, and recreational properties, as well as one place of worship. There are multiple commercial and retail properties throughout the Study Area that do not have areas of outdoor areas of frequent human use, so locations were not modeled. The results of the computer modeling are presented in **Table 4.12**.

Table 4.12

PM Peak Hour Noise Levels, dBA Leq(h)

Receiver Location	Land Use	Activity Category	Activity Criteria	Dwelling Units	Noise Level, L_{eq}(h) (dBA)			
			Leq (h)		Existing (2012)	No Build (2040)	Revised Square (2040)	Conventional Intersection (2040)
N1	Residential	B	67	3	69.0	**70.3**	**70.3**	**71.0**
N2	Daycare	C	67	0	67.4	**69.4**	**69.3**	**69.7**
FS-3	Retail	F	N/A	0	71.0	73.0	71.9	72.5
N3	Daycare	C	67	0	69.2	**71.3**	**70.3**	**70.6**
N4	Residential	B	67	3	67.1	**68.4**	**68.7**	**69.2**
N5	Residential	B	67	2	66.6	**67.7**	**67.8**	**68.1**
N6	Residential	B	67	3	66.1	**67.1**	**67.1**	**67.1**
N7	Place of Worship	D	52	0	41.1*	41.7*	41.6*	41.3*
N8	Residential	B	67	3	66.0	**67.2**	**67.3**	**66.8**
FS-4	Park	C	67	0	70.0	**71.5**	**73.1**	**70.2**
N9	Residential	B	67	1	65.4	**67.3**	**68.0**	**67.7**
N10	Residential	B	67	2	63.7	**65.6**	**66.3**	**66.0**
N11	Residential	B	67	2	63.9	**65.7**	**66.9**	**66.2**
FS-1	Residential	B	67	1	63.9	**65.7**	**66.9**	**66.1**
N12	Residential	B	67	2	64.7	**66.4**	**67.5**	**66.9**
N13	Residential	B	67	2	65.2	**66.8**	**67.8**	**67.3**
N14	Residential	B	67	2	65.9	**67.4**	**68.2**	**67.9**
N15	Residential	B	67	2	66.9	**68.2**	**68.9**	**68.8**
N16	Residential	B	67	1	67.3	**68.6**	**69.1**	**69.3**
N17	Residential	B	67	3	67.5	**68.6**	**68.8**	**69.6**
N18	Residential	B	67	3	67.5	**68.6**	**68.6**	**69.6**
FS-2	Park	C	67	0	71.1	**73.2**	**72.8**	**73.7**

Notes: ___ - Indicates impacted receptor. A receptor is impacted if the predicted noise level approaches or exceeds DDOT NAC, as shown on Table 3.15.

* - N7 Building Type was classified as – Masonry and Window Condition – Single Glazed. Therefore the 'Noise Reduction Due to Exterior of the Structure' is 25 dB as defined on *Table 6: Building Noise Reduction Factors* (page 30) in the "Highway Traffic Noise: Analysis and Abatement Guidance", FHWA, January 2011.

Source: HNTB Corporation, 2013.

4.6.2 Impact Assessment

No Build Alternative

Under the No Build Alternative, no transfer of jurisdiction between NPS and DDOT would occur and the roadway configuration and traffic operational characteristics would remain unchanged from the existing condition. Noise can be heard consistently throughout the day at this urban intersection. However, due to the projected increase in traffic volume in 2040, the noise at the project intersection under the No Build Alternative is expected to worsen. No Build Alternative (2040) peak hour noise is predicted to exceed the NAC at 16 residential locations and four activity category C locations. The noise levels at the 16 residential locations would range from 65.6 to 70.3 dBA $L_{eq}(h)$ and represents 35 dwelling units. The noise levels at the category C locations would range from 69.4 to 73.2 dBA $L_{eq}(h)$. The interior analysis at the category D location, N7, did not approach or exceed the 52 dBA $L_{eq}(h)$ criteria.

No short-term impacts would result under the No Build Alternative, as no construction would occur.

In the long term, due to the projected increase in traffic volume at this intersection, noise levels will increase by 2040 under the No Build Alternative.

Build Alternative 1 – Revised Square Alternative

Build Alternative 1 would have a short-term adverse impact to noise levels in the Study Area during the construction phase. The major construction elements of this project are expected to be demolition, hauling, grading, and paving. Construction of the proposed improvements and local rerouting of traffic for either alternative will result in a temporary increase in the ambient noise levels for properties in the Study Area, especially along Pennsylvania Avenue and Minnesota Avenue. General construction noise impacts for passerby and those individuals living or working near the project can be expected particularly from demolition, earth moving, and paving operations. Equipment associated with construction generally includes backhoes, graders, pavers, concrete trucks, compressors, and other miscellaneous heavy equipment. **Figure 4-10** lists some typical peak operating noise levels at a distance of 15 m (50 feet), grouping construction equipment according to mobility and operating characteristics. Considering the relatively short-term nature of construction noise, impacts would be minor. The transmission loss characteristics of nearby structures are believed to be sufficient to moderate the effects of intrusive construction noise.

Construction noise is regulated by Title 20 of the DCMR. Construction is permitted from 7:00 am to 7:00 pm from Monday-Saturday, with noise levels not to exceed 80 dBA, unless granted a variance (20-2802).[76] Construction is not permitted in residential zones outside of this time frame (20-2803).[77] While some construction under Build Alternative 1 would be adjacent to residential areas, it would not be within a residential zone. Potential mitigation for the construction noise impacts could include: “work hour limits, equipment muffler requirements, location of haul roads, eliminate of “tail gate banging,” ambient sensitive back-up alarms, community rapport, and complaint mechanisms.”[78]

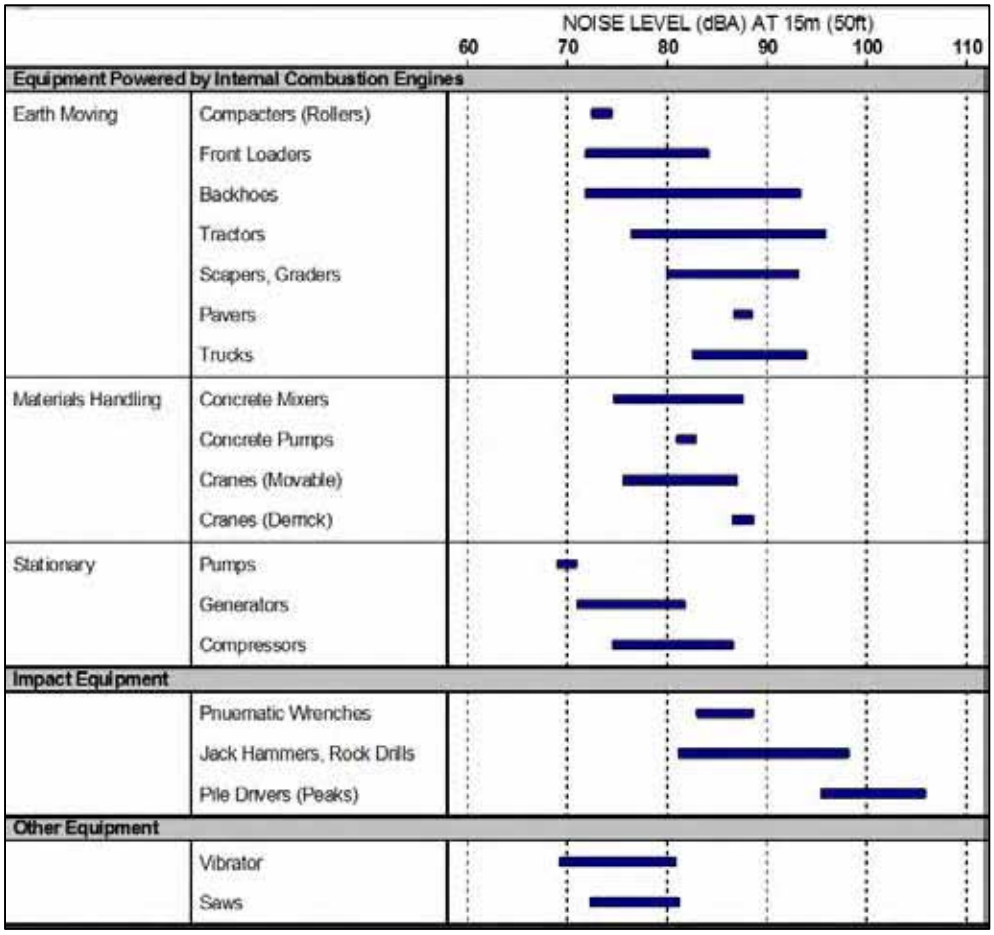
As with the No Build Alternative, predicted future (2040) noise levels for Build Alternative 1 would approach or exceed the NAC at 16 residential receivers and the same four activity category C locations identified under the No Build Alternative noise levels. The noise levels at the 16 residential locations would range from 69.3 to 73.1 dBA $L_{eq}(h)$, representing 35 dwelling units. The noise levels at the

category C locations would range from 66.6 to 73.1 dBA $L_{eq}(h)$. None of the predicted future noise levels would substantially exceed existing noise levels (DDOT has defined an increase over existing noise levels of 10 decibels or more as being a substantial noise increase). [79] The interior analysis at the category D location, N7, did not approach or exceed the 52 dBA $L_{eq}(h)$ criteria.

Impacts under Build Alternative 1 would not be substantially different from the No Build Alternative. The impacts to noise do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

Figure 4-10

Construction Equipment Sound Levels



Source: U.S. Report to the President and Congress on Noise, February 1972.

Build Alternative 2 – Conventional Intersection Alternative

Impacts during construction would be similar to Build Alternative 1 and would be short term and minor. Potential mitigation for the construction noise impacts could include: "work hour limits, equipment muffler requirements, location of haul roads, eliminate of "tail gate banging," ambient sensitive back-up alarms, community rapport, and complaint mechanisms."[80]

As is the case with the No Build Alternative, predicted future (2040) noise levels for Build Alternative 2 would approach or exceed the NAC at 16 residential receivers and the same four activity category C locations identified under the No Build and Build Alternative 1 noise levels. The noise levels at the 16 residential locations would range from 66.0 to 71.0 dBA $L_{eq}(h)$, representing 35 dwelling units. The noise levels at the category C locations would range from 69.7 to 73.7 dBA $L_{eq}(h)$. None of the predicted future noise levels would substantially exceed existing noise levels (DDOT has defined an increase over existing noise levels of 10 decibels or more as being substantial). The interior analysis at the category D location, N7, did not approach or exceed the 52 dBA $L_{eq}(h)$ criteria.

Impacts under Build Alternative 2 would not be substantially different from the No Build Alternative. The impacts to noise do not meet the CEQ criteria for either context or intensity; therefore, these impacts do not rise to a level of "significance" as defined by CEQ.

4.6.3 Undeveloped Lands

Traditionally, setback distances to 66 and 71 dB(A) $L_{eq}(h)$ are developed to assist local planning authorities in developing land use control over the remaining undeveloped lands along the project in order to prevent further development of incompatible land use based on predicted noise levels. However, the Study Area surrounding the Pennsylvania Avenue and Minnesota Avenue intersection is completely built out and therefore setback distances would not assist for this project.

4.6.4 Conclusion

Based on the study completed, mitigation of noise impacts for the Pennsylvania Avenue and Minnesota Avenue, SE improvements is not feasible for either of the Build Alternatives. Due to the built out nature of the Study Area and local access requirements, noise mitigation in this urban environment is not possible. If it subsequently develops during final design that these conditions have substantially changed, noise abatement measures will be reviewed. Refer to Section *4.8, Mitigation Measures*, for a complete discussion of mitigation related to noise.

4.7 Indirect and Cumulative Effects

The CEQ regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federally funded 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 non-Federal) or person "undertakes such other actions. Cumulative effects can result from individually minor, but collectively moderate or major actions taking place over a period of time." (40 CFR 1508.7).

Cumulative effects are determined by combining the impacts of the Proposed Action with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or foreseeable future projects within immediate vicinity of the Study Area and, if necessary, the surrounding region. Cumulative effects are evaluated in a regional context, which varies for each impact topic; however, in general, the regional context is Pennsylvania Avenue, SE, the Anacostia River Watershed, and the surrounding Wards and Neighborhoods including but not limited to Randle Highlands, Fairlawn, Deanwood, Fort Dupont, and Hillcrest. The Study Area for cumulative impacts differs based on resource topic. For instance, cumulative effects to water quality generally use a larger

watershed to define the Study Area; whereas, cumulative effects on aesthetics would use a Study Area defined by viewsheds. Generally, short-term impacts do not result in cumulative effects (unless specified in this section) and if there is no impact or a beneficial impact, the alternatives would not have a cumulative impact regardless of other actions in the project vicinity. As presented earlier in this EA, implementation of the alternatives would have no long-term impacts on certain resources because the resource is either not present or the Proposed Action would have negligible impacts on the resource. As a result, there would be no appreciable cumulative effect to these resources. The resources that would not have appreciable cumulative effects include: geology, soils, topography, water resources, wildlife, historic structures, cultural landscapes, paleontological resources, land use, zoning, demographics, environmental justice, economics and development, joint development, aesthetics and visual quality, health and safety, community resources, utilities, Indian Trust resources, Sacred Sites, pedestrian and bicycle network, transit, air quality, noise, hazardous waste and energy conservation.

Past, present, and future representative projects that would have the potential to add to cumulative effects are described below. Cumulative effects are considered for all alternatives and are presented in this section for each resource topic. Indirect impacts are identified in the impact analysis under each resource topic when applicable.

4.7.1 Past Actions

I-295 Ramp Interchange Improvements

As part of the ongoing 11th Street Bridges project, approximately one mile from the Study Area, a new ramp from the 11th Street Bridge to I-295 North opened in the summer of 2012. Prior to the opening of this interchange, drivers trying to reach I-295 Northbound had to get off at the Southeast Freeway, merge onto Pennsylvania Avenue headed southbound, travel under the Sousa Bridge and make a left turn just prior to Fairlawn Avenue, SE and onto the I-295 Northbound ramp.

4.7.2 Current or Future Actions

Pennsylvania Avenue, SE Great Streets Initiative

Pennsylvania Avenue, SE Great Streets Initiative is a multiple agency effort in the District to transform this corridor into thriving and inviting neighborhood center using public actions and tools as needed to leverage private investment. With planning and financial involvement from DDOT, DMPED and D.C. Office of Planning, over $200 million is being invested in new mixed use development projects, storefront improvements, transportation, streetscape, and transit improvements along these corridors. Neighborhood economic development projects that include quality local and national retailers are ongoing along the Pennsylvania Avenue, SE corridor. Redevelopment of key sites along the corridor are being planned and implemented.

2300 Block of Pennsylvania Avenue, SE

DMPED has plans to facilitate development along the 2300 Block of Pennsylvania Avenue, SE. This block is within the project Study Area and is located immediately west of Twining Square. The District aims to help implement the goals of the Great Streets Initiative by redeveloping this key corridor to eliminate blight, provide quality neighborhood-serving retail and potential job creation. DMPED has

already acquired 2337 Pennsylvania Avenue, SE.[81] The next steps in development will be to negotiate with private land owners on the 2300 Block in order to develop the properties.

Pennsylvania and Potomac Avenues, SE Intersection Improvements

As part of the District's AWI Program, DDOT is conducting an EA for proposed improvements at the Pennsylvania and Potomac Avenues, SE intersection to enhance safety at these street intersections for neighborhood pedestrians and transit users of the Potomac Avenue Metrorail Station and the numerous area bus stops. This project was originally proposed in the 2005 Middle Anacostia Crossings (MAC) Transportation Study as a mid-term improvement for enhancing the transportation network in the Middle Anacostia River region. The Pennsylvania and Potomac Avenues intersection is located approximately one mile west of the Study Area.

The current configuration of the six-legged intersection has multiple crosswalk locations making crosswalk signal timing challenging. Despite the numerous crosswalk locations, pedestrians traverse the intersection through the grassed median owned by the NPS. Proposed intersection changes will seek to reduce the number of pedestrian and vehicle conflict points and provide safer, more direct routes for the pedestrian and transit users. Concepts for the Pennsylvania and Potomac Avenue Intersection Project will focus on pedestrian safety for residents and multi-modal transit users. The EA is anticipated to be completed by the end of 2013.[82]

Barney Circle and Southeast Boulevard Transportation Planning Study

Also part of the AWI Program, DDOT is conducting an EA for proposed improvements at Barney Circle-Southeast Boulevard to evaluate updated concept alternatives that were previously developed in the 2005 MAC Transportation Study and is including new alternatives for the project to ensure that pedestrian safety and multi-modal transportation needs are included, as well as new or planned residential and economic development within the surrounding AWI Program area.

Located less than a mile west of the Study Area and across the Anacostia River, Barney Circle is located at the west end of the John Philip Sousa Bridge where the SE/SW Freeway, Pennsylvania Avenue, SE and various local neighborhood streets converge. Originally designed as part of the future Interstate 295 extension across the Anacostia River, linking DC 295 to the Southeast Freeway (I-695) and I-395, Barney Circle does not function as a true traffic circle or serve all traffic movements and has become a barrier to the Anacostia waterfront. Several alternatives are being considered at Barney Circle that would provide for the necessary movements to enable it to function as a true traffic circle and improve mobility and accessibility for the surrounding community. Concepts for the Barney Circle Project will involve transforming the former Southeast Expressway interstate roadway into a boulevard with plantings and streetscape amenities integrated with the adjacent neighborhoods between the new 11th Street bridges and Barney Circle. The EA is anticipated to be completed by the end of 2013.[83]

D.C. Streetcar

Planning and construction is underway for a D.C. Streetcar System in the District. The D.C. Streetcar is intended to connect neighborhoods, reduce short inter-city auto trips, parking demand, traffic congestion, air pollution, and encourage economic development and affordable housing options along the Streetcar corridors. Three phases are ultimately planned that will one day span all eight District Wards. Active

planning and construction is underway for the first 22 miles of an ultimate 37-Mile Streetcar System.[84] According to the *DC's Transit Future System Plan*, Minnesota Avenue, SE in the vicinity of the Study Area is included in Phase 3 of the D.C. Streetcar program. The Study Area is along the Streetcar Line proposed to run from Bolling Air Force Base (AFB) to the Benning Road area.[85] The current planned route would be an extension to the Anacostia Initial Line Segment (under construction), and would travel along Minnesota Avenue (heading north-south) and cross Pennsylvania Avenue, SE in the Study Area. D.C. Streetcar in this area would connect neighborhoods to Minnesota Avenue/Benning Road, Twining Square, and Historic Anacostia commercial nodes. It would also connect to the AWI redevelopment areas and connect economically distressed neighborhoods not well served by Metro to the Minnesota Avenue Metro Station.

Currently, Phase 2 of roadway construction along H Street/Benning Road is underway. About 80 percent of the work to make H Street/Benning streetcar-ready was completed during Phase 1 in 2011, during the Great Streets roadway reconstruction project. The H Street/Benning corridor anticipates being ready for the arrival of streetcars in Fall 2013.[86] Long range planning is ongoing for Phase 3 with a broad, 30-year Streetcar vision for the completion of the entire 37-mile system. DDOT has not provided a specific date for the implementation of Phase 3 in the vicinity of Study Area.

4.7.3 Cumulative Effects

Cumulative Effects Analysis for Road Network and Traffic

The Build Alternatives for the Pennsylvania and Minnesota Avenues, SE Intersection Improvements Project would result in minor adverse impacts compared to the No Build Alternative in the long term (2040). Compared to the No Build Alternative, the Build Alternatives would cause longer queues on Pennsylvania at Minnesota Avenues, SE in the peak travel direction during AM and PM peak hours, and would increase travel times on most vehicular trips by 2040.

The addition of the I-295 Northbound ramp connection from the 11th Street Bridge likely reduces some of the traffic on Pennsylvania Avenue, SE traveling southbound. Although the improvements are not in the Study Area, and the intersection previously affected where motorists turned left to access the I-295 Northbound ramp, spillover (indirect) effects from this traffic likely contributed to traffic congestion and illegal traffic movements in the Study Area. With the new access to I-295 Northbound from the 11th Street Bridge, cumulative effects due to the Build Alternatives would be negligible.

Development in the Study Area due to Great Streets Initiative development and the District's redevelopment plans would not be negatively impacted by the minor impacts to the roadway network due to the Build Alternatives. In fact, the Proposed Action is intended to contribute to the "place-making" ability of the Study Area and the Pennsylvania Avenue, SE corridor, in keeping with the Great Streets Initiative and the District's revitalization plans.

Alternatives development and environmental documentation are currently underway for proposed improvements at both Barney Circle and the Pennsylvania and Potomac Avenues, SE intersection. Both of these projects include roadway improvements that may impact traffic operations in the immediate vicinity of those projects. Both of these AWI projects are approximately one mile west of the Study Area along Pennsylvania Avenue and are across the Anacostia River from the Proposed Action. Neither Build Alternative is expected to result in impacts to the road network or traffic across the bridge. Queuing

analysis results are not estimated to be greater than approximately 0.30 miles in any direction from the Study Area as a result of either of the Build Alternatives in the future design year (2040). Therefore, cumulative effects due to the Build Alternatives are anticipated to be negligible.

To the extent possible, the D.C. Streetcar phasing plans are designed to coordinate with the construction of streetcar facilities with planned roadway and development projects located along the planned lines. The conceptual design of the Build Alternatives would not preclude the implementation of a Streetcar line traveling through the intersection along Minnesota Avenue. The Minnesota Avenue roadway width in the Study Area would not be reduced compared to existing conditions and the No Build Alternative. Implementation of the D.C. Streetcar in the Study Area would encourage public transit use and could ultimately lead to fewer vehicles using the intersection which could help to reduce queue lengths and travel times.

Overall the impacts to the Road Network and Traffic would be minor as described in the impact analysis in Section 4.4.2. From a regional context, the incremental impact to traffic and the roadway network in 2040 due to the Build Alternatives would be negligible and would not cause the cumulative impact to be significant.

Cumulative Effects Analysis for Archaeological Resources

Due to the fact that the southern NPS reservation in the Study Area is considered a zone of high potential for archaeological resources, a Phase IB/II testing of this small area is recommended prior to final design decisions and construction of either of the Build Alternatives. Given that the area where the potential to recover historic or prehistoric archaeological resources exists is limited to the southern reservation (approximately 0.06 acres), the past, present and foreseeable actions, when combined with the Build Alternatives, are not expected to cumulatively effect archaeological resources.

4.8 Mitigation Measures

Mitigation measures are presented as part of the Proposed Action and have been developed to lessen the effects. The following mitigation measures are recommended for implementing the Preferred Alternative:

Soils

Erosion and sediment control plans would be prepared in accordance with DDOE Standards and Specifications for Soil Erosion and Sediment Control and implemented during construction of the reconfigured intersection. The plans would include project-specific measures to avoid and/or minimize soil erosion and transport due to ground-disturbing activities, including potential vegetation clearing and minimal grading. BMPs would be used during construction, to include practices such as stabilized construction entrances, silt fences, temporary sediment traps and filtering devices and earth dikes. Use of BMPs would be detailed in the approved erosion and sediment control plans.

Water Resources

Similar to the soil mitigation plan, implementation of erosion and sediment control practices would help to avoid temporary impacts to water quality during construction. BMPs such as silt fence and sediment trapping or filtering will lessen the impacts of sediment transport that degrades water quality during

stormwater runoff periods. Stormwater management plans would also be prepared to address long-term runoff and pollutant discharge into the Anacostia River watershed.

Wildlife

The Study Area likely supports a limited population of birds, small mammals, reptiles and amphibians. Wildlife found in the Study Area are those that are able to adapt to the urban landscape. However, BMPs would be used to mitigate any potential impacts to wildlife. The tree canopy in the Study Area would be preserved and enhanced wherever possible to protect habitat for local wildlife. Erosion and sediment control plans would minimize potential impacts to water quality and thus protect impacts to aquatic habitat within the watershed.

Vegetation

Measures would be implemented, to the extent practical, to avoid impacts to larger or older tree specimens both inside and outside of the existing DDOT right-of-way. Applying LID principles to the development, the existing tree canopy in the Study Area would be preserved and enhanced wherever possible. Landscaping and replacement of trees will be conducted in accordance with the DDOT Design and Engineering Manual. New trees and vegetation would be planted in appropriate locations to maintain and enhance the tree canopy along the project corridor. Protection to tree specimens may include installation of tree protection fencing at the outer drop line of trees to be saved, staging construction equipment to avoid damage to trees and their root systems, and avoiding collision of construction equipment with trees and vegetation.

Landscaping at the project site would fulfill functional and aesthetic requirements along with those mandated by DDOT policy and Federal regulations, in coordination with NPS. Landscape plans would be developed in accordance with the NPS and DDOT's Urban Forestry Administration. Landscape plans may include planting, grading, erosion control and irrigation systems.

In addition, landscaping would be utilized where possible to improve storm water management features by following the concept of LID. Following development, the landscape would be monitored and maintained to ensure successful establishment.

Cultural Resources

If during construction, archaeological resources are discovered, all work in the immediate vicinity of the discovery would be halted until the resources can be identified and documented and an appropriate mitigation strategy developed. If necessary, consultation with the DC SHPO, NPS, and/or the NPS Regional Archeologist will be coordinated to ensure that the protection of resources are addressed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 would be followed.

Parkland

Users of the intersection parkland would be notified of construction-related closures or changes in traffic patterns. DDOT would use public notification techniques such as posting information on the DDOT and

NPS websites to notify residents, merchants and users of the transit and commercial establishments at the intersection of detours or any other restrictions at the intersection.

Aesthetic and Visual Quality

All landscaping and site amenities would consider aesthetics. Landscape plans would be developed in coordination with the NPS and DDOT's Urban Forestry Administration and Landscaping plans and other proposed aesthetic treatments would be submitted to the DC Commission of Fine Arts (CFA), NCPC, and NPS for review and comment.

Health and Safety

During construction, active construction areas of the project site would be closed to pedestrians by using signage and fences. When necessary, areas of the construction site may also be closed off to cars which will be re-routed through or around the intersection. After construction, the intersection would be maintained in order to provide enhanced safety for pedestrians, bicyclists and vehicles using the intersection. Maintenance activities that would ensure protection of the public using the intersection include removing snow and ice during winter months, sealing cracks and filling potholes that may be hazardous to motorists and bicyclists, and policing the area to deter any illegal activities. New pavement markings and signage would be utilized as needed for motorists and pedestrians using the intersection.

Community Resources

DDOT would coordinate with the local emergency services before construction with regards to access through the project intersection during periods of construction and how the ultimate intersection design may affect emergency responders.

Utilities and Infrastructure

DDOT would consult with all utility companies to determine if and how utility poles and other above-ground utilities in the Study Area would be impacted during construction or with project implementation. Care would be taken during construction activities so as to avoid all underground utilities. This would be done through consultations with each of the respective utilities early in design to determine exactly where, and to what depth the utilities are buried. These areas would then be marked off and carefully excavated to ensure the utilities are not accidentally damaged during construction of the trail. Utilities that are determined to be damaged would be repaired prior to the construction of the intersection.

Bicycle and Pedestrian Network

Active construction areas of the project site would be closed to pedestrians and bicyclists by using signage and fencing. Signage will be provided to indicate alternate routes and detours to be used when walkways, paths, or street crossings are blocked.

Roadway Network and Traffic

Plans to maintain traffic during construction will be developed to minimize impacts to local traffic. Work schedules for construction may be adjusted to minimize impacts during peak traffic volumes. Active construction areas of the project site would be closed to motorists by using signage and blockades. Signage will be provided to indicate alternate routes and detours to be used during any road closures.

Additionally, DDOT would use public notification techniques such as posting information on the DDOT website to notify residents, commuters, merchants, etc. of temporary roadway closures or any other restrictions at the intersection.

The following maintenance of traffic (MOT) assumptions are anticipated:

- Maintain three lanes of traffic in each direction on Pennsylvania Avenue through the project area;
- Maintain two lanes of traffic in each direction on Minnesota Avenue through the project area;
- Maintain all turning movements during all phases of project construction (note, temporary, short-duration lane closures are anticipated during construction);
- Maintain pedestrian and bicycle access through the project area;
- Maintain full access to bus stops, businesses and residences during construction, and;
- Minimize impacts to the local community during construction.

MOT plans are included in *Appendix F, Traffic Analysis Report*. MOT plans were developed for Build Alternative 1 only; however the MOT for Build Alternative 2 would be comparable as they both has the same number of phases.

Transit

DDOT would continue to coordinate with WMATA during design and construction to avoid impacts to WMATA's facilities, maintain access, and allow for future access.

Air Quality

Particulate emissions during the two anticipated construction seasons, whether from construction equipment diesel exhaust or dust from the construction activities, should be controlled as well as possible. Contractors will follow all DDOT Standard Construction Specification sections that address the control of construction equipment exhaust or dust during construction. Even though construction mitigation measures are not required, there are several measures that could be considered to reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits. Also, technological adjustments to construction equipment, such as off-road dump trucks and bulldozers, could be an appropriate strategy. The EPA recommends Best Available Diesel Retrofit Control Technology (BACT) to reduce diesel emissions. Typically, BACT requirements can be met through the retrofit of all diesel powered equipment with diesel oxidation catalysts or diesel particulate filters, and other devices that provide an after-treatment of exhaust emissions.

Noise

Within the framework of DDOT's criteria, various methods were reviewed to mitigate the noise impact of the proposed improvements. Among those considered were traffic management measures (reduction of speed limits, restriction of truck traffic to specific times of the day, a total prohibition of trucks), alteration of horizontal and vertical alignments, acquisition of real property or interests therein to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise, and noise insulation of

Activity Category D land use facilities listed in Table 3.11, the construction of berms, and the construction of noise barriers.

Reductions of speed limits, although acoustically beneficial, are seldom practical unless the design speed of the proposed roadway is also reduced. Restriction or prohibition of trucks is counter to the project purpose and need. Design criteria, recommended termini and the preliminary design process leading to the preferred alternative preclude substantial horizontal and vertical alignment shifts that would produce noticeable changes in the projected acoustical environment. Acquisition of undeveloped property for buffer zones is typically neither feasible nor reasonable due to the amount of land needed to create an acoustically effective buffer zone and the desire to keep as much land as possible in the local community's tax base. There are no Activity Category D land use facilities that approach or exceed the NAC, so noise insulation was not considered.

A noise berm or barrier must be long enough and tall enough to minimize the noise coming over the top or around the ends of the barrier, such that the noise barrier, according to DDOT's Noise Policy, dated April 5, 2011, provides at least a 5 dB(A) reduction at impacted receptors to be considered feasible. In addition, the noise barrier or berm cannot restrict pedestrian or vehicular access for the mitigation to be considered feasible. The berm or barrier cannot have any holes in the barrier which would seriously degrade the noise reduction capability of the berm or barrier. The construction of noise berms along this project would not be feasible due to the limited space between the traffic and the receptors. Temporary noise impacts would be minimized during construction, however, by utilizing BMPs, as necessary, to meet the requirements of the Washington, DC Noise Control Act.

There is limited space to construct noise barriers between the traffic and receptors. However, all the receptors have access to a parking lane in front of the residences; see Figures 3-15 and 3-16. The length of the barriers would be limited by line of sight requirements at intersections. Providing pedestrian access from the residences to the parked cars would create a number of holes in each noise barrier. Therefore, it is not feasible to construct a noise barrier that would provide a 5 dB(A) reduction for the residences abutting the local streets throughout the project area.

Furthermore, *DDOT Noise Policy* states, "In order for a noise abatement option to be selected, it must be both feasible and reasonable."[87] As explained above, the proposed project does not meet the criteria for traffic noise mitigation feasibility. Additionally, in determining "reasonableness," for a noise abatement technique to be considered reasonable, all of the criteria must be met. Specifically, the proposed project does not meet Reasonableness criteria #5 in the *DDOT Noise Policy*: "Future traffic noise levels are all less than 75 dBA and less than 10 dBA higher than existing traffic noise levels."[88] None of the future (2040) alternatives exceed 75 dBA, nor do any of the alternatives cause the noise levels to increase 10 dBA compared to existing conditions.

4.9 Permits and Authorizations

- The transfer of land jurisdiction between NPS and DDOT is subject to additional review and approval by the National Capital Planning Commission and the D.C. Council. In accordance with United States Code (USC) Title 40 Section 8124(a), any transfer of jurisdiction of lands between the NPS and DDOT is subject to the review and recommendation of the NCPC, and authorization of the D.C. Council. 40 USC 8124(a) and D.C. Code 10-111 – Transfer of Jurisdiction states the following:

Federal and District of Columbia authorities administering properties in the District that are owned by the Federal Government or by the District may transfer jurisdiction over any part of the property among or between themselves for purposes of administration and maintenance under conditions the parties agree on. The National Capital Planning Commission shall recommend the transfer before it is completed.

- Preliminary correspondence from the U.S. Fish and Wildlife Service (FWS) was received on August 1, 2012 that confirmed that there are no listed species identified for the vicinity of the project. Due to the location of the Study Area and the associated USGS topographic map, official online certification was received that states, "that except for occasional transient individuals, no federally proposed or listed endangered or threatened species are known to exist within the project area. Therefore, no Biological Assessment or further Section 7 consultation with the FWS is required. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.
- Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470) sets forth the procedures for compliance with the NHPA. This created the President's ACHP to review and comment upon activities sponsored or licensed by the Federal Government, that may have an effect on resources listed or eligible for listing on the NRHP. Compliance through Section 106 involves a demarcation of area to be effected and may include surveys to ascertain the presence of artifacts that are eligible for NRHP listing. The DC SHPO issued a finding of *Conditional* No Adverse Effect for this undertaking, subject to conditions (Refer to *Appendix E* for the *DC SHPO Section 106 Review Form*).
- A NPS Special Use Permit was required for DDOT and its contractors to perform work on NPS property for the geoarchaeological soil borings conducted in November of 2012 to gain access to the northern and southern reservations in the Study Area/APE (signed copy of permit is included in *Appendix E, Cultural Resources*). A Special Use Permit authorizes work on NPS property and outlines conditions for which work can be performed on NPS property. The requirements for Special Use Permits and required applications are found in Director's Order 53 Special Park Uses at http://www.nps.gov/policy/DO-53draft.htm.
- Upon coordination with the DC SHPO, Phase I archaeological investigation may be needed in the Study Area. This work would require an Archaeological Resources Protection Act (ARPA) Permit for conducting archeological fieldwork on federal lands. An ARPA permit is issued under the authority of the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm; 43 CFR 7) and The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 431-433; 43 CFR 3). Issuance and use of an ARPA permit with the NPS is described in Director's Order 28A: Archeology.

4.10 Section 6(f) – Land and Water Conservation Act of 1965

The Land and Water Conservation Fund (LWCF) Program was established by the Federal government in 1965 to increase the net quantity of public, outdoor recreational space. Section 6(f) of this Act provides matching funds to states or municipalities for planning, improvements, or acquisition of outdoor recreational lands. Any property that was planned, purchased, or improved with LWCF money is

considered 6(f) property. No 6(f) properties exist at the project intersection, and therefore no Section 6(f) analysis or mitigation is required.

4.11 Irreversible and Irretrievable Commitment of Resources

Reconfiguration of the project intersection would involve the irreversible and irretrievable commitment of resources. Some of these resources include land, construction materials and manpower. Land within the right-of-way used for the construction of the reconfigured intersection is considered an irretrievable resource, however, the improvements are all within DDOT and NPS right-of-way (and presumably within all DDOT right-of-way once a transfer of land jurisdiction is approved), and DDOT as part of this project would continue to maintain the right-of-way for transportation purposes. Construction at the intersection would require that some existing infrastructure be either removed or relocated, which would also involve the commitment of resources. In the future, if a greater need for the land is identified, or if the transportation corridor is no longer necessary, it would be possible to convert the property to another use. It is not likely, however, that either of these situations would occur.

Construction of the reconfigured intersection would require the use of fossil fuels for construction vehicles, construction equipment, and construction personnel vehicles. Electrical energy would also be used onsite to power maintenance trailers (if applicable) and other equipment. Fossil fuels and electrical energy would be expended to manufacture the materials and products associated with development of the reconfigured intersection. In addition to those materials already mentioned, other materials such as asphalt, sand, aggregate, and steel would be used. These resources are not retrievable; however, the proposed project would not have an adverse effect on their continued availability. In order to minimize the usage of these resources, DDOT would consider ways to minimize resource commitments by reusing materials or by using recycled materials when possible, to construct the reconfigured intersection.

The current alignment of Pennsylvania Avenue, SE at the project site has been used as a transportation corridor since at least the 1860s. Reconfiguring the intersection would require the commitment of additional land, previously under NPS ownership, to be transferred to DDOT. However, the land exchange would not be considered an irreversible commitment of resources and would ultimately benefit the community. With the exception of this land transfer, the proposed intersection would remain within the existing transportation right-of-way. The reconfigured intersection could result in a minor loss of vegetation during construction activities, but would not affect wildlife habitat or special status species and the movement of wildlife. Land used for the intersection is considered an irreversible commitment during the time it is used for a transportation corridor and as a right-of way for several utilities. Alteration of the landscape by the proposed intersection would also be considered an irreversible change, however the urban environment in the vicinity of the intersection is not stagnant and is also subject to changes due to the fact that the commercial businesses and residences have private property owners. Additionally, the NPS owned land in the project intersection is currently not utilized as parkland. Long-term maintenance costs for the parkland would also be considered irretrievable.

The commitment of these resources is established on the premise that the local and regional residents, commuters, and business communities would benefit from the proposed reconfigured intersection. The reconfigured intersection would be beneficial to the local community by improving safety for pedestrians, bicyclists, motorists and public transit users, by enhancing mobility and connectivity in the area, and by enhancing the visual quality and aesthetics in the vicinity of the intersection. These long-term benefits are anticipated to outweigh the above-listed natural and fiscal resources.

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