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AFFECTED ENVIRONMENT

This chapter describes existing environmental conditions in and near the study area. The focus is on those aspects of the environment most likely to be affected by implementation of the proposed project. Because the study area is partly within the historic and monumental core of the District of Columbia, land use, parkland, cultural resources, and aesthetic conditions are particularly emphasized. Air quality and noise conditions are also described at length. Other areas surveyed include socioeconomic conditions, Kennedy Center operations, natural resources, and hazardous materials.

3.1 Land Use and Zoning

3.1.1 Existing Land Use

As is shown in Appendix A, Figure 3.1-1 (Existing Land Use), a mix of residential, commercial, institutional and educational, transportation, and recreational uses characterizes the study area and its immediate vicinity. These uses are not evenly distributed across the study area, but rather occur in clusters of varying size, each characterized by one or two major types of use. Roughly, four such clusters can be distinguished.

The first cluster is south of E Street (west of 23rd Street) and Virginia Avenue (east of 23rd Street), where large federal and institutional complexes or buildings and green space occupy most of the land. The buildings include the Kennedy Center itself, the Potomac Naval Annex, the Pan American Health Organization, the Department of State, and the Institute of Pharmacy. Most of the green space is federal parkland: part of West Potomac Park and the monumental core of Washington (see Subchapter 3.6.2). Large transportation facilities are also present, contributing to the loosely-woven character of the urban fabric in this area. These facilities include Roosevelt Bridge ramps, Potomac Freeway, E Street Expressway, and a government parking lot at 23rd Street and Constitution Avenue. This cluster does not include any residential or commercial functions.

The second land-use cluster, north of Virginia Avenue between 22nd and 24th Streets and extending to Washington Circle, is defined by The George Washington University (GWU), which owns and occupies most of the area. The GWU facilities include administrative and classroom space, dormitories, and other student amenities. The old (east of 23rd Street, now being demolished) and new (recently completed) GWU hospitals occupy the two blocks just south of Washington Circle. St. Mary's Elderly Housing on 24th Street, the Remington condominium on 24th Street, and St. Mary's Episcopal Church on 23rd Street represent non-GWU uses in this cluster.

The third cluster covers the area west of 24th Street, between E Street and Pennsylvania Avenue. The predominant land use is residential, with a mix of large condominiums and apartment complexes, such as the Watergate, Columbia Plaza, and Potomac Plaza, all located within sight of the Kennedy

Center and the proposed project site. The area also includes traditional row houses, many of which are concentrated in the four blocks fronting I Street between New Hampshire Avenue and 26th Street and are contributing elements of the National Register-listed Foggy Bottom Historic District.

Commercial land uses are also represented in the third land-use cluster, but they do not detract from its overall residential character. Despite the presence of a grocery store and several high-end boutiques and restaurants within the Watergate complex and a few stores in Columbia Plaza, retail uses are mostly found at the study area's periphery. Though some appear along Pennsylvania Avenue east of Rock Creek, most are on Pennsylvania Avenue and M Street west of the creek, in Georgetown. There are also two gas stations on either side of the western terminus of Virginia Avenue.

More characteristic of commercial uses in the neighborhood is the large number of hotels, due to the proximity of both the tourism and business centers of Washington, DC. One hotel is part of the Watergate complex, and several others are located along New Hampshire and Pennsylvania Avenues. One of the city's most prestigious hotels, the Georgetown Four Seasons, lies near the northwestern edge of the study area.

Although fewer and farther between than those east of 23rd Street, office buildings are also present in this third land-use cluster. Portions of the Watergate and sections of the Columbia Plaza complex are devoted to this use. Office buildings are also present along Pennsylvania Avenue and along 30th Street, west of Rock Creek.

Institutional and educational uses in this cluster include the Royal Embassy of Saudi Arabia, across from the Watergate and the Kennedy Center; several churches (Western Presbyterian Church, at Virginia Avenue and 24th Street; St. Paul Episcopal Church on K Street, west of Washington Circle; and St. Stephen Catholic Church, at the corner of 25th Street and Pennsylvania Avenue); and GWU properties (most notably the former Howard Johnson Motel across Virginia Avenue from the Watergate, now a student dormitory). Somewhat apart from the rest of the area on the small peninsula created by the confluence of Rock Creek and the Potomac is Thompson's Boathouse, popular with local boaters and rowers.

Much of the northwest portion of the third land-use cluster, between I Street, 26th Street, Pennsylvania Avenue, and Rock Creek, is occupied by a tangle of ramps and roadways associated with the Rock Creek Parkway, the Potomac Freeway, and the Whitehurst Freeway/K Street complex. The city's West Heating Plant looms over the area from across the creek.

The fourth and last land-use cluster is made up of the three blocks between Virginia Avenue, E and F Streets, and 23rd and 20th Streets. Land uses on these blocks are like a sampling of the land uses found elsewhere in and near the study area: residential, along F Street and 21st Street; some retail on Virginia Avenue; office buildings on Virginia Avenue and 22nd Street; hotels, including the old Allan Lee rooming house where F Street, 23rd Street, and Virginia Avenue meet; the Embassy of Bosnia and Herzegovina on E Street; GWU-owned student housing on F Street; and the District of Columbia Section of the American Red Cross, recently rebuilt, on E Street, between 21st and 20th Streets.

3.1.2 Zoning

District of Columbia zoning for the study area is shown in Appendix A, Figure 3.1-2 (Zoning). With the exception of two blocks north of Constitution Avenue between 21st and 23rd Streets (occupied by the American Institute of Pharmacy and the American Academy of Sciences), the South Sector of the study area is not zoned by the city, since it is federal land (land ownership in the study area is shown in Appendix A, Figure 3.1-3 [Land Ownership in Study Area]). The same is true of the Rock Creek Parkway corridor north of H Street and east of 27th Street.

The western half of the study area's Center Sector (including the site of the Kennedy Center and the roadways east of it) is zoned SP-2, i.e., medium to high-density special-purpose district with limited offices and apartments; this is further described in the text box below. The same category applies to the two blocks north of Constitution Avenue mentioned above. The eastern half of the Center Sector is zoned R-5-E (high-density general residential) and R-5-D (medium- to high-density general residential).

Special Purpose (SP) Districts

Special purpose districts are designed "to act as a buffer between adjoining commercial and residential areas to ensure that new development is compatible in use, scale, and design with the transitional function of this zone."

In an SP district, the following uses are a matter of right: all uses permitted in R-5 (general residential) districts except a hotel (which is a conditionally permitted use in an SP district); private school; religious reading room; community center building; park or other recreational facility operated by a local community organization; ticket office; child or elderly care center; art gallery; and, with some limitations, artist studio.

Conditionally permitted uses includes: chanceries, parking garages, college and universities, offices, utilities, accessory parking spaces, hotels and inns, community-based residential facilities, broadcasting antennas, clerical and religious group residences, and church programs. The exact conditions under which each of these uses is permitted are detailed in Section 5 of the District of Columbia's Zoning Regulations. Accessory uses to all permitted uses are also allowed.

In an SP-2 district, buildings are not to exceed a height of 90 feet (27.4 meters), and the maximum floor-to-area ratio is 6 for residential uses and 3.5 for other permitted uses.

Source: District of Columbia Office of Zoning, 2002.

General residential (R-5) zoning categories mixed with some commercial ones characterize the North Sector of the study area. A small area northwest of Juarez Circle, now cut through by the Potomac Freeway, is zoned C-2-A (medium-density community business center). South of the Whitehurst Freeway/K Street complex, land occupied by access ramps and interstitial grassy areas is zoned CR (mixed uses: retail, residential, office, and light industry) or R-5-B (moderate density general residential).

The North Sector of the study area also includes a special zoning feature: the Foggy Bottom Overlay District, mapped over a R-3 (row dwellings) district and coincident with the Foggy Bottom Historic District. The purposes of the Foggy Bottom Overlay District are to:

- Require a scale of development consistent with Comprehensive Plan provisions and the low-scale architectural harmony in a purely residential neighborhood, which was the basis for its designation as a historic district.

- Protect the integrity of the historic district.
 - Enhance the residential character of the area.
 - Preserve open backyards and alleyways that provide the only access to historic alley dwellings.
 - Enhance the human scale streetscape by maintaining the public space in front of the buildings and limiting future curb cuts.
 - Encourage greater use of public transportation through use of the nearby Foggy Bottom Metrorail station, so as to protect residential streets and alleys from the effects of too much through traffic.
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3.2 Relevant Plans, Studies, and Projects

In addition to the plans and projects listed in Chapter 1 and described more at length in Appendix D, Sections D1 through D9, the following plans are relevant to the proposed action.

3.2.1 Comprehensive Plan for the National Capital

The two main planning agencies with jurisdiction over development in Washington, DC are DCOP and the NCPC. Both agencies share in the preparation of the *Comprehensive Plan for the National Capital* (CPNC), which provides a “statement of goals, objectives, and planning policies for the growth and development of the National Capital” (NCPC, 1989). The CPNC has two parts: the federal elements, which contain recommendations directed at federal lands and the federal interest in the National Capital Region; and the District elements, which deal with non-federal lands in the District of Columbia. NCPC prepares the section of the CPNC dealing with federal elements. NCPC also reviews plans and programs proposed by state, regional, and local agencies for the impacts these plans and programs may have on the federal interest in the District. DCOP prepares the section of the plan dealing with the District elements and reviews plans and programs for the impacts these plans and programs may have on the city.

3.2.1.1 Comprehensive Plan for the National Capital – Federal Elements

The *Comprehensive Plan for the National Capital: Federal Elements* (NCPC, 1989 and 2003) is prepared pursuant to Section 4(a) of the National Capital Planning Act of 1952, as amended. The plan contains recommendations directed at federal lands and the federal interest in the National Capital Region, which includes the District of Columbia. The elements relevant to the KCAI project are:

- Federal Goals for the National Capital. This element identifies planning goals for use in the preparation of other elements of the Comprehensive Plan and for other purposes.
- Federal Facilities. The goal of this element is to “provide for the efficient and effective operation of the federal establishment while contributing to the general order and beauty of the National Capital.”

- Parks, Open Space and Natural Features. The goal of this element is to “conserve the natural features and resources of the National Capital and enhance cultural and recreational opportunities and the ecological value of the region’s parks and open space.”
- Federal Environment. The goal of this element is to “enhance the quality of the environment.”
- Visitors to the National Capital. The goal of this element is to “accommodate visitors to the National Capital in an efficient, attractive, and informative manner.”
- Preservation and Historic Features. The goal of this element is to “preserve the important historic features of the National Capital while permitting new development which is respectful of these features.”

The goals and objectives of each elements relevant to the proposed action are listed in Appendix D, Section D10.

3.2.1.2 Comprehensive Plan for the National Capital – District Elements

The 1973 Home Rule Act (Public Law 93-198, as amended) that gave District residents the right to govern themselves also required the District government to develop a Comprehensive Plan. The Comprehensive Plan is a general policy document that provides overall guidance for future planning and development of the city. The first Comprehensive Plan was adopted in 1984 and 1985, and it has been updated periodically, most recently in 1998 and 1999 (DCOP, February 2003). The guiding themes of the *Comprehensive Plan for the National Capital – District Elements* include:

- Stabilizing and improving the District’s neighborhoods.
- Increasing the quantity and quality of employment opportunities in the District.
- Developing a living downtown.
- Preserving and promoting cultural and natural amenities.
- Respecting and improving the physical character of the District.
- Preserving and ensuring community input.
- Preserving the historic character of the District.
- Reaffirming and strengthening the District’s role as the economic hub of the National Capital Region.
- Promoting enhanced public safety.
- Providing for diversity and overall social responsibilities.

The guiding themes are supported by the District elements of the Comprehensive Plan. The elements relevant to the KCAI project are:

- Economic development.
- Environmental protection.
- Transportation.
- Urban Design.

- Preservation and historic features.
- Land Use.

The goals of each element are described in more details in Appendix D, Section D11. Additionally, the District elements of the CPNC also include plans for each of the District's eight wards. Each ward plan outlines planning goals and policies for the ward. The goals and policies of each ward plan are adapted from the general sections of the District elements of the CPNC. The study area is located within Ward 2. The objectives of the Ward 2 Plan relevant to the KCAI project are described in Appendix D, Section D11.

3.2.2 Priorities 2000: Metropolitan Vision, Circulation System

The Metropolitan Washington Council of Government's (MWCOG) 2001 vision for the region is for a transportation system that promotes the region's economy, is financially sustainable, promotes areas of concentrated growth, and joins rail, roadway, bus, water, pedestrian, and bicycle facilities into a fully interconnected network (MWCOG, 2001). Goals are to:

- Enhance quality of life and create a strong growing economy.
- Provide a better pedestrian environment.
- Promote reasonable access to transit.
- Enhance the use of technology.

The report identifies one project in the vicinity of the study area: a Downtown Circulator, proposed by the DC Council, the Mayor of Washington, and the Downtown Business Improvement District. The Circulator would include four surface loop routes. Two east-west routes would connect Union Station to Georgetown, and the east end of the National Mall to its west end, respectively. Two north-south routes would connect the new Convention Center and the White House to the southwest waterfront. The Downtown Circulator would provide both visitors and workers with an affordable means to travel through downtown Washington (Layton, 2003).

3.2.3 A Transportation Vision, Strategy, and Action Plan for the Nation's Capital – Department of Public Works, District of Columbia

Published by the DC Department of Public Works in 1997, this plan provides a strategy for using transportation as a mechanism to reverse the trend of declining population and employment in Washington DC, and restoring it to being a vibrant capital city. The objectives of the plan are listed in Appendix D, Section D12.

3.2.4 Washington Metropolitan Area Transit Authority's (WMATA) Transit Service Expansion Plan

This study by the Washington Metropolitan Area Transit Authority (WMATA, 1999) aims at enhancing the role of transit in the metropolitan region. Plan objectives cover a 25-year planning

horizon. The plan identifies three goals for the role of public transit in the District:

- Double transit ridership by 2025 to maintain transit market share.
- Include an important transit element in the major transportation corridors and regional transportation systems to maintain the region's competitiveness.
- Use public transit to support and enhance community livability and quality of life.

The potential projects identified in the vicinity of the Kennedy Center Study Area included:

- Adding a new east entrance to the Foggy Bottom Metrorail Station.
- Adding new fixed guideway transit service connecting K Street to Rosslyn via the Kennedy Center.

In September 2002, WMATA, in the *District of Columbia Transit Development Study*, recommended that planning for four light rail lines in the District be carried forward, but not the planning for a line along New Hampshire Avenue that would have run in front of the Kennedy Center. The KCAI study, however, aimed to provide solutions compatible with all originally planned light rail lines.

3.2.5 Other Projects

Planned or on-going projects in the study area include:

- George Washington University Projects.
- New Swedish Embassy.
- US Institute of Peace.
- Georgetown Boathouse.

These project are summarized in Appendix D, Sections D13 through D16.

3.3 Transportation System

The transportation system around the Kennedy Center serves the needs of residents, workers in Foggy Bottom, major regional movements, and visitors to the Kennedy Center, albeit often with conflicts and difficulties caused by the multi-functional nature of the facilities. The area is highly urbanized, and the transportation system elements exist in complex relationship to one another.

On Saturday, January 17, 1998, and Thursday, January 29, 1998, Wells and Associates conducted surveys to collect a wide range of data on modes of access to the Kennedy Center. As part of these surveys, travel modal splits were estimated based on observations of patrons entering the garage, being dropped off at the Center by taxi and automobiles, and arriving by transit (Kennedy Center, 1998a). The results of these modal splits surveys are shown in Table 3.3-1.

**Table 3.3-1
Observed Travel Modes to Kennedy Center (Peak Performance Time)**

Mode of Arrival	Thursday	Saturday
Private Auto	69%	68%
Taxi	4%	2%
Metrorail	18%	10%
Metrobus	0%	0%
Tour Bus	7%	4%
Pedestrian ¹	3%	16%
1. Patrons who parked off-site and walked to the Kennedy Center from their car were counted as pedestrians. Source: Kennedy Center, 1998a.		

3.3.1 Pedestrian Access

The existing pedestrian network in the study area is shown in Appendix A, Figure 3.3-1 (Pedestrian/Bicycle Network near the Kennedy Center). The numbered circles indicate problematic trail/roadway intersections mentioned in the text. The major pedestrian desire lines to the Kennedy Center are from:

- The Foggy Bottom Metrorail Station in the north.
- Georgetown in the west.
- Rosslyn, Virginia, in the west, across the Potomac River.
- Downtown in the east.
- The Mall in the south.

Pedestrians are common in Foggy Bottom, a high-density urban neighborhood with The George Washington University at its center. For the purpose of the study, pedestrian counts were conducted on weekdays and weekends to confirm desire lines in the study area and to measure the volume of activity along these lines. The principal areas of interest were the major avenues and intersections--the avenues as primary routes through the study area, and the intersections with large vehicular and pedestrian volumes to determine the need for new routes or safety improvements.

Counts were conducted for morning (8:00 – 9:00 AM), evening (5:15-6:15 PM), and pre- and post-performance (6:30-7:30 PM and 9:15-10:15 PM, respectively) periods on weekdays along New Hampshire Avenue from the Foggy Bottom Metrorail Station to the Kennedy Center. Included were the intersections of New Hampshire Avenue with I Street, 25th Street, Virginia Avenue, and F Street; and the intersections of Rock Creek Parkway with Virginia Avenue and F Street. Counts at these locations were also conducted for pre- and post-performance periods on weekends. Further, Saturday mid-day counts were conducted along the recreational trail west of the Center. The intersection counts are shown in Appendix F, Figures F-1 (Weekday AM/PM Peak Hour Pedestrian Counts), F-2 (Weekday/weekend Pre-performance Pedestrian Counts), and F-3 (Weekday/weekend Post-performance Pedestrian Counts). The trail counts are shown, along with bicycle counts, on Figure F-4 (Weekday AM/PM Peak Hour and Weekend Bicycle Counts).

Many Kennedy Center patrons who arrive at the Foggy Bottom Metrorail Station walk to the Kennedy Center. Other pedestrians approach the Center from the Watergate Complex on the north or the Lincoln Memorial on the south. People also walk (and jog or skateboard) to or past the Kennedy Center on the riverside along Rock Creek Parkway. Some of these movements include the crossing of very busy streets or roadways (e.g., Rock Creek Parkway or Virginia Avenue) often with uncontrolled intersections and at some risk to the pedestrians.

3.3.1.1 Pedestrian Access to/from the Foggy Bottom Metrorail Station

While pedestrian access to the Kennedy Center from the Foggy Bottom Metrorail Station is fairly direct, signage is poor or non-existent. The primary route from the Metrorail Station is west on I Street, which functions as a pedestrian mall between 23rd and 24th Streets. After crossing 24th Street, a pedestrian would turn left on New Hampshire Avenue and see the Center directly ahead.

The sidewalks along New Hampshire Avenue are six to eight feet wide and are not sufficient to carry peak-hour pedestrian traffic (almost 300 persons). The trees along New Hampshire Avenue's sidewalks reduce the amount of usable space. Brick sidewalks enhance the streetscape but are not well maintained.

Pedestrian crossing of Juarez Circle – the intersection of Virginia Avenue, H Street, 25th Street, and New Hampshire Avenue (Intersection 1 in Appendix A, Figure 3.3-1) – is difficult and unclear. To navigate the circle, pedestrians must make multiple crossings, the most hazardous of which is six-lane Virginia Avenue which has inadequate pedestrian refuge at the median.

The pedestrian route to gain access most directly to the front of the Kennedy Center is along the west side of New Hampshire Avenue; this route requires multiple street crossings throughout the circle. However, when coming from the Metrorail Station, the east side of New Hampshire is the most directly-perceived route and possibly the easiest side to use when navigating Juarez Circle.

3.3.1.2 Pedestrian Access to/from Georgetown

From Georgetown, pedestrians can reach the Kennedy Center via the trail along the Georgetown Waterfront and Georgetown Harbour, and the trail along Rock Creek Parkway.

The trail along the Georgetown Waterfront and Georgetown Harbour generally consists of a hard, paved surface along the Potomac River that terminates at 30th Street. The Washington Harbour boardwalk is well-lit, with pedestrian amenities and streetscape furnishings. Boats are allowed to dock at the bulkhead, and the plaza provides outdoor seating for restaurants and cafes. The Kennedy Center is visible from all points along the waterfront, but signage is not present.

East or southeast of 30th Street, the waterfront is a mix of dirt, gravel, and paved areas with no clearly defined path. From these areas, Thompson's Boathouse – an active center for crew clubs from local universities and high schools and a natural draw to travelers heading south – is visible, but the route beyond to the Kennedy Center is unclear.

After walking along this dirt and gravel path for approximately fifty feet, the traveler arrives at a paved area and the driveway servicing the boat center. The driveway leads to a short, one-lane bridge

across Rock Creek that has a narrow, three-foot-wide sidewalk on the downstream (south) side and an eighteen-inch safety curb on the upstream (north) side. This bridge connects to a parking lot reserved for the boathouse with a vehicle entry point on Rock Creek Parkway controlled by the signalized intersection with Virginia Avenue. It was observed that pedestrians typically cross Rock Creek using the travel lane rather than the sidewalk.

The sidewalk from the bridge follows the southern edge of the parking lot and connects to the Rock Creek Parkway pedestrian/bicycle trail at the intersection with Virginia Avenue (Intersection 3 in Appendix A, Figure 3.3-1). The asphalt pedestrian and bicycle path along Rock Creek Parkway is six feet wide north of Virginia Avenue and ten feet wide south of Virginia Avenue. To the north, users must navigate across ramps to and from K Street. To the south, the large number of well-worn paths in the grass adjacent to the paved surface indicates that the width may be inadequate for the number of users. Further south, as the trail approaches the Kennedy Center, there is a pedestrian crosswalk connection at a signalized intersection across Rock Creek Parkway to F Street. In front of the Center, the trail widens to ten feet and hugs the bulkhead along the river. This concrete portion of the trail was built in conjunction with the Kennedy Center and provides seating areas. Further south, the trail connects to Ohio Drive, Lincoln Circle, and Independence Avenue through the underpass for Roosevelt Bridge.

3.3.1.3 Pedestrian Access to/from Rosslyn (Virginia)

Pedestrian access to the Kennedy Center from Virginia is possible by walking along either side of the Francis Scott Key Bridge or along the north side of the Theodore Roosevelt Bridge. The Key Bridge route is much more pedestrian-friendly than the Roosevelt Bridge route. It is more convenient for a Kennedy Center patron to walk along the east (downstream) side of the Key Bridge to avoid crossing the Key Bridge's vehicular traffic lanes on the District side of the river. On the District side of the bridge, the pedestrian walks through the Francis Scott Key Park (located at the Key Bridge and M Street in Georgetown) and across the C&O Canal on a footbridge down to Water Street. From Water Street, the pedestrian would follow the route along the Georgetown Waterfront, as described in Subchapter 3.3.1.2.

Because the connection to the Roosevelt Bridge on the Virginia side is not convenient, the usefulness of this route for pedestrians is limited. The south sidewalk for Roosevelt Bridge lacks any connection to a trail network on the Virginia side, and the north sidewalk only connects to Rosslyn without access through the US 50 corridor. Additionally, the pedestrian route via the Roosevelt Bridge includes some backtracking north on the District side of the river to reach the Kennedy Center.

From Rosslyn, a pedestrian must access the Custis Memorial Parkway pedestrian/bicycle path at the corner of Lee Highway and North Lynn Street near an off-ramp for westbound I-66 traffic exiting to Rosslyn. From there, the trail becomes more isolated from traffic as the traveler follows the path down a hill and over a pedestrian bridge crossing the George Washington Memorial Parkway. The path leading to the bridge is asphalt, in good condition, and six to eight feet wide. Lighting is provided on the portion of the trail up to the bridge. At the bridge, the trail widens to ten feet. There are adequate railings for pedestrians and bicycles, but the lighting is discontinued.

Next, the traveler passes along the north side of the parking lot for Theodore Roosevelt Island. The trail is adjacent to the river, approximately six feet wide, and set immediately behind a raised six-inch curb. It is in poor condition, and no railing is provided. This portion of the trail is half the length of the parking lot and terminates at a curb ramp into the parking lot. From that point, pedestrians are required to cross the parking lot. The trail continues on the south side of the lot as an asphalt path approximately six feet wide.

After a short distance, an elevated wooden bridge carries the trail that is approximately eight feet wide between curbs and has railings consisting of posts and two chains that do not meet current design standards. The wooden timbers comprising the deck are in fair condition, with minor splintering observed but no serious deterioration. After approximately 500 feet, the trail splits, with the through direction taking the traveler to the Roosevelt Bridge trail and a hard left turn required to access the Mount Vernon Trail. No directional signs are provided for the eastbound traveler. The Roosevelt Bridge trail continues along the parkway and curves west onto the bridge.

On the Roosevelt Bridge, the trail becomes a concrete sidewalk that is narrow with inadequate railings. The width varies between six and eight feet, which includes a traffic rail between the travel lanes and the sidewalk. Neither the exterior pedestrian rail nor the traffic rail meets current design standards. The traffic rail is particularly hazardous as it is low and designed for vehicular impact requirements.

On the District side, the traveler leaves the bridge for an asphalt trail that veers to the north between two ramps. On the right is an on-ramp to the Roosevelt Bridge for westbound vehicular traffic, and on the left is an extension of 25th Street that provides vehicular access to the Kennedy Center's south garage entrances. Under the current garage expansion plan, the trail will ultimately become a sidewalk parallel to 25th Street that will take the traveler to Juarez Circle. This route, however, will still require travelers to cross 25th Street to access the Kennedy Center, and for those destined for Juarez Circle, the crossing of a new ramp off 25th Street to Roosevelt Bridge.

The south sidewalk has a similar cross section as the north side of the Roosevelt Bridge and connects to West Potomac Park on the District side of the Potomac River via a six-foot, asphalt trail that terminates at the base of an off-ramp for the Roosevelt Bridge. From there, it is possible to ultimately connect to Constitution Avenue at 23rd Street. However, this connection requires making two crossings of the Potomac Freeway, at its southbound intersection with Ohio Drive (Intersection 6 in Appendix A, Figure 3.3-1) and at the Ohio Drive on-ramp to northbound Potomac Freeway (Intersection 5 in Appendix A, Figure 3.3-1). While both crossings have designated crosswalks, both are uncontrolled and unsafe, with no direct connection to the Kennedy Center.

Neither pedestrian walkway along the Roosevelt Bridge connects to the Rock Creek Parkway pedestrian/bicycle trail. The most direct connection between the paths requires that users first pass in front of the Kennedy Center as far north as Juarez Circle, turn left and follow Virginia Avenue to Rock Creek Parkway, and finally join the path after passing through the signalized intersection.

3.3.1.4 Pedestrian Access to/from Downtown

Westbound E Street and eastbound D Street are parallel roads separated by a landscaped park between 18th and 20th Streets, forming a natural esplanade with the Kennedy Center visible in the

distance but largely inaccessible due to freeway ramps and to E Street's dead-ending at the Potomac Freeway.

Beyond 23rd Street, a complex series of ramps (at the confluence of the E Street Expressway and the Potomac Freeway) prevents direct access along E Street to the Kennedy Center. The E Street frontage road has a sidewalk along the north side to the driveway and curb cut for the Columbia Plaza entrance and loading dock. Beyond the loading dock, a service road continues between the Columbia Plaza and the depressed Potomac Freeway, terminating at Virginia Avenue. This service road doubles as an informal pedestrian way that would allow travelers to ultimately access Juarez Circle at Virginia Avenue and from there, 25th Street and the Kennedy Center.

3.3.1.5 Pedestrian Access to/from the National Mall

While the Kennedy Center is visible from the Mall, no direct access from the Mall exists and pedestrians must follow indirect routes.

One route is to use the existing street grid and adjacent sidewalks. This route would require a pedestrian to travel north from Constitution Avenue on 23rd Street to E Street or Virginia Avenue. From there, a traveler would use the routes described in Subchapter 3.3.1.4 to Juarez Circle and 25th Street to the Kennedy Center. This route is considered the most direct and safest because the street grid is relatively intuitive, all the streets have adequate sidewalks, and all crossings are signal-controlled and have pedestrian facilities such as curb ramps.

Another possible route is via the southern approaches of the Rock Creek Parkway pedestrian/bicycle trail. There are two main ways to get to the trail from the Mall. One option is to use the crosswalks around the northern, outer ring of Lincoln Circle to reach one of the sidewalks (the west one is about 12 feet wide, and the east one is about eight feet wide) along Parkway Drive. This requires the use of crosswalks: Henry Bacon Drive (signalized), 23rd Street (signalized), and the ramp from northbound Ohio Drive to Lincoln Circle (unsignalized). The Parkway Drive sidewalks end at the Belvedere, which is the southern terminus of the Rock Creek Parkway pedestrian/bicycle trail. Pedestrians may cross Parkway Drive using an unsignalized crosswalk either at Lincoln Circle to reach the west sidewalk or at the Belvedere. The trail narrows slightly under the Roosevelt Bridge with a solid wall abutment on one side. Beyond the Roosevelt Bridge underpass, the trail is as described above in Subchapter 3.3.1.2 (Pedestrian Access to/from Georgetown), with a signalized crosswalk at F Street for access to the Kennedy Center.

The second option is to head south from Lincoln Circle along 23rd Street, cross Independence Avenue, and follow Ohio Drive north to join the trail at the Belvedere. This connection has two major problems. First, it requires the traveler to first walk away from the Kennedy Center, which is counterintuitive, and second, the path is on the west side of Rock Creek Parkway (along the river), which requires people to cross the parkway's travel lanes at the signalized crosswalk to F Street. Safe access along this route requires the pedestrian to travel south from the Lincoln Memorial along 23rd Street to Independence Avenue, where a signalized crosswalk provides access to the trail along the river. From there, the traveler must move north along the west side of Ohio Drive on a combination pedestrian/bicycle path that is narrow and unsuitable for multi-purpose use.

This is particularly true opposite Ohio Drive from the Watergate Steps (directly west of Lincoln Circle). The narrow trail on the west side of Ohio Drive is between heavy traffic volumes immediately to the east and a few more steps descending to grass along the river on the west. This route also requires passage through two underpasses, each approximately three feet wide, that have a solid wall abutment on one side and an inadequate safety rail between the trail edge and the vehicular travel lane on the other.

After passing through the second underpass, the traveler continues to follow Ohio Drive north on a six-foot-wide asphalt trail that passes several volleyball courts and leads to the Rock Creek Parkway and Ohio Drive intersection at the Belvedere. Here, the route crosses the parkway at an unsignalized crosswalk that has an island median for refuge and continues around the Belvedere and northward along the waterfront under the Roosevelt Bridge to the F Street crossing point.

In general, access to and from the Mall is not easy for pedestrians even if the way is known. Signage is lacking and the routes are not direct. Instead, they are indirect roundabouts that are particularly onerous to tourists and visitors who may see the Center but are left without a clear, intuitive route to follow.

3.3.2 Bicycle Access

The existing bicycle network in the study area is shown in Appendix A, Figure 3.3-1. As can be seen from the figure, the bicycle network in the area is limited, few facilities exist that can accommodate all movements, and important connections are lacking in several directions.

The primary bicycle desire lines to and from the Kennedy Center are:

- Georgetown/Rock Creek Park in the west and north.
- Rosslyn, Virginia, in the west, across the Potomac River.
- Downtown in the east.
- The Mall in the south.

Bicycles are common around The George Washington University (GWU) and on the trail along Rock Creek Parkway, especially on weekends during the day, when Beach Drive, north of the parkway, is closed to all vehicular traffic. Generally, access to the Kennedy Center from these two points is through the existing street grid, primarily along Virginia Avenue and then 25th Street. Cyclists can also access the Center more directly from the parkway trail using the signalized crosswalk at F Street. However, as is the case for pedestrians, it is difficult to get to the Center by bicycle from points east, from the Mall, and from the riverfront.

For the purpose of this study, bicycle counts were conducted on both weekdays and weekends to confirm desire lines in the study area and to measure the volume of activity along these lines. The major focus of bicycle activity in the study area is along the river between Memorial Bridge and Georgetown. The main areas of interest were the major bicycle routes, the avenues that serve as the primary routes through the study area, and the intersections with large volumes.

Counts were conducted on weekday mornings and evenings and weekend afternoons at the following locations:

- Along the Rock Creek Parkway pedestrian/bicycle trail just south of Virginia Avenue opposite the Watergate complex.
- South of the Belvedere, along the trail leading to Memorial Bridge.
- Along the north sidewalk trail on the Roosevelt Bridge.
- Along Virginia Avenue east and west of Juarez Circle.
- On New Hampshire Avenue north of Juarez Circle.

The counts are shown in Appendix F, Figure F-4 (Weekday AM/PM Peak Hour and Weekend Bicycle Counts).

3.3.2.1 Bicycle Access to/from Georgetown/Rock Creek Park

The Rock Creek Parkway pedestrian/bicycle trail extends along the length of Rock Creek Parkway from Calvert Street in the north, where it connects to trails in Rock Creek Park, to the Belvedere in the south, where it connects to trails leading to the Mall and across Memorial Bridge. The existing network in Georgetown includes the Georgetown Waterfront pedestrian/bicycle trail described above in Subchapter 3.3.1.2. This trail connects indirectly via Thompson's Boathouse to the Rock Creek Parkway pedestrian/bicycle trail at the intersection of Rock Creek Parkway and Virginia Avenue.

To reach the Kennedy Center from Georgetown, bicyclists would use the same route pedestrians use. The connection is described above in Subchapter 3.3.1.2. While the connection is not ideal for pedestrians, it is even less so for bicyclists, owing to the lack of a rail along the waterfront where boats dock; the heavy usage by pedestrians, which increases the potential for conflicts; and the poor condition of the path to Thompson's Boathouse, which presents additional hazards to bicyclists.

After traversing the dirt and gravel connection to the driveway servicing the boat center, a bicyclist would use the one-lane bridge across Rock Creek to access the parking lot reserved for the boathouse and approach the signalized intersection with Virginia Avenue (see Intersection 3 in Appendix A, Figure 3.3-1). From that intersection bicyclists arriving from either Georgetown or upper Rock Creek Parkway can use either Virginia Avenue or the pedestrian/bicycle path along Rock Creek Parkway to reach the Kennedy Center.

In the latter case, bicyclists would ride south and cross at F Street, the sole crosswalk across Rock Creek Parkway in close proximity to the Kennedy Center. However, a bicyclist would be disinclined to use F Street, as it functions more as an access road to the north garage entrance for the Center, with portions closest to the crosswalk being one-way westbound.

Another route is to use Virginia Avenue to 25th Street or New Hampshire Avenue. That route is not signed for bicyclists. To use this route, a bicyclist would cross Rock Creek Parkway using the south crosswalk, since only left or right turns are allowed from the parking lot entrance drive. This would place the bicyclist on the south sidewalk for Virginia Avenue, requiring entry to the street grid, as the sidewalk is not designated for bicycle use. After entering Virginia Avenue, the bicyclist would ride

with street traffic to Juarez Circle and either navigate to New Hampshire Avenue or 25th Street before heading to the Kennedy Center.

In the reverse direction, access to Georgetown and the parkway trail is more difficult. The F Street connection is easiest, since a bicyclist would generally be moving with traffic along F Street to the Rock Creek Parkway crosswalk. However, returning via Virginia Avenue is difficult and confusing. Bike route signs are provided along northbound parts of 25th Street, guiding the bicyclist to Juarez Circle. A left turn through the circle places the bicyclist on westbound Virginia Avenue, and bike route signs direct the bicyclist to stay in the far right lane. However, this sends the bicyclist through a confusing intersection at 27th and I Street and then to the intersection with Rock Creek Parkway, where mandatory right turns are required without access across the parkway to the pedestrian/bicycle trail. Bicyclists familiar with this shortcoming would cross Virginia Avenue at the 27th Street crosswalk and use the sidewalk on the south side of Virginia Avenue to reach the crosswalk at the parkway.

In general, access to and from Georgetown and Rock Creek Parkway is not easy for bicyclists, even when the way is known. Signage is lacking, and the routes are not direct and potentially dangerous.

3.3.2.2 Bicycle Access to/from Rosslyn (Virginia)

Bicycle access across the Potomac River to the Kennedy Center is possible via either side of the Key Bridge or the north side of Roosevelt Bridge as described in detail in Subchapter 3.3.1.3. Unlike pedestrians, cyclists using the Key Bridge route would need to avoid the stairs associated with the footbridge crossing the C&O Canal. Some bicyclists may opt to ride east along M Street to avoid these stairs. These bicyclists could then turn south on Wisconsin Avenue to Water Street at the Georgetown Waterfront Park.

The Roosevelt Bridge route connects directly to 25th Street on the District side, providing access to the street grid. While the trail is inconvenient to pedestrians, bicyclists generally would find the route direct and relatively pleasant. The main drawbacks, however, are the trail width through the parking lot at Roosevelt Island and on Roosevelt Bridge, and the lack of adequate and proper railings for bicyclists on the wooden trestle bridge leading to Roosevelt Bridge and on Roosevelt Bridge itself.

The trail through the parking lot for Roosevelt Island is only about six feet wide and is set immediately behind a raised, six-inch curb with no protection. Similarly, the trail on Roosevelt Bridge varies between six and eight feet wide, which includes a traffic rail between the travel lanes and the sidewalk. Narrow trails at both locations make traveling difficult, particularly when passing other bicyclists or pedestrians traveling in pairs or groups. These trails are heavily used, particularly on weekends, and narrow trails provide greater potential for conflicts. The trail through the Roosevelt Island parking lot is supplemented by the parking lot itself, and bicyclists often divert to it when the trail is crowded. On Roosevelt Bridge, however, there are no comparable alternatives, and the bicyclist must dismount or stop to allow traffic to pass.

As mentioned above, railing is inadequate in two locations: on the wooden trestle bridge and on Roosevelt Bridge. On the wooden bridge, the railing consists of posts and two chains that do not meet current design standards. On Roosevelt Bridge, both the exterior pedestrian rail and the traffic rail fail to meet current design standards. The traffic rail is particularly hazardous, as it is low and

designed for vehicular impact requirements. Bicyclists hitting it would run the risk of being catapulted over the rail and into oncoming traffic.

As noted in Subchapter 3.3.1.3, the south sidewalk for Roosevelt Bridge lacks a direct connection to Virginia, although travelers, both pedestrian and bicyclist, often attempt access by crossing the US 50 corridor from the Iwo Jima Memorial.

The most direct connection between the paths along the Roosevelt Bridge and the Rock Creek Parkway trail requires that users first pass in front of the Kennedy Center as far as Juarez Circle, turn left and follow Virginia Avenue to Rock Creek Parkway, and then join the trail crossing the signalized intersection between Virginia Avenue and the parkway. This connection and its shortcomings are discussed in Subchapter 3.3.2.1.

3.3.2.3 Bicycle Access to/from Downtown

The local streets near the Kennedy Center do not have separate bicycle lanes, so bicyclists must use vehicular travel lanes. As noted in Subchapter 3.3.1.4, E Street does not connect to the Kennedy Center. Any connections to the east, therefore, must be through Virginia Avenue and the east-west (lettered) streets north of E Street.

F, G, H and I Streets are relatively low-volume, two-lane streets providing an approach that can be used by most bicyclists. These streets ultimately lead to either Virginia Avenue or New Hampshire Avenue. New Hampshire Avenue between Washington Circle and Juarez Circle is similar to the lettered streets crossing it--a low-volume, two-lane road with stop-controlled intersections.

On Virginia Avenue, the intersection with 23rd Street includes two service roads for local traffic and an underpass for through traffic. Bicyclists are likely to use the service roads, as they are safer to navigate. A difficulty occurs at the merging point on the west side of the underpass where the westbound service road rejoins the main Virginia Avenue lanes. Here, bicyclists must merge with car traffic exiting the underpass at a relatively high speed with poor sight distances.

Continuing west, bicyclists must enter the left lane of Virginia Avenue to make a left turn at Juarez Circle and then proceed to New Hampshire Avenue or 25th Street to continue to the Kennedy Center. Alternatively, bicyclists might turn right into the circle and navigate it counter-clockwise, passing through the intersections with New Hampshire Avenue and 25th Street on the north before crossing Virginia Avenue to the Center. This is a safer route, but not obvious and not signed.

Connections to the east are possible but difficult, especially for the inexperienced bicyclist. The reverse direction is easier only in respect to navigating Juarez Circle, as only right turns are required to regain access to Virginia Avenue. However, left turns from Virginia Avenue are ultimately required to continue east.

3.3.2.4 Bicycle Access to/from the National Mall

The most direct bicycle connection between the Kennedy Center and the Mall is along the Rock Creek Parkway pedestrian/bicycle trail in the South Sector. This connection suffers from the same problems as the pedestrian connection described in Subchapter 3.3.1.5. Otherwise, the three

approaches to the Kennedy Center described in that subchapter – using the existing street grid via 23rd Street and Virginia Avenue, using the Ohio Drive approach of the Rock Creek Parkway pedestrian/bicycle trail, or using the sidewalk system around Lincoln Circle – apply equally to bicyclists, with differences in the street grid approach as described below.

Use of the street grid requires the bicyclist to ride in the travel lanes, as bicycles are prohibited on sidewalks in the Central Business District. Twenty-third Street is a six-lane roadway with signalized intersections between Constitution and Virginia Avenues, which is the required bicycle route. At Virginia Avenue, a bicyclist would need to make a left turn onto the westbound service road and merge with the through traffic using the underpass before proceeding on to the Kennedy Center.

In general, bicycling between the Kennedy Center and the Mall is not easy, even if the way is known. Signage is lacking, and the routes are indirect.

3.3.3 Vehicular Access

The road network in the study area is shown in Appendix A, Figure 3.3-2 (Roadway and Street Network). Because of the complexity of the interchanges and lack of previous identification for the numerous ramps that connect the roadway network in the study area, the following naming method has been used: ramps are identified as RP-1 through RP-28, numbered from south to north.

As shown in Table 3.3-1, which is based on a 1998 survey of access modes to the Kennedy Center (Kennedy Center, 1998a), 68 to 69 percent of patrons arriving for evening performances come by private automobile. Before arriving at the Center, however, drivers must navigate poorly-signed roadways, including the Rock Creek Parkway, the E Street Expressway, the Potomac Freeway, and the ramp systems that connect these roadways to the Roosevelt Bridge in the south and to the Whitehurst Freeway in the north.

3.3.3.1 Major Approach Routes to the Kennedy Center

The 1998 study surveyed Kennedy Center patrons about which roadways they used to reach the Center for evening performances (Kennedy Center, 1998a). The results are shown in Table 3.3-2. The study shows that 42 percent of the patrons came across the Roosevelt Bridge. The remaining 58 percent were distributed among several routes, most originating from points in the District of Columbia or Maryland. Patrons who do not have to cross the Potomac River to reach the Kennedy Center have a wider choice of routes.

**Table 3.3-2
Percentage of Inbound Traffic to Kennedy Center by Roadway**

Corridor	Weekday	Saturday
Inbound Theodore Roosevelt Bridge	42%	42%
Southbound Rock Creek Parkway north of Virginia Avenue	9%	16%
Southbound New Hampshire Avenue north of Virginia Avenue	13%	9%
Westbound Virginia Avenue from 23 rd Street	10%	8%
27 th Street from K Street and Whitehurst Freeway	6%	6%
Northbound Ohio Drive from points south	19%	18%
Westbound E Street Expressway	1%	1%
Source: Kennedy Center, 1998a.		

The study showed that the main roadways used by patrons to approach the Kennedy Center are:

- The Roosevelt Bridge
- The Rock Creek Parkway
- New Hampshire Avenue
- Virginia Avenue
- Ohio Drive
- 27th Street.

A short description of how patrons approach the Kennedy Center from these roadways follows. User percentages are all based on data provided by the 1998 survey (Kennedy Center, 1998a).

Vehicular Access from the Roosevelt Bridge

The Roosevelt Bridge carries I-66 into the District, where it becomes the Potomac Freeway. In addition to this major road, the Virginia side of the bridge has ramp connections to southbound George Washington Memorial Parkway and eastbound US 50. Most Kennedy Center patrons using the bridge (39 percent out of 42 percent on weekdays and 37 percent out of 42 percent on Saturdays) continue onto the ramp leading to Ohio Drive toward northbound Rock Creek Parkway and the Kennedy Center. The rest get on the E Street Expressway, continuing on to the Potomac Freeway, 27th Street, Virginia Avenue, New Hampshire Avenue, and the Kennedy Center.

Vehicular Access from Rock Creek Parkway

Rock Creek Parkway extends north through Rock Creek Park, and links up with Beach Drive, which continues for a number of miles into Montgomery County, Maryland. Beach Drive and the parkway serve as a major route to downtown Washington for travelers living in Northeast and Northwest Washington and the inner suburbs of Montgomery County, particularly Bethesda, Chevy Chase, Silver Spring, and Kensington. As shown in Table 3.3-2, on weekdays nine percent of Kennedy Center patrons use southbound Rock Creek Parkway. On Saturdays, 16 percent do. To reach the Center, these patrons turn left onto Virginia Avenue then right onto 25th Street.

South of the Kennedy Center, northbound Rock Creek Parkway is a major access route to the Center: 57 percent of the Center's patrons on weekdays and 54 percent on the weekend reach their

destination by this route. They include those patrons coming across the Memorial and Roosevelt bridges, as well as those patrons coming from Independence Avenue via Ohio Drive.

Vehicular Access from New Hampshire Avenue

New Hampshire Avenue is an important connector to downtown Washington via Washington Circle. It is also the primary route pedestrians use to access the Kennedy Center from the Foggy Bottom Metrorail Station at 23rd and I Street. Thirteen percent of patrons of the Center arriving by private cars on weekdays and nine percent of those arriving by private cars on Saturdays use New Hampshire Avenue north of Virginia Avenue. At Juarez Circle, New Hampshire Avenue picks up Kennedy Center-bound traffic from Virginia Avenue, including traffic from southbound Rock Creek Parkway and 27th Street. Along with the southbound parkway, New Hampshire Avenue south of Virginia Avenue used to be the main approach to the Center (40 percent of all patrons on weekdays and 43 percent on the weekend). However, the Kennedy Center garage expansion project has recently redirected the Center-bound traffic carried by New Hampshire Avenue to 25th Street.

Vehicular Access from Virginia Avenue

Virginia Avenue connects (via New Hampshire Avenue) the Kennedy Center to southbound Rock Creek Parkway, K Street and the Whitehurst Freeway (via 27th Street), and 23rd Street. On weekdays, 27 percent of the Center's patrons use Virginia Avenue; on weekends, 34 percent use this route.

Vehicular Access from Ohio Drive

Ohio Drive provides access to the Kennedy Center from Independence Avenue and beyond. On weekdays, 18 percent of the Center's patrons use it; on weekends, 17 percent use Ohio Drive. Of these, all but one percent (on both weekdays and weekends) stay on Ohio Drive to the Rock Creek Parkway northbound and on to the Center. This traffic passes through the intersection of Ohio Drive with southbound Potomac Freeway and the ramp off eastbound Roosevelt Bridge. The remaining one percent gets on northbound Potomac Freeway and reaches the Center via 27th Street, Virginia Avenue, and New Hampshire Avenue.

Vehicular Access from 27th Street

Twenty-seventh Street is used by patrons approaching the Kennedy Center from K Street/Whitehurst Freeway and from northbound Potomac Freeway, representing 11 percent of all motorized patrons on weekdays and 13 percent on the weekend. These patrons must pass through the intersection with I Street to reach Virginia Avenue and, beyond that point, New Hampshire Avenue and the Center.

3.3.3.2 Major Highways and Streets

Theodore Roosevelt Bridge and Ramps

The Roosevelt Bridge is a primary commuting link between Northern Virginia and the District of Columbia. It is functionally classified as an interstate route (I-66). With connections to the George Washington Memorial Parkway, Arlington Boulevard (US 50), and I-66 on the Virginia side, the

Roosevelt Bridge carries more than 40 percent of the traffic to and from the Kennedy Center. Current traffic counts show the bridge carrying 120,000 vehicles per day (VPD). To accommodate this high volume of traffic, the District of Columbia Department of Transportation (DDOT) operates a movable median barrier, providing four inbound lanes with three outbound lanes during the morning peak period and four outbound lanes with three inbound lanes during the evening peak period. No trucks are allowed on this facility west of the Potomac Freeway.

Ramp connections with the Roosevelt Bridge on the District side provide access to Constitution Avenue, E Street Expressway, Potomac Freeway, and Rock Creek Parkway. During peak periods, there is considerable traffic congestion and queuing on these ramps, as described below.

The two-lane eastbound ramp to Constitution Avenue (Ramp RP-3) carries over 20,000 VPD, with traffic backing up on the Roosevelt Bridge during morning peak periods. Backups primarily result from a series of traffic signals on Constitution Avenue, beginning at 23rd Street and continuing east. However, the westbound two-lane ramp to the Roosevelt Bridge (Ramp RP-4), carrying 21,000 VPD, benefits from these same signals, because they have a metering effect on traffic leaving the District. Before the Potomac Freeway overpass, a ramp from northbound Potomac Freeway (Ramp RP-7) merges with Ramp RP-4, which then reduces to one westbound lane on weekdays between 5 AM and 12 noon as it joins the Roosevelt Bridge.

Ramp RP-5 carries 8,000 VPD from the Roosevelt Bridge to southbound Potomac Freeway, Ohio Drive, and Independence Avenue. Because it provides access to northbound Rock Creek Parkway via Ohio Drive, this ramp is one of the primary routes to the Kennedy Center. Traffic frequently backs up on the ramp as far as the Roosevelt Bridge for several reasons:

- There is no acceleration lane to merge with southbound Potomac Freeway traffic.
- Traffic queues on southbound Potomac Freeway often extend from the stop sign at Ohio Drive to a point north of Ramp RP-6, blocking ramp traffic wishing to merge.
- During the evening peak periods (3:45-6:30 PM), southbound Ohio Drive is closed. As a result, unwary drivers must decide whether to turn right on northbound Ohio Drive, or U-turn to northbound Potomac Freeway. Approximately 1,100 VPD make this U-turn maneuver, the majority during the evening peak period.

A two-lane ramp from the Roosevelt Bridge to E Street Expressway (Ramp RP-6) and Potomac Freeway carries approximately 33,000 VPD. From there, one lane (Ramp RP-12) diverges to connect to northbound Potomac Freeway. Ramp RP-6 continues to E Street, where it reduces to one lane where the expressway begins. Approximately 23,000 VPD converge at this lane-reduction point, which has a considerable impact on eastbound traffic flow. During morning peak periods, traffic queues have been observed extending to the Roosevelt Bridge.

Potomac Freeway

The Potomac Freeway begins at Ohio Drive and terminates as ramps to and from the Whitehurst Freeway, K Street, and 27th Street. The Potomac Freeway is classified as an interstate route (I-66). No truck traffic is allowed on the freeway south of the E Street Expressway.

The Potomac Freeway once provided an access point from the southbound lanes to the Kennedy Center. This access has now been closed and will be replaced with a new egress ramp from the Center to westbound Roosevelt Bridge, as proposed in the *Transportation Management Plan* for the Kennedy Center, dated March 2, 1998 (Kennedy Center, 1998a). This new ramp is projected to serve up to a third of the patrons leaving the Center after a performance.

The freeway primarily serves traffic movements between the Roosevelt Bridge, the E Street Expressway, and the Whitehurst Freeway interchanges, generally resulting in more traffic on the ramps than on the mainline. The freeway carries two 12-foot lanes in each direction, but widens to eight lanes through the tunnel beneath Juarez Circle to accommodate the merging and diverging lanes among the three interchanges. Existing traffic volumes range from approximately 18,000 VPD passing under the Constitution Avenue ramps to almost 58,000 VPD at the Juarez Circle tunnel. At each of these locations, usage is far below the potential roadway capacity. However, the design of the intersecting roadways at either end of the Potomac Freeway dramatically affects the quality of traffic flow.

The two northbound lanes of the Potomac Freeway begin at a sharp curve on Ohio Drive. Just 500 feet north is the departure point of Ramp RP-7 to westbound Roosevelt Bridge and the E Street Expressway. This ramp carries 7,700 VPD and splits to form Ramp RP-8, which continues to E Street, while Ramp RP-7 continues to the bridge and westbound I-66. Further north, Ramp RP-12 from eastbound Roosevelt Bridge joins the freeway to form a third northbound freeway lane. Just south of the Juarez Circle tunnel, lightly-used (1,500 VPD) Ramp RP-14 from westbound E Street joins the freeway to form the fourth northbound lane. These four lanes continue as far north as I Street, where the freeway ends, and the lanes split into two-lane Ramps RP-20 and RP-21, which carry 12,200 and 16,600 VPD, respectively. Ramp RP-21 again splits to form Ramp RP-22 (7,100 VPD) and Ramp RP-23 (9,500 VPD), one connecting to westbound Whitehurst Freeway and the other to L Street. Ramp RP-20 runs into 27th Street, with two lanes going south and one lane going north on 27th Street.

During peak periods, traffic queuing has been observed on northbound Potomac Freeway north of Juarez Circle, extending south to the tunnel. This can be attributed to two problems. The first is that Ramp RP-23 traffic attempting to enter Pennsylvania Avenue via L Street and 26th Street is controlled by a stop sign. The second is the complex intersection of Rock Creek Parkway, Virginia Avenue, I Street, and 27th Street, discussed below.

In the southbound direction, four-lane Potomac Freeway begins just north of Juarez Circle, at the merging point of Ramp RP-19 from eastbound Whitehurst Freeway and Ramp RP-18 from 27th and I Streets. Ramp RP-19 operates as one lane and Ramp RP-18 as two lanes, carrying 8,000 VPD and 25,000 VPD, respectively. A fourth southbound freeway lane begins where the two ramps meet. These four lanes continue south through the Juarez Circle Tunnel, with the two inside lanes continuing south as through lanes and the two outside lanes becoming Ramp RP-10, which carries 25,000 VPD. This ramp splits in front of the Kennedy Center to form Ramp RP-13, which carries 2,300 VPD to eastbound E Street Expressway, and Ramp RP-10, which continues to westbound Roosevelt Bridge, carrying 22,700 VPD. Because trucks are prohibited from both the Roosevelt Bridge and the Potomac Freeway south of E Street, all trucks must exit using Ramp RP-13.

One of the site improvements for the Kennedy Center currently under construction is a new ramp connection (Ramp RP-16) from the Center to Ramp RP-10. This is shown in Figure 5 of the *Kennedy Center Additions to Parking Garage Environmental Assessment* (Kennedy Center, 1998b).

Two southbound lanes on the Potomac Freeway continue to a point 100 feet north of Ohio Drive. At this location, a single through lane continues south to terminate at an unsignalized intersection with Ohio Drive, while the other lane terminates in a U-turn to northbound Potomac Freeway. Two ramps (Ramps RP-9 and RP-5) merge with the southbound Potomac Freeway within this segment. Ramp RP-9, carrying traffic from eastbound E Street Expressway, merges beneath the overpass from the Roosevelt Bridge to eastbound Constitution Avenue and is immediately followed by Ramp RP-5 (from eastbound Roosevelt Bridge), which merges without benefit of an acceleration lane.

The design of the intersection of the Potomac Freeway and Ohio Drive (Appendix A, Figure 3.3-3, Potomac Freeway and Ohio Drive Intersection) causes considerable confusion during peak periods, and the relatively sharp curvature and high operating speed on Ohio Drive make this a potentially hazardous location. Traffic is allowed to pass through the intersection from the southbound freeway during morning peak and off-peak periods only. This movement operates relatively well during this morning peak period because conflicting traffic from northbound Ohio Drive is absent, and southbound freeway traffic flows freely into a dedicated lane. During off-peak periods, southbound freeway traffic is controlled by a stop sign, and can only safely proceed when gaps are available. This causes queuing to occur north of the intersection as well as on Ramp RP-5, often extending to the Roosevelt Bridge, blocking bridge traffic destined for Constitution Avenue.

During evening peak periods (3:45-6:30 PM), the southbound through movement on the freeway is prohibited, and motorists must either make use of the U-turn to access the northbound freeway or turn onto northbound Ohio Drive, which turns into the Rock Creek Parkway. Once on this particular road, the first exit opportunity is at the Kennedy Center's south entrance. Prior to the modifications to the Kennedy Center access roads, a steady stream of lost motorists was observed seeking to find their way out of the Center parking lot during the evening peak. This situation is a major problem for unwary motorists traveling east on the Roosevelt Bridge, where signage directs drivers to use Ramp RP-5 to gain access to Independence Avenue, even though such access is not possible during the evening peak period.

E Street Expressway

This facility, functionally classified as a freeway or expressway, begins as a series of ramps to and from the Potomac Freeway and the Theodore Roosevelt Bridge. It ends at 20th Street, where it merges with a pair of one-way urban streets. Trucks are allowed on this facility. Because E Street and the E Street Expressway have no direct connections to the Kennedy Center, less than one percent of Kennedy Center patrons use this facility (Kennedy Center, 1998b).

The expressway carries two 12-foot lanes in each direction, except for an auxiliary lane that serves the exit ramp to Virginia Avenue. In addition, a surface street along the north side of the expressway serves local traffic. The one-way urban street (east of 20th Street) operates as four lanes in each direction during peak periods, when parking is prohibited. Traffic counts indicate approximately 35,000 VPD on the expressway.

The eastbound expressway consists of the conjunction of Ramp RP-6 from eastbound Theodore Roosevelt Bridge, Ramp RP-8 from northbound Potomac Freeway, and Ramp RP-13 from southbound Potomac Freeway. Beneath the 23rd Street underpass, a two-lane ramp (Ramp RP-17) diverges to provide a connection to Virginia Avenue, which is controlled by a stop sign. (At the time of this writing, there is also a stop control on the ramp at the intersection of F Street, but this appears to be temporary construction signage.) The eastbound expressway ends as a two-lane ramp to a signalized intersection with 20th Street.

The westbound expressway begins as a two-lane westbound ramp from 20th Street and ends as a series of ramps. Ramp RP-14 connects the westbound expressway to northbound Potomac Freeway and merges with a ramp from E Street (Ramp RP-15). All truck traffic must exit the Expressway at Ramp RP-12. Ramp RP-11 carries westbound expressway traffic to the Roosevelt Bridge. Just before the bridge, it splits to create another ramp, Ramp RP-9, which connects to the southbound Potomac Freeway.

Rock Creek Parkway

The Rock Creek Parkway begins at the Lincoln Memorial in the south and runs northward along the Potomac River to Rock Creek, then along Rock Creek to Connecticut Avenue. Constructed by the National Park Service (NPS) as a scenic roadway, the Rock Creek Parkway is classified as a principal arterial north of its intersection with Virginia Avenue and as a minor arterial south of it. Trucks are not allowed on the parkway. This facility is heavily used by commuters during the peak periods and is the most popular route to the Kennedy Center. Because of the varying traffic patterns on different sections of the Parkway during the morning and evening traffic peaks, traffic volumes vary dramatically.

Between the Lincoln Memorial and Ohio Drive, the Rock Creek Parkway is a two-way, two-lane facility with two 12-foot lanes that accommodate parking on both sides during off-peak periods. This stretch of parkway is also known as Parkway Drive. During the morning peak (6:30-9:30 AM), the facility essentially serves southbound traffic only. The few unwary northbound motorists are forced to turn right at Ohio Drive, since they cannot continue north on the parkway, which during the morning peak is exclusively southbound north of Ohio Drive. During the evening peak (3:45-6:30 PM), the roadway serves northbound traffic only. Daily volumes on this segment of the parkway average 14,000 VPD, with the dominant traffic flow being southbound.

The next segment, between Ohio Drive and Virginia Avenue, is a four-lane, divided facility, with two 10-foot lanes in each direction during off-peak hours. There is a traffic signal at the northern entrance to the Kennedy Center, but it is generally only activated by traffic exiting the Center or by pedestrians using the crosswalk. In the morning peak period only the two southbound lanes are open to traffic; in the evening peak, these lanes operate as northbound lanes. The two lanes normally serving northbound traffic operate in the following manner during the evening peak: both lanes are blocked off to F Street, and traffic north of Ohio Drive must exit at the south entrance of the Kennedy Center. Traffic from F Street is allowed to use the northbound parkway lanes only to Virginia Avenue, where only right turns are permitted.

The last Parkway segment considered in this study lies north of Virginia Avenue. Here the roadway consists of four 10-foot lanes, divided by a raised median up to the Whitehurst Freeway, and an

undivided roadway with four 10-foot lanes north of that point. Carrying more than 65,000 VPD, this is the most heavily traveled segment. There is a traffic signal at the Virginia Avenue intersection, and it functions during off-peak hours to allow turning movements in all directions, except for northbound left turns into Thompson's Boathouse. During the morning peak period, all four lanes of the parkway function one-way southbound. The two westernmost lanes continue south of Virginia Avenue, while traffic in the other two lanes must turn left to Virginia Avenue or I Street to gain access to the Potomac Freeway. During the evening peak period, the process essentially reverses. The two westernmost lanes are one-way northbound, and the other two lanes serve northbound traffic from Virginia Avenue or I Street. The complex intersection of the parkway, Virginia Avenue, I Street, and 27th Street is discussed further below.

Four ramps (Ramps RP-24, RP-25, RP-26, and RP-27) connect K Street to the parkway and provide access from all directions during off-peak hours only. During the morning peak, when all parkway traffic flows southbound, Ramp RP-24 from westbound K Street to the northbound parkway is closed. It is open at all other times. However, this ramp is lightly used (1,000 VPD) because the poor sight distance at the parkway entrance combined with the lack of an acceleration lane make it difficult for ramp traffic to merge with the heavy northbound Parkway traffic. During the evening peak period, most westbound K Street traffic destined for the parkway uses 27th Street, I Street, and Virginia Avenue to avoid this difficult merge. Ramp RP-25 carries 3,400 VPD and is usable during off-peaks and evening peaks to get to westbound Whitehurst Freeway from the northbound parkway.

Ramp RP-26 (4,500 VPD) allows southbound access from K Street to the parkway during off-peak and morning peak hours only. A small sign on K Street advises motorists that the ramp is closed from 3:45 to 6:30 PM, but with the occasionally absent physical barrier at the ramp entrance, a large number of errant drivers have been observed attempting to turn around or back up on the ramp during this time period. (Recent traffic counts indicate as many as 125 vehicles per hour (VPH) use this ramp during the 5:30-6:30 evening peak, but the actual number may be half that, because the vehicles are counted twice when U-turns are made).

A loop ramp (Ramp RP-28) connects the southbound parkway lanes to eastbound Pennsylvania Avenue. This ramp is operational during the morning and off-peak periods only and carries 1,400 VPD.

Ohio Drive

Ohio Drive begins south of Independence Avenue, where it provides access to the Jefferson Memorial and Haines Point Park. At the southern boundary of the study area, it intersects with 23rd Street and Independence Avenue, proceeds north past the Lincoln Memorial, and joins the Parkway, with important connections to Memorial Bridge and the Potomac Freeway. No trucks are allowed on Ohio Drive, which is functionally classified as a local road.

An important feature of the segment of Ohio Drive in the study area is that the travel patterns on the roadway are manipulated during the morning peak periods (6:30-9:30 AM) and the evening peak periods (3:45-6:30 PM) to accommodate peak traffic flow. This causes considerable confusion to unwary motorists at the southern end of the Potomac Freeway, as discussed above. A large number of Kennedy Center patrons use Ohio Drive and the Rock Creek Parkway for both access and egress.

From Independence Avenue to Potomac Freeway, Ohio Drive operates as two 10-foot lanes in each direction during off-peak and morning peak periods. During the evening peak period, Ohio Drive operates as four lanes northbound. However, there is a lane reduction on the northbound lane just prior to the on-ramp (Ramp RP-1) from Memorial Bridge to facilitate the heavy traffic movement from that ramp in both the morning and evening peak periods. Just beyond the Parkway overpass, a loop ramp (Ramp RP-2) carries traffic to Memorial Bridge and northbound Rock Creek Parkway during all time periods. Approximately 54,000 VPD use this segment of Ohio Drive, with unequal flow in each direction because of changeable traffic patterns.

North of the Potomac Freeway intersection, Ohio Drive has two 12-foot lanes northbound and one 12-foot lane southbound. At the Potomac Freeway intersection, a southbound freeway lane joins the single southbound Ohio Drive lane to form two lanes southbound. During the morning peak period the two northbound lanes are barricaded, and traffic is only allowed on the single southbound lane. In the evening peak period, all three lanes operate in the northbound direction. This section of Ohio Drive carries more than 28,000 VPD, but the traffic flow is not equal in both directions because of the variable traffic patterns.

Virginia Avenue

This major city street is functionally classified as a minor arterial. It begins at Rock Creek Parkway and extends southeastward to Constitution Avenue. The roadway consists of three 11-foot lanes in each direction, separated by a raised median, except beneath the 23rd Street overpass, where four lanes are provided. Parking is permitted during off-peak periods, effectively reducing Virginia Avenue to four lanes during that time.

Traffic volumes west of New Hampshire Avenue are nearly 21,000 VPD, but decrease to less than 14,000 VPD near 21st Street. Approximately 30 percent of Kennedy Center patrons use Virginia Avenue as their primary route of access via private automobile, taxi, or Metrobus. Juarez Circle is the converging point for Kennedy Center traffic from both directions of Virginia Avenue as well as New Hampshire Avenue, so through this important intersection complex passes more than half of all traffic destined for the Center. Traffic operations at the complex intersection of the Rock Creek Parkway, Virginia Avenue, I Street, and 27th Street have a major impact on access to the Center and are discussed as a separate issue below.

New Hampshire Avenue

New Hampshire Avenue begins at the Kennedy Center and extends in a northeasterly direction through the District and into Prince George's County, Maryland. The section south of Juarez Circle is functionally classified as a local road, and formerly was the second most popular access to the Center. However, a recent modification to the access roads redirects most of this traffic to 25th Street. The section north of Juarez Circle is classified as a collector and carries between nine and 13 percent of Kennedy Center-bound traffic.

The section of New Hampshire Avenue between the Kennedy Center and Virginia Avenue consists of three 11-foot lanes southbound and two 11-foot lanes northbound, separated by a raised median. Parking is permitted in the southbound direction, reducing the operation to two lanes. Recommendations in the Kennedy Center *Transportation Management Plan* (Kennedy Center, 1998a)

include proposals to remove parking and reduce New Hampshire Avenue to one lane in each direction.

North of Virginia Avenue, New Hampshire Avenue continues past Washington Circle, which is a major traffic problem area. The street is wide enough to support four lanes; however, permitted parking reduces travel to one lane in each direction. Four-way stop conditions at H Street, I Street, and 24th Street effectively discourage through traffic on this facility. Shuttle bus service between the Foggy Bottom Metro Station and the Kennedy Center runs along this section of New Hampshire Avenue.

Constitution Avenue

Constitution Avenue is an eight-lane street running east to west between 23rd Street and Pennsylvania Avenue. It is an important link between the District street system and the Roosevelt Bridge. This facility is functionally classified as a principal arterial and carries more than 41,000 VPD. An eastbound two-lane ramp (Ramp RP-3) provides a direct connection from the Roosevelt Bridge, and a two-lane ramp (Ramp RP-4) provides a connection in the westbound direction. Parking is allowed on both sides of the street during off-peak periods, reducing the facility to six lanes during that time. Traffic signals are found at all major street intersections, including one at 23rd Street, which greatly affects traffic flow to and from the Roosevelt Bridge, as noted above.

27th Street

Functionally classified as a local road, this street runs between Virginia Avenue and K Street, and serves to connect the Whitehurst Freeway and the Potomac Freeway to Virginia Avenue. In the absence of a direct connection between the Potomac Freeway and the Rock Creek Parkway, 27th Street serves as one leg of a very cumbersome connection between these two major facilities, as will be discussed in more detail in the next subchapter. Twenty-seventh Street operates as three lanes southbound between Virginia Avenue and the Potomac Freeway on-ramps, and as two lanes in each direction from that point to K Street.

Rock Creek Parkway/Virginia Avenue/I Street/27th Street Intersection

Approximately one-third of Kennedy Center patrons must pass through this intersection complex, and traffic congestion has a major impact on access to the Kennedy Center for evening performances. The intersection operates under different traffic conditions during the morning, afternoon, and off-peak periods (Appendix A, Figure 3.3-4, Rock Creek Parkway and Virginia Avenue Intersection).

During the morning peak period (6:45-9:30 AM), all four lanes of the parkway are southbound to Virginia Avenue. The two westernmost lanes are allowed to continue southbound (with no turns), while the other two lanes turn onto Virginia Avenue either to continue east or to reach the Potomac Freeway via I Street. For this pattern to operate safely, NPS uses a system of moveable barricades to prohibit right turns from southbound 27th Street and westbound Virginia Avenue east of 27th Street.

During the evening peak period (4:00-6:15 PM), the operation essentially reverses. The two westernmost lanes of the parkway are northbound (no turns allowed), and the other two lanes serve

northbound traffic from westbound Virginia Avenue and 27th Street via I Street. During this time, southbound traffic movements are prohibited on Virginia Avenue between the parkway and 27th Street.

Off-peak traffic operations at this intersection cause the most congestion and are especially problematic immediately following the evening peak period (the Kennedy Center pre-performance peak). Field observations indicate that upon resumption of the southbound parkway traffic flow, a left-turn queue forms at the Virginia Avenue intersection and extends to the Pennsylvania Avenue overpass. This congestion primarily results from traffic destined for the Potomac Freeway. To gain access to the Potomac Freeway, traffic must turn left on Virginia Avenue, then immediately turn left at an unsignalized median break to reach I Street. After running on a short section of I Street, traffic must pass through the signalized intersection with 27th Street to reach the Potomac Freeway on-ramp. This traffic movement is made even more difficult by the lack of space between the parkway intersection and the median break (up to four cars at once may be seen waiting to make a left turn at this point), and the lack of southbound storage space (two to three cars) on I Street between Virginia Avenue and 27th Street.

25th Street

This street runs from F Street to north of Juarez Circle and is functionally classified as a local road. Twenty-fifth Street has recently been extended south to connect with the Kennedy Center, and now provides the main access route to the Center from the north. A new ramp connection is being constructed to provide access to westbound Roosevelt Bridge from either direction on 25th Street. There is no parking on 25th Street, and the street operates as a three-lane facility, with the center lane reversible during peak traffic periods.

F Street

F Street runs from the Rock Creek Parkway to 25th Street and is functionally classified as a local road. While access from F Street to the parkway is possible during off-peak times, access to F Street from the parkway (northbound or southbound) is currently not allowed. However, upon completion of the Kennedy Center Improved Access and Parking Project, there will be access from the northbound parkway into the garage at all times except during the morning peak period, when there is no northbound traffic.

3.3.3.3 Traffic Analysis

Levels of Service

To provide a base for an existing conditions traffic analysis, traffic counts were taken during the last week in March and the first and second weeks in April 2002 on roadways leading to the Kennedy Center. Supplemental traffic data were provided by traffic counts taken in mid 1999 for the *Kennedy Center Access Study* (FHWA, September 2000). Traffic count results are shown in Appendix F, Figure F-5 (Existing Daily Traffic Volumes). It should be noted that there is some disparity between 1999 traffic counts and the most recent 2002 counts. On some facilities there has been an increase in traffic volumes, while on others, a decrease. These apparent discrepancies can be attributed to changes in traffic patterns due to street closures following September 11, 2001.

Based upon the earlier traffic data, and using *Highway Capacity Manual* (HCM) (Transportation Research Board, 2000) supplemented by SYNCHRO/Simtraffic or CORSIM as appropriate, levels of service (LOS) were calculated for several intersections within the study area. The Transportation Research Board’s HCM provides a methodology to determine the capacity and level of service of signalized and stop-controlled intersections for each approach as well as for the intersection as a whole. HCM states LOS criteria for traffic signals in terms of the average control delay per vehicle, typically for a 15-minute analysis period.

Delay is a complex measure and depends on a number of variables. Levels of service are defined in terms that represent reasonable ranges in control delay. Generally, LOS describes the quality of the traffic flow through an intersection, and is established by calculating the average delay experienced by the vehicles using the intersection. Each LOS is identified by a letter, A through F. LOS A indicates that vehicles approaching the intersection experience little or no delay. LOS C, the middle of the range, indicates moderate delays, acceptable to most drivers. F implies serious delays deemed unacceptable by a majority of drivers. Tables 3.3-3 and 3.3-4 provide LOS criteria in terms of stopped delays for signalized and stop-controlled intersections, respectively. Generally in urban conditions, LOS D or better is considered acceptable.

It should be noted that LOS calculations conducted on the basis of the HCM treat each intersection as a discrete element and only take into account the number of vehicles going through the intersection. Also, the LOS shown for any given intersection is an average, with one or more legs of the intersection experiencing better and/or worse service. The HCM method does not take into account the cumulative effects on the intersection of nearby interchanges or intersections, even though they may result in congestion. This means that for complex freeway and street systems that often contain many closely spaced highway components, results based on the HCM do not necessarily reflect reality with sufficient accuracy.

**Table 3.3-3
Level of Service (LOS): Criteria for Signalized Intersections**

LOS	Description
A	Very short delays, i.e., less than 10 seconds per vehicle. Excellent flow. Most vehicles do not stop at all.
B	Delays range from 10.1 to 20.0 seconds per vehicle. Good flow with few vehicles queuing.
C	Delays range from 20.1 to 35.0 seconds per vehicle. Acceptable flow. Many vehicles still pass through the intersection without stopping.
D	Delays range from 35.1 to 55.0 seconds per vehicle. Noticeable congestion. Many vehicles must stop.
E	Delays range from 55.1 to 80.0 seconds per vehicle. This is considered the limit of what is acceptable. The intersection is considered to be at capacity.
F	Delays are in excess of 80.1 seconds per vehicle. Most drivers find this unacceptable. Lengthy queues develop, with vehicles having to wait for two or more green lights to pass through the intersection.

Source: Transportation Research Board Special Report, 209, Highway Capacity Manual, 2000.

**Table 3.3-4
Level of Service (LOS): Criteria for Stop-Controlled Intersections**

LOS	Average Total Delay (seconds/vehicle)
A	10 or less
B	More than 10 but less than 20
C	More than 20 but less than 35
D	More than 35 but less than 55
E	More than 55 but less than 80
F	80 or more
Source: Transportation Research Board Special Report, 209, Highway Capacity Manual, 2000.	

To make up for this limitation of the method, the CORSIM or SYNCHRO/Simtraffic traffic simulation programs have been used to replicate observed conditions of the roadway system. However, even these programs may give LOS results that are somewhat better than reality when traffic operates under constrained conditions and a reduced number of vehicles is counted and entered into the traffic model. For the purpose of comparison between existing conditions and the impacts of the proposed action, however, these limitations are not relevant.

AM and PM Peak Period LOS

LOS were calculated for the morning peak (8:00-9:00 AM) and the evening peak (5:15-6:15 PM) at 20 intersections throughout the study area:

- New Hampshire Avenue and Virginia Avenue (Juarez Circle west).
- New Hampshire Avenue and 25th Street (Juarez Circle east).
- Rock Creek Parkway and Virginia Avenue.
- Virginia Avenue and 27th Street.
- 27th Street and I Street.
- K Street/Whitehurst Freeway and 27th Street.
- Ramp 24 (from K Street/Whitehurst Freeway) and Rock Creek Parkway (northbound)**.
- Virginia Avenue and 20th Street.
- E Street Expressway (eastbound) and 20th Street.
- E Street Expressway (westbound) and 20th Street.
- Virginia Avenue and 23rd Street (westbound).
- Virginia Avenue and 23rd Street (eastbound).
- E Street and 23rd Street.
- E Street and Virginia Avenue.
- Ramp off E Street Expressway (eastbound) and Virginia Avenue**.
- Virginia Avenue and 21st Street.
- Constitution Avenue and 23rd Street.
- Constitution Avenue and 22nd Street.
- Constitution Avenue and Henry Bacon Drive.
- Potomac Freeway and Ohio Drive*.

The intersection denoted “*” operates as “free-flow” during the peak periods; those denoted “**” are unsignalized. AM and PM peak LOS for the above 20 intersections are summarized in Table 3.3-5 and illustrated in Appendix F, Figures F-6 (AM Peak Hour Traffic Volumes) and F-7 (PM Peak Hour Traffic Volumes).

**Table 3.3-5
Existing AM and PM Peak LOS**

Intersection	AM LOS	PM LOS
New Hampshire Avenue and Virginia Avenue (Juarez Circle west) ¹	B	A
New Hampshire Avenue and 25 th Street (Juarez Circle east) ¹	A	B
Rock Creek Parkway and Virginia Avenue ¹ I-18	B	B
Virginia Avenue and 27 th Street ¹	C	A
27 th Street and I Street ¹	F	C
K Street/Whitehurst Freeway and 27 th Street ¹	F	F
Ramp 24 (from K Street/Whitehurst Freeway) and Rock Creek Parkway (northbound) ¹	N/A ³	C
Virginia Avenue and 20 th Street ¹	B	B
E Street Expressway (eastbound) and 20 th Street ¹	E	B
E Street Expressway (westbound) and 20 th Street ¹	B	B
Virginia Avenue and 23 rd Street (westbound) ¹	A	B
Virginia Avenue and 23 rd Street (eastbound) ¹	C	A
E Street and 23 rd Street ¹	B	A
E Street and Virginia Avenue ¹	B	A
Ramp off E Street Expressway (eastbound) and Virginia Avenue ²	C	B
Virginia Avenue and 21 st Street ¹	B	B
Constitution Avenue and 23 rd Street ¹	E ⁵	F ⁵
Constitution Avenue and 22 nd Street ¹	E ⁵	F ⁵
Constitution Avenue and Henry Bacon Drive ¹	E ⁵	F ⁵
Potomac Freeway and Ohio Drive ²	N/A ⁴	N/A ⁴
Notes: 1. Signalized intersection. 2. Stop-controlled intersection. 3. Ramp is closed in the AM. 4. Traffic is free-flowing during the AM and PM peak periods. 5. LOS based on corridor study for the segment of Constitution between Henry Bacon Drive and 23 rd Street.		
Source: Kennedy Center Access Improvements - Existing Conditions Report (FHWA, 2003)		

As can be seen in Table 3.3-5, 14 of the 20 intersections studied operate at LOS D or better during both AM and PM peak times, indicating acceptable operating efficiency through the intersections. Two of the 20 intersections studied operate at LOS E or worse during the AM peak period but operate at an acceptable LOS during the PM peak period:

- **27th Street and I Street:** This signalized intersection operates at LOS F during the AM peak period. Southbound 27th Street traffic from northbound Potomac Freeway shares green time with eastbound I Street traffic from Southbound Rock Creek Parkway destined for southbound Potomac Freeway. The major traffic volumes for each movement described above result in failure at this intersection during the AM peak period.

- **E Street Expressway (eastbound) and 20th Street.** This signalized intersection operates at LOS E in the AM peak period. Heavy northbound through traffic along 20th Street conflicts with eastbound E Street Expressway traffic turning left onto northbound 20th Street or continuing eastbound through the intersection.

Four of the 20 intersections operate at LOS E or worse during both the AM and PM peak traffic periods:

- **K Street/Whitehurst Freeway and 27th Street:** this signalized intersection operates at LOS F during both the AM and PM peak periods. The east intersection approach must accommodate both upper (Whitehurst Freeway) and lower (K Street) street traffic, which requires two separate signal phases for this leg alone. The lengthy green time required for the east leg results in minimal green time for the heavy traffic movements required on the east and south legs.
- **Constitution Avenue Intersections with Henry Bacon Drive, 22nd Street, and 23rd Street.** Taken together, these closely-spaced signalized intersections operate at LOS E in the AM and F in the PM peak periods. In the AM period, high traffic volumes from the west along I-66 flow continuously to the intersection with 23rd Street, causing lengthy queuing. Insufficient green time for the above traffic movements causes a severe breakdown for eastbound Constitution Avenue traffic. In the PM peak period, the main traffic flow is westbound along Constitution Avenue towards the Roosevelt Bridge. At 23rd Street, this westbound traffic conflicts with heavy southbound 23rd Street traffic destined for Memorial Bridge. Field observations have identified additional factors that contribute to the poor operating efficiency of these intersections. First, the outside travel lanes along Constitution Avenue are available for street parking during off-peak periods. However, on many occasions, primarily during the tourist high season, vehicles remain parked in those lanes even during the PM rush hour, resulting in major delays. Second, during heavy storm events, ponding occurs in the outside westbound travel lane in the vicinity of 18th and 21st Streets, resulting in slower-than-normal travel speeds and compounding the poor operating efficiency of the intersections. Last, southbound vehicles traveling along 22nd and 21st Streets frequently turn right onto westbound Constitution Avenue and block the through traffic as they wait to enter the left turn queue at Henry Bacon Drive and 23rd Street. This adversely affects through traffic traveling westbound on Constitution Avenue.

Pre-Performance Peak LOS

LOS were calculated for the pre-performance peak time (6:30-7:30 PM) at these intersections:

- New Hampshire Avenue and Virginia Avenue (Juarez Circle west).
- New Hampshire Avenue and 25th Street (Juarez Circle east).
- Rock Creek Parkway and Virginia Avenue.
- Virginia Avenue and 27th Street.
- 27th Street and I Street.
- K Street/Whitehurst Freeway and 27th Street.
- Rock Creek Parkway and F Street.
- New Hampshire Avenue and F Street**.

- F Street and 25th Street**.
- Ohio Drive and Rock Creek Parkway**.
- Virginia Avenue and 20th Street.
- E Street Expressway (eastbound) and 20th Street.
- E Street Expressway (westbound) and 20th Street.
- Ohio Drive and Potomac Freeway.
- Virginia Avenue and 23rd Street (westbound).
- Virginia Avenue and 23rd Street (eastbound).
- E Street and 23rd Street.
- E Street and Virginia Avenue.
- Ramp off E Street Expressway (eastbound) and Virginia Avenue**.
- Virginia Avenue and 21st Street.
- Constitution Avenue and 23rd Street.
- Constitution Avenue and 22nd Street.
- Constitution Avenue and Henry Bacon Drive.

The intersections denoted “**” are unsignalized. LOS for these 23 intersections are summarized in Table 3.3-6 and illustrated in Appendix F, Figure F-8.

**Table 3.3-6
Existing Pre-Performance LOS**

Intersection	Pre-Performance LOS
New Hampshire Avenue and Virginia Avenue (Juarez Circle west) ¹	A
New Hampshire Avenue and 25 th Street (Juarez Circle east) ¹	C
Rock Creek Parkway and Virginia Avenue ¹	F
Virginia Avenue and 27 th Street ¹	B
27 th Street and I Street ¹	A
K Street/Whitehurst Freeway and 27 th Street ¹	F
Rock Creek Parkway and F Street ¹	A
New Hampshire Avenue and F Street ²	A
F Street and 25 th Street ²	D
Ohio Drive and Rock Creek Parkway ²	F
Virginia Avenue and 20 th Street ¹	B
E Street Expressway (eastbound) and 20 th Street ¹	B
E Street Expressway (westbound) and 20 th Street ¹	B
Ohio Drive and Potomac Freeway ²	F
Virginia Avenue and 23 rd Street (westbound) ¹	B
Virginia Avenue and 23 rd Street (eastbound) ¹	A
E Street and 23 rd Street ¹	A
E Street and Virginia Avenue ¹	B
Ramp off E Street Expressway (eastbound) and Virginia Avenue ²	B
Virginia Avenue and 21 st Street ¹	B
Constitution Avenue and 23 rd Street ¹	F
Constitution Avenue and 22 nd Street ¹	F
Constitution Avenue and Henry Bacon Drive ¹	F
Notes: 1. Signalized intersection. 2. Stop-controlled intersection.	

- **K Street/Whitehurst Freeway and 27th Street:** This intersection operates at LOS F during pre-performance times. Heavy PM peak volumes normally carry over into the pre-performance time period, resulting in many of the same problems that occur during the PM peak period. Although pre-performance volumes are lower, the intersection still cannot accommodate the volume of traffic entering and exiting this intersection.
- **Ohio Drive and Rock Creek Parkway:** As indicated above, all conflicting movements at this intersection are eliminated during the PM peak period because Ohio Drive operates as a one-way route. Field observations have shown that during the pre-performance time period, shortly after Ohio Drive is returned to two-way operation, major delays and poor operating conditions occur. The high-volume traffic from the Roosevelt Bridge to southbound Independence Avenue conflicts with extended peak-period traffic traveling northbound on Ohio Drive to Rock Creek Parkway through the intersection with Potomac Freeway, causing extensive delays. The queuing and delay is caused primarily by vehicles from the Roosevelt Bridge that must stop and wait for gaps in the northbound Ohio Drive traffic stream to execute a left turn onto southbound Ohio Drive. Poor sight distance, tight horizontal curves, and speeding contribute to the difficulty for left-turning vehicles. LOS F at the intersection of Ohio Drive with the parkway results from high turning volumes.
- **Ohio Drive and Potomac Freeway:** This intersection is stop-controlled. The southbound Rock Creek Parkway movement from Lincoln Circle must stop, while the Ohio Drive/Rock Creek Parkway movement is uncontrolled. The heavy northbound Rock Creek Parkway/Ohio Drive traffic that extends beyond the rush hour period and the southbound Rock Creek Parkway/Ohio Drive traffic make it difficult for vehicles from Lincoln Circle to turn left onto northbound Rock Creek Parkway.
- **Constitution Avenue Intersections with Henry Bacon Drive, 22nd Street, and 23rd Street:** This is a continuation of the conditions described above for the PM peak period.

Measures of Effectiveness

LOS results are based upon individual components of interchanges or street intersections. Traffic simulation models, such as CORSIM and SYNCHRO/Simtraffic, can supplement the LOS analyses by evaluating the overall street system performance for the complex freeway and street systems that characterize much of the study area. For the purpose of the traffic analysis conducted for this EA, more than 40 CORSIM and/or SYNCHRO traffic models were developed, including AM/PM Peak Hour periods and several Pre-performance periods. A common set of default values were used to compare the advantages and disadvantages of each alternative, except where data were available to support a different value.

The simulation models identified several factors that, taken together, measure the overall effectiveness of the existing and proposed road network in the study area. The measures of effectiveness (MOE) are tabulations of the overall performance of the study area's roadways during the periods studied. A short definition of each measure follows.

Total Signal Delay (hours). The cumulative hours of delay experienced by all vehicles in the study area during the period being considered, with adjustments based on the length of delay. The difference between the free-flow travel times and projected congested travel times constitutes the

delay inherent in the network. More delay is indicative of a less efficiently operating roadway network.

Total Travel Time (hours). The total of the time each vehicle was present in this area. In addition to distance traveled, the time it takes to traverse the study area is a measure of efficiency. The longer it takes in aggregate for all the vehicles in the study area to move through it, the less efficient the network.

Fuel Consumed (gallons). The amount of fuel consumed, based on delays, stops, speed, distance traveled, and travel time. Fuel consumption is another measure of efficiency, with greater fuel consumption indicating more congestion and more inefficient operating conditions.

Queuing Penalty (number of vehicles). The Queuing Penalty is a measure of the effects of queuing and blocking, and reflects the number of vehicles affected. Queuing is a negative factor, so the larger the number of vehicles affected by queuing, the lower the level of service the roadway system is providing.

Distance Traveled (miles). The total miles summed for all vehicles in the study area for the specified period. Fewer miles needed for all cars to traverse the study area are better than more miles, since more miles of travel equate to more air pollution, less direct routing, and overall lower operating efficiency.

Stops (number of stops). The total number of stops made by all vehicles in the study area during the specified period. The better the performance of a network, the fewer the number of stops required for traffic. To avoid underestimating the impact of stop-and-go conditions, “stops” include vehicles that are operating at a very low crawl speed.

Unlike LOS, the MOE do not provide an absolute measure of traffic conditions, but a relative one. MOE do not indicate whether a network is working well or badly but rather whether it is working better or worse than an other network. MOE are useful to compare entire transportation networks. LOS, on the other hand, indicate in absolute terms how well (or how badly) specific intersections are operating. LOS and MOE are complementary modes of assessing the performance of a transportation system and an in-depth analysis needs to employ both. Measures of effectiveness under existing conditions are shown in Table 3.3-7.

**Table 3.3-7
Existing Measures of Effectiveness**

Measure	AM	PM	Pre-Performance
Total Signal Delay (hr)	428	276	600
Total Travel Time (hr)	1,322	1,030	1,269
Fuel Consumed (gal)	1,635	1,349	1,748
Queuing Penalty (veh)	6,117	5,503	6,143
Distance Traveled (mi)	26,344	22,623	23,328
Stops	44,765	38,924	55,696

As shown in Table 3.3-7, the performance of the existing street system varies substantially between the three periods studied. Of the three periods evaluated, the PM period operates with the least delay, followed by the AM peak hour and the Pre-Performance period. The AM and Pre-Performance periods are similar in efficiency, with one edging out the other by small margins for most measures. However, the exceptions to this are the measurement of stops and the cumulative hours of signal delay, where in both cases the Pre-Performance Period is less effective.

Pre-performance MOE are markedly worse than PM period MOE and somewhat worse than AM period MOE because during the AM and PM peaks, traffic flows through the study area are modified to accommodate large amounts of inbound (in the morning) and outbound (in the evening) traffic, and circulation through the area is optimized. However, during the pre-performance period, when the study area network is returned to normal operating conditions and ceases to favor outbound traffic, the presence of still-substantial amounts of such traffic results in a network-wide deterioration of service.

3.3.3.4 Signing for the Kennedy Center

Signage that directs patrons to the Kennedy Center is generally ineffective, especially for those unfamiliar with existing traffic patterns. At various locations, small green and white signs (green background with white lettering) with directional arrows point the way to the Center. While it would be more technically correct to sign the Kennedy Center as a “Cultural Interest Area” (brown background with white lettering), the current green and white color scheme may be more effective because most of the events at the Center occur at night, and white upon green is more visible under nighttime conditions.

Temporary pedestal-mounted signs that direct patrons to the Kennedy Center via 25th Street have been placed on the south ring of Juarez Circle. These signs include a logo of the Kennedy Center and appear to be effective, based upon recent traffic counts.

A potentially confusing signage situation exists on eastbound Whitehurst Freeway, prior to the exit ramp to southbound Potomac Freeway. A sign directing motorists to the Kennedy Center is overlaid with a “CLOSED” message. Some motorists may not understand that this means that the ramp to the Center, not the Center itself, is closed. To further add to the uncertainty, there is no signage at the 27th Street intersection directing motorists to the Center via 27th Street and Virginia Avenue.

3.3.3.5 Accidents

Rock Creek Parkway

Data for traffic accidents along Rock Creek Parkway between Lincoln Circle and K Street between 1996 and Fall 2002 were obtained from NPS and are summarized in Table 3.3-8.

**Table 3.3-8
US Park Police:
Accident Summary Report from 1/1/96 to 9/12/02**

Location	Total	Fatal	Injury	Material Damage
23 rd Street between Constitution Avenue and Lincoln Memorial	11	0	2	8
23 rd Street at Lincoln Circle (North Side)	34	0	4	30
Ramp from Ohio Drive to Lincoln Circle (RP-2)	48	0	6	42
Rock Creek Parkway between Lincoln Circle and Ohio Drive	33	0	5	28
Rock Creek Parkway at Lincoln Circle	83	0	14	69
West Side of Lincoln Circle	20	0	3	17
Ramp from Lincoln Circle to Ohio Drive (RP-1)	65	1	11	53
Ohio Drive between 23 rd Street and Rock Creek Parkway	138	0	26	112
Intersection of Ohio Drive and Rock Creek Parkway	8	0	1	7
Rock Creek Parkway between Ohio Drive and Virginia Avenue	91	0	20	71
Ramp from northbound Rock Creek Parkway to Kennedy Center	19	0	2	17
Ramp from Kennedy Center to northbound Rock Creek Parkway	33	0	2	31
Rock Creek Parkway/Virginia Avenue Intersection	158	1	38	119
Rock Creek Parkway between Virginia Avenue and M Street Overpass	26	0	4	22
Ramp from northbound Rock Creek Parkway to K Street (RP-25)	13	0	2	11
Ramp from southbound Rock Creek Parkway to K Street (RP-27)	16	0	5	11
Ramp from K Street to northbound Rock Creek Parkway (RP-24)	19	0	3	16
Ramp from K Street to southbound Rock Creek Parkway (RP-26)	24	0	4	20
Source: National Park Service, Park Visitor Vehicle Accidents Reported – Lincoln Memorial Circle to K Street Area of Rock Creek Parkway – CY 1996 through 09/12/02.				

Table 3.3-8 indicates two high-accident-rate areas: the Rock Creek Parkway/Virginia Avenue intersection (158 recorded accidents) and Ohio Drive between 23rd Street and the Rock Creek Parkway (138 recorded accidents). More particularly, in 1997, NPS identified the intersection of Ohio Drive and the Potomac Freeway as a high-accident-rate location and conducted a traffic study as a result (NPS, 1997). According to this study, 76 accidents were recorded at the intersection between 1993 and 1995, four of which caused injuries. Accident occurrence was intermittent, with a peak number occurring between 2 and 4 PM. The accident rate was determined to be 3.03 accidents per million vehicles entering (acc./MVE). Many local jurisdictions consider an accident rate of 1.0/MVE to be high. The most common type of accident was collision with another motor vehicle (82 percent). No accident involving a pedestrian or bicyclist was reported. Among the more common contributing factors were “improper lane change” (13 occurrences); “driver failed to give full time and attention” and “driver followed too closely” (ten occurrences each); and “driver failed to yield right of way” (nine occurrences).

The study identified as a problem the following (NPS, 1997):

...traffic backs up on the north approach from the Theodore Roosevelt Bridge during the morning and evening peak periods, but the traffic congestion is especially severe during high volume two-way traffic. There are numerous close calls as the drivers become more aggressive when trying to access Ohio Drive.

As indicated by the timeframe of the majority of accidents, operational safety is substantially better during the AM and PM peak periods. This is a direct result of the one-way operation of Rock Creek Parkway and the elimination of vehicle-turning conflicts during these time periods.

Further examination and numerous field visits to the Ohio Drive/Potomac Freeway intersection identified factors contributing to the high accident rate at this intersection during off-peak periods, including: tight horizontal geometry; limited horizontal sight distance; excessive speeds; poor or inadequate signage; and multiple closely-spaced decision points.

District Department of Transportation

Accident data obtained from DDOT are summarized in Table 3.3-9. As shown in the Table, a relatively greater number of accidents occur at three intersections than occur elsewhere in the study area. These three intersections are 23rd Street and Constitution Avenue, 23rd Street and Virginia Avenue, and 27th Street and K Street.

Table 3.3-9
DDOT
Accident Summary Report for Three-year Period from 1/1/97 to 12/31/99

Location	Accidents	Injury
23 rd Street and Constitution Avenue	18	10
21 st Street and Virginia Avenue	4	1
23 rd Street and Virginia Avenue	15	7
Rock Creek Parkway and Virginia Avenue	2	2
27 th Street and Virginia Avenue	3	1
27 th Street and I Street	6	2
27 th Street and K Street	12	5
E Street (Surface) and 23 rd Street	5	5

3.3.4 Transit Access

There are a variety of ways patrons and visitors can reach the Kennedy Center without driving their own vehicles:

- Metrorail service to the Foggy Bottom Metrorail Station.

- Metrobus to the Foggy Bottom Metrorail Station or directly to the Kennedy Center on the 80 Metrobus route.
- Kennedy Center Show Shuttle from the Foggy Bottom Metrorail Station directly to the Center or from the Columbia Plaza parking garage to the Center (available during overflow capacity conditions at the Kennedy Center garage).
- Tourmobiles, a privately run service under contract with NPS, operates on routes throughout the Monumental Core, and normally serves the Kennedy Center. However, due to garage construction work, in December 2001 Tourmobiles stopped serving the Center.
- Tour buses: the Kennedy Center is a major tour bus destination. Buses bring tourists to the Kennedy Center for activities ranging from a fifteen-minute walkthrough to show attendance. Storage of the tour buses during the stay is a major concern.
- School buses bring children to performances and field trips to see the facility. Buses now park at the National Zoo in Woodley Park or in available spaces on city streets, with logistical problems coordinating pickups after the visit is over.

3.3.4.1 Metrorail

The Kennedy Center is served by the Foggy Bottom Metrorail Station, a stop on the Blue and Orange lines. The station entrance is approximately a half-mile from the Center. From the station, visitors may either walk to the Center or take the Kennedy Center Show Shuttle, which stops outside the station's only exit on 23rd Street. Station volumes at Foggy Bottom average 40,000 riders on a weekday, as shown in Table 3.3-10, with trains operating at two-minute intervals in the peak hour and at up to 10-minute intervals after performances. Patrons may connect to the Red Line three stops to the east at the Metro Center Station, and to the Yellow and Green Lines six stops to the east at the L'Enfant Plaza Station.

The Foggy Bottom Metrorail Station is the peak load point on both the Blue and Orange lines in the PM peak, with more than 150 cars (in six-car trains) passing through the station going to Virginia and average loadings of more than 100 passengers per car.

**Table 3.3-10
Foggy Bottom Metrorail Station Daily Ridership**

Time of Day	Origin	Destination
AM Peak	2,393	10,300
AM Off-Peak	3,648	3,720
PM Peak	9,760	3,897
PM Off-Peak	3,296	1,402
All Day	19,097	19,319
Source: WMATA, 2002.		

3.3.4.2 Metrobus

Only Metrobus Route 80 – the North Capitol Street Line – serves the Kennedy Center directly, following a route from the Fort Totten Metrorail Station in northeast Washington, generally south along South Dakota Avenue, 12th Street, NE, Michigan Avenue, NE, and North Capitol Street, to Union Station. From Union Station, the line turns west and proceeds through downtown, following Massachusetts Avenue, H Street, 13th Street, K Street, 18th and 19th Streets, Virginia Avenue, and New Hampshire Avenue to stop at the Kennedy Center. Buses headed towards the Center operate about every 15 to 20 minutes between 6:00 PM and 8:00 PM on weekdays and about every 30 minutes until 11:55 PM. On weekends, the route operates on 30-minute intervals daytime and evenings in both directions. Few people appear to be using this line to get to the Center: The Performance Peak Travel Modes Survey conducted in February 1998 found one patron out of 4,914 surveyed alighting at the Center on Thursday, January 29, and 13 out of 7,094 on Saturday, January 17 (Kennedy Center, 1998a).

Several other bus routes traverse Foggy Bottom, with stops within walking distance of the Kennedy Center, as shown in Appendix A, Figure 3.3-5 (Bus Transit Routes near Kennedy Center). Available ridership statistics are presented in Table 3.3-11.

**Table 3.3-11
Metrobus Daily Ridership**

Route	Weekday	Saturday	Sunday
32, 34, 35, 36 - Pennsylvania Ave.	23,510	13,708	9,320
80 - North Capitol St.	7,743	3,226	2,287
38B - Ballston-Farragut Square	1,745	1,480	875
Peak-Directional Buses ¹			
D5 - McArthur Blvd/Georgetown	291	No Service	No Service
L1, L2 - Connecticut	4,381	1,900	1,614
P1, P2, P6 - Anacostia-Eckington	4,217	1,743	1,014
S1 - 16 th St.-Potomac Park	1,585	No Service	No Service
X1 - Benning Road-Potomac Park	808	No Service	No Service
Note: 1. Peak directional buses are buses that operate inbound in the AM peak and outbound in the PM peak. Source: WMATA, 2002.			

3.3.4.3 Kennedy Center Show Shuttle Bus

The Kennedy Center operates a fleet of eight 25-passenger buses that leave the Center and go around Juarez Circle to New Hampshire Avenue, northeast on New Hampshire to Washington Circle, around the Circle to 23rd Street and south on 23rd Street to the Foggy Bottom Metrorail Station. For the return trip, buses continue down 23rd to G Street, along G Street to Virginia Avenue to Juarez Circle and back into the Center. The route is shown in Appendix A, Figure 3.3-5.

Show Shuttle buses carry employees in the morning and the public throughout the remainder of the day from the Foggy Bottom Metrorail Station to the Kennedy Center. Most of the time, two to three buses operate simultaneously, resulting in about a 10-minute headway, but during performance peaks, six to seven shuttles operate to meet the demand.

When the Kennedy Center garage reaches capacity, the Show Shuttle also provides service from the Columbia Plaza garage to the Center. The statistics provided in this report include both Foggy Bottom and Columbia Plaza riders – about 50,000 passengers a month. Peak days have more than 4,000 riders. The data show greater ridership in the inclement weather of winter months, when presumably many potential pedestrians elect to ride the shuttle.

3.3.4.4 Tourmobiles

NPS contracts with tourist transit vehicles to link the major tourist attractions on or near the Mall. The current operator provides continuous service, permitting tourists to board and alight at many points for the price of a daily ticket. The Tourmobile route included the Kennedy Center until December 2001, when Kennedy Center parking garage and access construction precluded easy access to the Center. No data are available on use of the stop before service stopped for construction. Service is expected to return when construction is completed. The Tourmobiles provide a link between the Kennedy Center and the Monumental Core that is now missing.

3.3.4.5 Tour Buses

Charter buses bring tourists to the Kennedy Center in large numbers. Most tourists come to view the bust of John F. Kennedy in the Grand Foyer. These groups typically spend less than half an hour in the facility. Some tour groups come for performances. In either case, the tour bus must be available to pick up the tourists when they are finished. There is limited space at the Kennedy Center for tour bus parking, and tour buses cannot use the garage facilities.

3.3.4.6 School Buses

School buses bring students to the Kennedy Center throughout the school year. Students come to the Center for performances, field trips, and special programs. Part of the mission of the Center is to provide educational opportunities, and special efforts are made to attract school groups. The number of buses per weekday is generally between 20 and 60, but on very busy days, it can exceed 120. More than 3,600 buses arrived at the Center during the 2001-2002 school year. The logistical problems of picking up students at the end of their programs can be complicated, especially when buses are parked at the National Zoo in Woodley Park.

3.3.5 Parking

3.3.5.1 Parking Supply

The Kennedy Center currently has a 1,454-space parking garage on three levels under the performance halls. Several types of parkers use the facility. Approximately 700 monthly parking permits for the C level are sold to nearby employees. They are only valid on weekdays during the

day. Of the remaining spaces, about 250 are used by Center employees and 150 are used by others, with an average daily vacancy rate of about 10%. Parkers other than those holding leases pay upon exit. Patrons arriving for a performance pay for parking on entry to the garage, so there are no delays paying after the performance.

From the time the Kennedy Center opened, the parking shortage has been a problem. At evening performance time, demand for parking often exceeds capacity. Overflow parking is provided at the Columbia Plaza garage, from which patrons can either walk to the Center or ride the Show Shuttle. Even with this option, patrons often have to look for street parking, reducing the number of spaces available to local residents (Kennedy Center, 1998b).

The garage expansion project, described in Appendix D, Section D5, is under construction. It will mitigate this problem by adding about 525 parking spaces to the Center's garage, for a total of approximately 2,000 structured parking spaces. Another issue is the lack of parking facilities for tour buses and school buses. School buses, in particular, often have to lay over as far away as the National Zoo.

3.3.5.2 Parking Garage Access

From the south, access to the garage normally is via northbound Rock Creek Parkway (as of June 2003, the entrance is temporarily blocked off for Kennedy Center garage construction). To return south, traffic must exit from the north end of the garage and reach the parkway through a signalized intersection that operates at all times except during morning and evening peak periods. This signalized intersection also accommodates traffic wishing to travel north on the parkway. From the north all traffic must enter or exit the garage via 25th Street.

3.3.6 Waterborne Activity

Thompson's Boathouse, located at the intersection of Rock Creek Parkway and Virginia Avenue on the Potomac River, is the major source of waterborne activity in the vicinity of the Kennedy Center. It serves as a hub for rowing in the region, and hosts regional rowing regattas and races. It provides facilities for the GWU, Georgetown University, and Catholic University rowing teams, as well as many high schools and rowing clubs in the local area. As many as 1,500 team rowers use the facility as their base, and they are particularly active early in the morning and in mid-to-late afternoon (before and after school). The boathouse also rents boats for recreational users from early April through mid-October. Plans are underway for GWU and Georgetown to build their own boathouses upriver along the Georgetown waterfront. Other waterborne activity is mainly limited to cruise boats that ply the Potomac River, pointing out the Kennedy Center as one of the river's attractions. There are no docking facilities at the Kennedy Center.

3.4 Air Quality

3.4.1 National Ambient Air Quality Standards

The U.S. Environmental Protection Agency (U.S. EPA), under the requirements of the 1970 Clean Air Act (CAA) as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 CFR 50). These are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀), lead (Pb), and sulfur dioxide (SO₂). The NAAQS include primary and secondary standards. The primary standards were established at levels sufficient to protect public health with an adequate margin of safety. The secondary standards were established to protect the public welfare from the adverse effects associated with pollutants in the ambient air. The primary and secondary standards are presented in Table 3.4-1.

**Table 3.4-1
National and District of Columbia Ambient Air Quality Standards**

Pollutant and Averaging Time	Primary Standard ¹	Secondary Standard ¹
Carbon Monoxide 8-Hour Maximum 1-Hour Maximum	9 ppm ³ 35 ppm ³	9 ppm 35 ppm
Nitrogen Dioxide Annual Arithmetic Mean	100 ²	100
Ozone 1-Hour Maximum 8-Hour Maximum	0.12 ppm ⁴ 0.08 ppm ⁵	0.12 ppm 0.08 ppm
Particulate Matter ⁹ PM ₁₀ Annual Arithmetic Mean 24-Hour Maximum PM _{2.5} Annual Arithmetic Mean 24-Hour Maximum	50 ² 150 ⁶ 15 ² 65 ⁷	50 150 15 65
Lead Quarterly Arithmetic Mean	1.5 ⁸	1.5
Sulfur Dioxide Annual Arithmetic Mean 24-Hour Maximum 3-Hour Maximum	80 ² 365 ³ ---	--- --- 1300 ³
Notes:		
<ol style="list-style-type: none"> All concentrations in micrograms per cubic meter of air (µg/m³) or, except where noted, in parts per million (ppm). Not to be exceeded during any calendar year. Not to be exceeded more than once a year. Expected number of exceedances shall not be more than once per year (3-year average). Standard attained when 3-year average of annual 4th-highest daily maximum 8-hour concentration is below 0.08 ppm. Standard attained when annual highest 99th percentile of 24-hour concentrations over 3 years is below 150 µg/m³. Standard attained when the annual highest 99th percentile of 24-hour concentration over 3 years is below 65 µg/m³. The quarterly lead standard is not to be exceeded during any calendar quarter. PM₁₀ - particulate matter diameter of 10 microns or less; PM_{2.5} - particulate matter diameter of 2.5 microns or less. 		
Sources: 40 CFR 50; U.S. EPA Fact Sheets, July 1997; U.S. EPA Press Release, March 26, 2002.		

The CAA requires that the U.S. EPA review scientific data every five years to ensure that the NAAQS effectively protect the public health. Effective on September 16, 1997, the U.S. EPA enacted a more stringent standard for O₃. The final standard has been updated from 0.12 parts per million (ppm) of O₃ measured over one hour to 0.08 ppm measured over eight hours, with the average fourth-highest concentration over a three-year period used to determine whether or not an area is in compliance.

Additionally, on July 18, 1997, the U.S. EPA issued a new standard for particulate matter. The standard for PM₁₀ remains essentially unchanged, while a new standard for fine particles (PM_{2.5}: diameter ≤ 2.5 micrometers) is set at an annual limit of 15 micrograms per cubic meter (µg/m³), with a 24-hour limit of 65 µg/m³. Because this new standard would regulate fine particulates for the first time, the U.S. EPA allowed five years to build a nationwide monitoring network and to collect and analyze the data needed to designate areas and develop implementation plans.

Both revised O₃ and new PM_{2.5} standards have been contested in court over the last few years. In February 2001, the Supreme Court upheld the U.S. EPA's authority under the CAA to set national air quality standards. On March 26, 2002, the District of Columbia Circuit Court rejected all remaining challenges to both standards. Therefore, the U.S. EPA will move forward with programs to implement both new standards.

3.4.2 Vehicular Pollutants

Primary automobile-related air pollutants are CO and O₃ precursors (e.g., nitrogen oxides [NO_x] and volatile organic compounds [VOCs]). Lead emissions from automobiles are negligible and have declined in recent years through the increased use of unleaded gasoline. Lead emissions from highway usage have been virtually eliminated as a result of regulations and legislation prohibiting the manufacture, sale, or introduction into commerce of any engine requiring leaded gasoline after 1992. Potential emissions of particulates and sulfur dioxide from indirect (mobile) sources such as automobiles generally are minor in comparison with direct (non-mobile) emission sources. Therefore, only vehicular CO, NO_x, and VOC emissions are considered in this study.

3.4.3 National Ambient Air Quality Standard Attainment Status

Areas that meet the NAAQS for a criteria pollutant are designated as being “in attainment;” areas where a criteria pollutant level exceeds the NAAQS are designated as being “in non-attainment.” The O₃ non-attainment areas are categorized based on the severity of their pollution problem – marginal, moderate, serious, severe, or extreme. The CO and PM₁₀ non-attainment areas are categorized as moderate or serious. Where insufficient data exist to determine an area's attainment status, an area is designated unclassifiable (or in attainment). The study area is located in the District of Columbia, an area with the following current designations:

- Severe non-attainment for ozone.
- Attainment for all other criteria pollutants.

3.4.4 State Implementation Plan

Before March 25, 2003, the Metropolitan Washington D.C. area was in serious non-attainment for O₃. On January 24, 2003, the U.S. EPA took a final action and issued a determination that the Washington area did not attain the one-hour O₃ NAAQS by the November 15, 1999-CAA attainment deadline for serious O₃ non-attainment areas. As a result, the Washington area has been reclassified as a severe O₃ non-attainment area, effective as of March 25, 2003. The CAA as amended in 1990 mandates that state agencies adopt State Implementation Plans (SIPs) that target the elimination or reduction of the severity and number of violations of the NAAQS. SIPs set forth policies to expeditiously achieve and maintain attainment of the NAAQS. The current SIP applicable to the severe Washington, DC non-attainment area is the *Draft State Implementation Plan "Severe Area SIP"- Plan to Improve Air Quality in the Washington DC-MD-VA Region* (MWCOG, June 2, 2003). The SIP demonstrates a three-percent-per-year emission reduction rate of progress from 1999 to 2002 and a projected three-percent-per-year emission reduction rate from 2002 to 2005 to improve air quality by 2005.

3.4.5 Clean Air Act Conformity and Transportation Improvement Plan

The 1990 amendments to the CAA require federal agencies to ensure that their actions conform to the SIP in a non-attainment area. Conformity to a SIP, as defined in the CAA, means conformity to a SIP's purpose of reducing the severity and number of violations of the NAAQS to achieve attainment of these standards. The federal agency responsible for an action is required to determine if its action conforms to the applicable SIP.

The U.S. EPA has developed two sets of conformity regulations, differentiating federal actions into transportation and non-transportation-related projects:

- Transportation projects are governed by the Transportation Conformity Regulations (40 CFR Parts 51 and 93), which became effective on December 27, 1993 and were revised on August 15, 1997.
- Non-transportation-related projects are governed by the General Conformity Regulations (40 CFR Parts 6, 51 and 93) described in the final rule for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, published in the *Federal Register* on November 30, 1993. The general conformity rule became effective January 31, 1994 and has not been updated since.

Because the proposed action is a transportation project within an O₃ severe non-attainment area, the transportation conformity rule applies. The conformity rule requires that the project be part of a conforming Transportation Improvement Plan (TIP) so that it is exempt from an air quality impact analysis on a regional basis. The conformity rule also requires that the project not cause or contribute to any new violations of any standards in any area.

The TIP is prepared each year by the National Capital Region Transportation Planning Board (TPB), which is the designated metropolitan planning organization for the Washington, DC region. The TIP outlines the staged development of the region's financially constrained Long-Range Transportation Plan

(LRTP), with the priority projects selected for programming by the TPB, the states, and the transit agencies present in the first year of the six-year program. State, regional, and local transportation agencies update the program each year. The most recent TIP, developed for fiscal years 2003-2008, includes specific projects, improvements, and control measures proposed in the Washington, DC region. After FHWA and the Federal Transit Administration make a determination that the TIP conforms to the SIP, the projects identified in the TIP become exempt from a regional emission analysis.

In order to demonstrate compliance to the SIP according to the transportation conformity rule, the air quality impacts of a transportation project for typical vehicle-related pollutants are generally evaluated on two scales:

- Micro-scale: the air quality impacts of CO, the predominant pollutant emitted by motor vehicles, are typically evaluated through a micro-scale analysis of traffic-related emission impacts at specific intersections.
- Meso-scale: NO_x and VOC, precursors of O₃, are usually of regional concern. The Washington metropolitan area is in severe non-attainment for O₃. Potential NO_x and VOC emission increases from additional “vehicle miles traveled” (VMT) or from slower traveling due to traffic delays may affect regional O₃ levels. However, if a project is part of a conforming TIP, a regional meso-scale air quality impact analysis is not required.

The KCAI project is currently not included in the TIP. It is expected, however, that the project will be included in an updated conforming TIP when the proposed plan is more clearly defined. Therefore, a regional meso-scale impact analysis is not required for this proposed action. A discussion of the project status as part of a conforming TIP and a micro-scale CO impact analysis are included in this EA.

3.4.6 Local Ambient Air Quality

Ambient air quality conditions in the District of Columbia are monitored at many locations in the city by various environmental agencies. The most recent published data (for the year 2001) for the monitoring stations closest to the project site are used to describe existing ambient air quality in the project area (Table 3.4-2). The measured ambient air concentrations were all below the corresponding NAAQS, except for O₃. The O₃ exceedance was expected, since the region has been designated an O₃ severe non-attainment area.

**Table 3.4-2
Local Ambient Air Quality—District of Columbia**

Pollutant and Averaging Time	Monitored Data	Primary Standard	Secondary Standard	Monitoring Site Location
Carbon Monoxide 8-hour maximum (ppm) 1-hour maximum (ppm)	3.6 4.0	9 35	9 35	C&P Phone Company L Street between 20 th and 21 st Streets
Nitrogen Dioxide Annual Arithmetic Mean ($\mu\text{g}/\text{m}^3$)	45	100	100	34 th Street / Dix Street, NE
Ozone 8-hour maximum (ppm) 1-hour maximum (ppm)	n/a 0.122	0.08 0.12	0.08 0.12	34 th Street / Dix Street, NE
Sulfur Dioxide Annual Arithmetic Mean ($\mu\text{g}/\text{m}^3$) 24-hour Maximum ($\mu\text{g}/\text{m}^3$) 3-hour Maximum ($\mu\text{g}/\text{m}^3$)	21 78 122	80 365 -	- - 1,300	34 th Street / Dix Street, NE
Lead Quarterly Maximum ($\mu\text{g}/\text{m}^3$)	0.03	1.5	1.5	2150 Railroad Ave., SE
Source: U.S. EPA, 2001.				

3.5 Noise

3.5.1 Noise Fundamentals

Noise is unwanted sound. Sound occurs whenever pressure waves are generated in air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level. Table 3.5-1 shows the approximate decibel values of a range of sounds commonly encountered in daily life.

Sound waves may be of various frequencies, with the human ear responding to a limited range of frequencies. Those frequencies to which the human ear does not respond must be filtered out when measuring noise levels. This is best achieved by using the “A-scale” weighting of sound levels, the measure that best approximates the frequency response of the human ear. Sound levels measured on the A-scale are expressed in A-weighted decibels (dBA).

**Table 3.5-1
Decibel Scale**

Type of Sound	Sound Level (dB)
Threshold of hearing (reference level)	0
Rustling of leaves	20
Residential area at night	40
Quiet restaurant	50
Highway traffic 30 meters away	75
Jet aircraft 30 meters high	90
Threshold of pain	140

Source: FHWA, February 2000.

Human response to a change in noise level depends on a number of factors, including the frequency of the sound, the magnitude of the change, the time of day at which the change takes place, whether the noise is continuous or intermittent, and the individual's ability to perceive the change. Ability to perceive changes in noise levels varies widely from person to person, as does response to the perceived changes. Generally, though, a 3-dBA change in noise level would be barely perceptible to most listeners, whereas a 10-dBA change is normally perceived as a doubling (or halving) of the noise level and is considered a substantial change. These guidelines (summarized in Table 3.5-2) make it possible to estimate an individual's probable perception of changes in noise levels.

Because the dBA noise metric describes a noise level at just one moment and because very few noises are constant, methods to describe noise levels over extended periods are needed. One way is to describe fluctuating noise heard over a given period as if it had been a steady, unchanging sound. For this, a descriptor called the equivalent sound level (L_{eq}) was developed.

**Table 3.5-2
Changes in Sound Levels**

Measured Change (dBA)	Perceived Change
0	(Reference)
3	Barely-perceptible change
5	Readily-perceptible change
10	Doubling or halving of sound
20	Sound is 4 or 1/4 times as loud
40	Sound is 8 or 1/8 times as loud

Source: FHWA, June 1995.

The L_{eq} descriptor is the constant sound level that, in a given situation and period (e.g., one-hour L_{eq} [$L_{eq}(1)$] or 24-hour L_{eq} [$L_{eq}(24)$]), conveys the same sound energy as the actual time-varying sound. The $L_{eq}(1)$ descriptor has been adopted by the FHWA and each state's department of transportation as one of the most appropriate metrics for estimating the degree of nuisance or annoyance that increased noise levels from highway traffic would cause in the neighborhoods. Therefore, the $L_{eq}(1)$ descriptor has been used in the evaluation of existing noise conditions and will be used in the noise impact analysis for this project.

3.5.2 Noise Regulations and Impact Criteria

FHWA has developed noise regulations applicable to federally-aided highway projects. These regulations are described in 23 CFR 772 and *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (FHWA, June 1995). FHWA's procedures for highway traffic noise analysis and abatement specify the requirements that state highway agencies must meet when using federal funds for highway projects in order to protect public health and welfare. These procedures include:

- Identification of land uses or activities that may be affected by traffic noise under project operation.
- Determination of existing noise levels through measurement of current conditions.
- Prediction of traffic noise for the no action and action alternatives.
- Examination and evaluation of noise abatement measures to reduce or eliminate noise impacts.
- A general analysis of construction noise.

The standards established for noise analysis include noise abatement criteria (NAC) that FHWA considers to be the limits at which noise abatement measures must be considered for exterior land uses and outdoor activities and for certain interior uses. These criteria are summarized in Table 3.5-3. As shown in the table, potentially-impacted land use/activity types are grouped into five lettered categories. Category B is the category that best describes the project area. Future noise levels must be predicted in order to compare noise impacts to the NAC. If the criteria levels are approached or exceeded, or if there is a substantial increase above existing noise levels, abatement measures need to be considered.

**Table 3.5-3
Noise Abatement Criteria**

Land Use/Activity Category	Description	L _{eq} (1)
A	Land for which serenity and quiet are of extraordinary importance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	57 (exterior)
B	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.	67 (exterior)
C	Developed lands, properties, or activities not included in Categories A or B above.	72 (exterior)
D	Undeveloped lands.	None specified
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.	52 (interior)
Note: The L _{eq} designations represent hourly A-weighted sound levels expressed in decibels (dBA). Source: FHWA, June 1995.		

It should be noted that these criteria are generally applicable for a Type I project, which has been defined in 23 CFR 772.5(h) as a federal or federally aided highway project for:

- Construction of a highway in a new location.
 - Physical alteration of an existing highway that substantially changes either the horizontal or vertical alignment:
 - Horizontal: moves the alignment of the near traffic lane half the distance or closer to the nearest receptor.
 - Vertical: changes the profile by a grade separation distance of six to nine meters.
 - Addition of through-traffic lanes.
 - Based on the vertical changes in roadway profile along Potomac Freeway under the proposed alternatives, the proposed project can be defined as a Type I noise project.
-

3.5.3 Monitored Existing Noise Levels

Existing noise condition surveys were conducted along the project corridor to characterize the existing noise environment in the project area. Three typical Category B land uses adjacent to the corridor were identified and considered for a noise-monitoring survey:

- Residences and associated playgrounds.
- Institutional land uses (e.g., a church).
- Parklands, including playgrounds and resting areas.

Because morning peak period, afternoon peak period, and post-Kennedy-Center-performance time were expected to be the periods with the potential to be most affected by the proposed project, a noise-monitoring program was conducted during these periods at a total of 12 receptor locations between April 10 and April 12, 2002, concurrently with the traffic counts program described in Subchapter 3.3. Monitoring locations are shown in Appendix A, Figure 3.5-1 (Noise Monitoring Locations), and the monitoring results are summarized in Table 3.5-4.

It should be noted that the post-performance noise levels were collected only at receptor locations where potential outdoor activities could occur. The area where outdoor activities would most likely occur (e.g., backyard, picnic areas, parklands with resting benches, playgrounds, etc.) was chosen as the specific monitoring spot at each receptor location. Two samples were collected at each site during the peak-hour monitoring, with one sample including aircraft flyover noise and the other sample excluding it. Aircraft noise is produced by traffic associated with Ronald Reagan Washington National Airport as well as occasional military helicopter flights

**Table 3.5-4
Monitored Ambient Noise Levels (dBA)**

Site	Location	L _{eq} (1)				
		AM peak (Airplane Flyover)	AM peak (No Flyover)	PM peak (Airplane Flyover)	PM peak (No Flyover)	Post Performance (No Flyover)
1	Pennsylvania Avenue/Rock Creek Parkway Interchange Ramp	70.8	70.0	68.5	68.1	N/a
2	Thompson's Boathouse	59.7	57.4	64.9	55.4	N/a
3	Watergate Pool Area (inside court)	64.2	59.1	62.9	54.7	N/a
4	Watergate Resting Area (outside)	68.2	66.2	65.8	64.1	64.9
5	Kennedy Center West Terrace	64.3	60.0	62.4	60.9	N/a
6	Park along Riverside	69.6	68.6	67.6	67.1	65.9
7	Volleyball Park	64.1	61.2	63.8	63.4	n/a
8	26 th Street Playground	66.5	66.7	66.2	65.4	61.7
9	2528 I Street Backyard	69.2	69.1	67.6	66.4	67.2
10	Western Presbyterian Church	64.6	63.8	64.9	63.7	n/a
11	Juarez Circle/Virginia Avenue Overpass Park	69.4	68.8	66.3	64.9	65.3
12	Columbia Plaza Backyard	69.3	68.3	66.5	65.8	63.5

During the post-performance hour, only one sample excluding aircraft noise was collected at those locations with potential late-night outdoor activities. During each sampling, a sound signal was picked up by the outdoor microphone positioned at 1.5 meters above ground and then transferred to the noise analyzer. The analyzer A-weighted the incoming signal and determined L_{eq} (1). The data were digitally recorded by the noise analyzer for a continuous 15-minute period and then printed out at the end of each sampling period. A windscreen was used to minimize wind noise across the face of the microphone.

The predominant sources of noise at each monitoring location are vehicular traffic along the adjacent highways and periodic flyovers of aircraft and helicopters. The monitored hourly noise levels (see Table 3.5-4) indicate that:

- Existing noise levels of 66 dBA or greater, which is a noise level approaching or exceeding the FHWA 67 dBA NAC, occurred at seven locations.
- At most locations, the morning peak period experiences higher noise levels than other periods.
- Aircraft noise contributes an average of 1 to 3 additional dBA to the noise levels of most locations. However, aircraft noise can result in a substantial increase in noise (as high as 10 dBA) when receptor locations are away from traffic and mostly quiet, as is the case for sites 2 and 3.

3.5.4 Modeled Existing Noise Levels

3.5.4.1 Methodology

In order to assess the potential noise impact of a transportation project, a mathematical model capable of predicting future traffic noise levels must be developed. The analytical tool to predict future noise levels generated by traffic is the FHWA's *Traffic Noise Model* (TNM 2.0), a computer program for highway traffic noise prediction and analysis. The TNM computes highway traffic noise at nearby receivers and aids in the design of highway noise barriers. This program has built into it the most recent vehicle emission levels (including levels from congested traffic at very low moving speeds), algorithms for excess ground attenuation and barrier shielding, additional analysis capabilities, etc. TNM is an advanced tool for dealing with traffic noise issues.

For the mathematical modeling process to work, it is necessary to model the existing noise conditions by inputting various site-specific parameters, including:

- Existing topographic conditions, such as roadway geometry and profile, and receiver height.
- Existing traffic volumes, speeds, and vehicle classifications.
- Noise-shielding effects on a specific receptor location from building structures, trees, or earthen berms lying between traffic and the receptor.

These modeled noise levels are compared to the monitored noise levels to evaluate whether or not the model has been developed appropriately. If differences are within 3 dBA, which is a barely-perceptible change in noise levels, the model is considered appropriate and can be used to predict future noise levels at monitoring locations, as well as to predict both existing and future noise levels at additional receptor locations along the project corridor. The predicted future noise levels are compared to existing noise levels and to the NAC levels to determine if there are traffic-noise impacts.

3.5.4.2 Modeled Existing Noise Levels

Existing roadway geometries and profiles and project-area terrain conditions were taken into account to develop the model. Information on existing traffic volumes, speeds, and vehicle mixes collected through a field monitoring program were incorporated in the model.

The model was first used to predict existing noise levels at the 12 monitoring locations shown in Appendix A, Figure 3.5-1 for the same three periods. After making a series of adjustments to best approximate existing topographic conditions, the differences between the predicted and monitored levels were found to be within three dBA of each other at each location for each study period (results are summarized in Appendix G, Table G-1). Thus, the model was found to be appropriate and can be used reliably to predict noise levels along the project corridor under both existing and future conditions. It should be noted that the traffic-noise modeling was not performed for the post-performance period, since it was determined after intensive traffic analyses that this period is not critical because it does not produce significant traffic impacts.

Using the model, existing noise levels were predicted at 40 additional receptor locations along the project corridor (Appendix A, Figure 3.5-2, Noise Modeling Locations), to determine existing noise conditions over a broader portion of the study area where public activities are likely to occur. For modeling purposes, and given the complexity of the roadways and topography of the project site, these additional receptors are arranged in five distinct areas (see Appendix A, Figure 3.5-2), defined as follows:

- Area 1: Street blocks between Pennsylvania Avenue and I Street, west of 25th Street.
- Area 2: Watergate Complex site.
- Area 3: Kennedy Center site.
- Area 4: East of the Potomac Freeway and west of 23rd Street, between I and C Streets.
- Area 5: Parklands northwest of the Lincoln Memorial.

Predicted noise levels at the additional receptor locations are summarized in Table 3.5-5. The predicted existing noise levels will be used as the basis for comparisons in determining potential traffic-noise impacts.

**Table 3.5-5
TNM Predicted Existing Noise Levels**

Area	Receptor	L _{eq} (1) (dBA)	
		AM Peak	PM Peak
Area 1	1-1	66.3	66.2
	1-2	59.7	60.7
	1-3	66.5	65.1
	1-4	57.0	56.9
	1-5	66.7	66.3
	1-6	66.3	66.5
	1-7	69.4	69.6
	1-8	61.5	61.8
Area 2	2-1	56.9	55.4
	2-2	60.3	59.1
	2-3	61.0	60.3
	2-4	65.7	64.1
	2-5	63.7	62.7
	2-6	62.1	60.8
	2-7	61.4	60.1
	2-8	54.7	53.7
	2-9	64.3	64.0
	2-10	65.2	64.7
Area 3	3-1	66.5	68.6
	3-2	65.3	67.6
	3-3	66.4	69.2
	3-4	52.1	53.8
	3-5	54.1	57.5
	3-6	60.7	60.5
	3-7	62.0	63.9
	3-8	62.7	66.6

Area	Receptor	L _{eq} (1) (dBA)	
		AM Peak	PM Peak
Area 4	4-1	59.7	59.8
	4-2	63.6	63.7
	4-3	65.6	66.0
	4-4	62.4	62.2
	4-5	62.0	61.6
	4-6	63.5	63.3
	4-7	65.3	65.4
	4-8	60.6	63.3
Area 5	5-1	67.0	66.7
	5-2	63.5	65.0
	5-3	65.3	64.0
	5-4	63.8	66.1
	5-5	62.6	63.4

3.6 Park Lands and Memorials

3.6.1 Regulatory Framework – Section 4(f)

Section 303 of the Department of Transportation Act of 1966 (49 USC 303), commonly referred to as Section 4(f), states that the Secretary of Transportation shall not approve a transportation program or project requiring the use of any land of a public park, recreation area, wildlife or waterfowl refuge, or historic site unless there is no feasible and prudent alternative to the use of such land, and the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife or waterfowl refuge, or historic site. A Section 4(f) evaluation must be prepared in each location within a proposed study area before the use of Section 4(f) land is approved.

Multiple parks and memorials owned and managed by the NPS are located within the study area (Appendix A, Figure 3.6-1, Existing National Park Service Lands). If land associated with these parks and memorials must be acquired in conjunction with the proposed project, a Section 4(f) document will be required. The following subchapter provides baseline information on all parks and memorials within and adjacent to the study area.

3.6.2 Extent and Nature of Major Parks in Study Area

Three major NPS parks within and adjacent to the study area have the potential to be affected by the proposed action:

- Rock Creek Parkway.
- West Potomac Park.
- Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP).

3.6.2.1 Rock Creek Parkway

Size, Extent, and Ownership

The Rock Creek Parkway extends 2.5 miles between the National Zoo and the Lincoln Memorial Circle. The original property takings associated with the creation of the parkway extended to just north of the Roosevelt Bridge. For the purposes of this report, the south boundary of the parkway will conform to the Lincoln Memorial traffic circle description, since District of Columbia planners and designers consider this to be the parkway's historic south terminus (Davis, 1999).

The parkway traverses 174 acres and is administered by the Rock Creek Park unit of NPS. It is associated with Rock Creek Park, which extends from north of the National Zoo to the Maryland/District of Columbia border and encompasses 1,775 gross acres.

Approximately 12.2 acres of the Rock Creek Parkway are located in the study area. While most of the parkway is administered by Rock Creek Park, the portion of the parkway between Virginia Avenue and its south terminus is managed by the NPS National Capital Parks-Central office (Lorenzetti, May 15, 2002).

Thompson's Boathouse, which is owned by the C&O Canal NHP, is also located in the study area and administered by the Rock Creek Park NPS unit. Because it is administered by Rock Creek Park, the boathouse is described in this subchapter. Within the study area, the parkway is situated near other NPS park lands, including the C&O Canal NHP at the confluence of Rock Creek and the Potomac River.

Access and Usage

In the study area, driving is the primary activity along the Rock Creek Parkway. Between the Lincoln Memorial and Ohio Drive, the parkway is a two-way, two-lane facility. North of Ohio Drive it becomes a four-lane facility, which is divided south of the Whitehurst Freeway and undivided north of it. Traffic patterns on the Rock Creek Parkway are described at length in Subchapter 3.3.3.

Traffic counts conducted for this project on a Spring 2002 weekday found a total of 65,100 cars using the parkway in the vicinity of Pennsylvania Avenue, 69,400 cars using it at Virginia Avenue, and 40,400 at the Kennedy Center. Indeed, the parkway functions as a major commuter route between the District, Maryland, and Virginia.

An asphalt and block-paved pedestrian trail is also located within the study area. At the north end of the study area, the trail extends along the east bank of Rock Creek and shifts to the west side of the Rock Creek Parkway south of the confluence of Rock Creek and the Potomac River. The trail continues along the west side of the parkway and terminates at the Lincoln Memorial traffic circle. A portion of the trail is located west of the west facade of the Kennedy Center and is popular with joggers, walkers, bikers, and rollerbladers. Amenities along the trail west of the Center include rectangular seating niches, tulip-style trash receptacles, and a metal rail atop the Potomac River seawall.

According to a survey conducted for this study, on a weekday afternoon, 80 pedestrians and 80 bicyclists per hour used the path near the Kennedy Center. On a weekend afternoon, the rate of utilization increased to 380 per hour for pedestrians and 220 per hour for bicyclists.

Numerous special events occur during the year along the parkway. Two of these – the Cherry Blossom Run in April and the Marine Corps Marathon in October – require the closure of the parkway in the study area. The October marathon is temporarily using Rock Creek Parkway within the study area because of ongoing construction at Hains Point. When Hains Point reopens in the near future, the Marine Corps Marathon course will cease using the parkway within the study area.

Special events that do not require closure of the parkway within the study area occur in conjunction with regattas. During the spring, Thompson's Boathouse hosts multiple regattas. Special events are also hosted by other organizations, such as the Metropolitan Washington, DC Section of the Chinese Women's League, which hosted a Dragon Boat Festival within the project area in May 2002 (Illige, May 28, 2002) and again in 2003.

Thompson's Boathouse

One recreational facility within the study area along Rock Creek Parkway is Thompson's Boathouse. The boathouse, built in 1959-60, is owned by the C&O Canal NHP and administered by Rock Creek Park. It consists of a two-story building located west of the intersection of the Rock Creek Parkway and Virginia Avenue, on the small peninsula created by the confluence of Rock Creek and the Potomac River. Guest Services, Inc. operates the boathouse for NPS.

Thompson's Boathouse functions as a hub for rowing practice and regattas. Georgetown University, GWU, and Catholic University, as well as many local schools and clubs, store the sculls they use for training and racing at the boathouse and in an adjacent yard northwest of the building. In addition, the boathouse offers a full schedule of lessons and rowing programs for children and adults, as well as boat (kayaks, canoes, and rowing shells) and bike (all-terrain and cruiser) rentals.

The boathouse is open from 5:30 AM to 8:00 PM and is most active early in the morning and after 2:00 PM in the afternoon (before and after the school day). According to the director, the boathouse receives an average of about 35,000 visitors a month throughout the ten months of the year that it is open (Eidsness, May 8, 2002).

The proposed project raises some potential pedestrian and water access issues as well as opportunities for the boathouse. The pedestrian path along the west side of the Rock Creek Parkway is severed from the pedestrian path along the Georgetown waterfront, west of the boathouse. As a result, pedestrians from the south must proceed along the path and cross at a footbridge north of the boathouse to cross Rock Creek, and then follow the path around the boathouse to the Georgetown waterfront. A more direct connection between the parkway path and the Georgetown waterfront path would be desirable for both users of the boathouse and passers-by.

Another potential issue concerns rowers' use of a landing located south of the boathouse along the Potomac River. A water taxi stop on the west side of the Kennedy Center along the Potomac River (as proposed in the *Kennedy Center Access Study* [FHWA, September 2000]), could potentially affect rower's access to this landing.

Unusual Characteristics

The Rock Creek Parkway presents several unusual characteristics within the study area. One characteristic is that a large portion of it (4.4 acres) lies in the one-hundred-year floodplain (see Subchapter 3.12.2.2). A number of physical characteristics also distinguish the parkway within the study area. Concrete seawalls flank the road and pedestrian path along the river. A mixture of mature and young trees adorns the pedestrian path. In the vicinity of the Kennedy Center, most trees are ornamental cherries (*Prunus* spp.) and pin oaks (*Quercus palustris*).

Historic Designation Status

As discussed in Subchapter 3.7.4, the Rock Creek Parkway is a District of Columbia Landmark subject to the protection afforded by the District of Columbia landmarks law. A National Register nomination is currently being prepared by NPS. Since the parkway is considered National Register-eligible, it is covered by Section 106 of the National Historic Preservation Act. In addition to the parkway itself, several contributing features are located within the project area and include:

- A historic gas station built in the 1930s, located at 2780 Virginia Avenue, at the intersection of the avenue and the parkway.
- Multiple bridges, including the Pennsylvania Avenue Bridge (1915-16); the K Street Bridge 1939-41; 1947-49); and the M Street Bridge (1929-30) over the Parkway, in or adjacent to the North Sector of the study area.

In addition, Godey's Lime Kilns, a National Register-listed property described in Subchapter 3.7.4, is located on Rock Creek Parkway property, near the intersection of K Street, the Whitehurst Freeway, and the parkway. The kilns do not contribute to the historic character of the Rock Creek Parkway.

Future Projects

The 1987 *Georgetown Waterfront Plan* (NPS) proposed several projects within the study area, including: architectural enhancement of Thompson's Boathouse and changes to the parking lot; creation of a memorial site in the vicinity of Virginia Avenue and the parkway; rehabilitation and interpretation of the tide lock at the mouth of Rock Creek, which marks the entrance to the C&O Canal; addition of a waterfront trail that would cross the boathouse site and connect the Georgetown Waterfront Trail with the Rock Creek Riverfront Trail; and an area of riverfront dedicated to new boathouses.

The Rock Creek Park and the Rock Creek and Potomac Parkway Draft General Management Plan Environmental Impact Statement (NPS, 2003), summarized in Appendix D, Section D8, includes an overall management plan for the Rock Creek Parkway south to Virginia Avenue. The preferred alternative would close segments of Beach Drive (in Rock Creek Park north of the parkway, but flowing into the parkway) from 9:30 AM to 3:30 PM weekdays. If implemented, this action would reduce the flow of traffic onto the parkway during these times.

The *Management Plan's* preferred alternative would also: upgrade two miles of trails within Rock Creek Parkway; continue rush hour traffic reversals on the parkway; improve the intersection of Connecticut Avenue, Beach Drive and the parkway to improve safety for pedestrians, bicyclists, and motorists; and lead to better enforcement of speed limits.

In the *Management Plan*, Thompson's Boathouse is designated as an "urban recreation zone" where "high levels of intervention and maintenance are required to support concentrated visitor use." The desired visitor experience is "strongly associated with the presence of developed facilities. Social interactions are supported, and the visitor encounter rate with other visitors is very high. Visitors participate in active recreation and entertainment events within a background provided by the rustic setting." Management of this resource would continue at current levels.

3.6.2.2 West Potomac Park

Size, Extent, and Ownership

West Potomac Park consists of 400 acres of parkland bounded by Constitution Avenue to the north, the Potomac River to the west, 17th Street to the northeast, and, to the south, the elevated railroad bridge that forms its boundary with associated East Potomac Park. Major memorials are located within the park (see *Unusual Characteristics* below).

Approximately 41 acres of West Potomac Park are located within the study area. The park is owned and managed by the NPS National Capital Parks–Central office, which altogether manages 6,831 gross acres of park in the Washington, DC region. West Potomac Park is adjacent to other NPS parklands, including Rock Creek Parkway to the northwest, the National Mall to the east, and East Potomac Park to the southeast. A portion of parkland also administered by the NPS National Capital Parks-Central office lies between the north boundary of West Potomac Park and the Kennedy Center. Continuous with West Potomac Park, it covers approximately 9.4 acres of land and is traversed by several ramps associated with the Roosevelt Bridge.

Access and Usage

Within the study area, primary uses include driving and recreational activities. Driving occurs along Lincoln Memorial Circle, the approaches of the Memorial Bridge and Roosevelt Bridge, 23rd Street, and Constitution Avenue.

Pedestrian paths are located along the bank of the Potomac River, at the Rock Creek Parkway terminus (or Belvedere, formerly the west terminus of Constitution Avenue), and around the Lincoln Memorial. Many of the pedestrians using the portion of the park within the study area are visitors to the Lincoln Memorial.

Ball diamonds are located between the Lincoln Memorial and Constitution Avenue on either side of 23rd Street. Several volleyball courts lie east of the Rock Creek Parkway, southeast of the Belvedere. These ball fields and courts are heavily used during fair-weather weekends.

The NPS visitation database provides statistics for National Capital Parks–Central office, which includes West Potomac Park, East Potomac Park, the National Mall, and several park units within the monumental core; statistics on West Potomac Park alone are not collected. However, the NPS keeps statistics on visits to major memorials, including the Lincoln Memorial, which is the main feature of West Potomac Park within the study area. For the purpose of this report, statistics for the Lincoln Memorial can be considered a good approximation of visitor usage of the portion of West

Potomac Park located within the study area. In 2001, 3,968,857 people visited the Lincoln Memorial. The figure for 2000 was slightly higher (4,009,145 people).

Unusual Characteristics

The portion of West Potomac Park within the study area is entirely located on reclaimed land. Approximately 9.4 acres of West Potomac Park and 2.1 acres of the National Capital Parks-Central land that lies between West Potomac Park and the Kennedy Center are located in the one-hundred-year floodplain (see Subchapter 3.12.2.2).

The portion of the park within the study area includes mature elm trees standing east of the Belvedere and south of the Roosevelt Bridge access ramps. These trees may be associated with planting schemes implemented during construction of Memorial Bridge and the now-vanished stretch of Constitution Avenue west of 23rd Street (Maloney, April 9, 2002).

West Potomac Park within the study area is characterized by the presence of several monuments and memorials of national importance that enhance its cultural value. These include the Lincoln Memorial and Memorial Bridge (managed by the NPS George Washington Memorial Parkway unit). Major memorials adjacent to the study area include the Vietnam Veterans Memorial and the Korean War Veterans Memorial. These are described in more detail in Subchapter 3.6.4 below.

Historic Designation Status

As described in Subchapter 3.7.4, West Potomac Park is given special cultural value by being a District of Columbia Landmark and listed on the National Register. As such, it enjoys the protections afforded by the District of Columbia landmarks law and Section 106 of the National Historic Preservation Act. Contributing elements within the study area include the Lincoln Memorial, associated grounds (Lincoln Memorial Circle, Reflecting Pool, Rainbow Pool, Elm Walks), and Memorial Bridge.

Future Projects

In 2002, NPS issued an EA for the Lincoln Memorial Circle Rehabilitation and Security Project (NPS, November 2002) and then issued a revised EA (June 2003) based on public comments. NPS is proposing to: 1) construct a vehicular security barrier system around the Lincoln Memorial to provide security to the memorial and its visitors, and 2) rehabilitate Lincoln Circle. A vehicular barrier wall would be constructed from Daniel French Drive along the west side to Henry Bacon Drive and bollards would be constructed along the outer ring of the memorial. A secure access gate would be added on the west side of the memorial and two visitor service areas would be built on the north and south sides of the Lincoln Memorial.

Another project with the potential to affect West Potomac Park is the proposed upgrade of the Roosevelt Bridge. The Washington side of the bridge is characterized by access ramps running through and next to West Potomac Park. Presently, alternatives are being developed and studied. Some of the alternatives considered include realigning the bridge to create a direct connection with Constitution Avenue, potentially affecting the Belvedere. In compliance with NEPA and other environmental regulations, once the alternatives development process is complete, environmental

documentation will be prepared to assess the potential impacts of this project, including potential impacts to West Potomac Park (Lorenzetti, May 20, 2002).

Another future plan is the development of a tour bus ramp connected to Constitution Avenue that would remove tour buses from the east side of the Lincoln Memorial. The ramp would be located near the Roosevelt Bridge ramp system in the northwest portion of West Potomac Park (Lorenzetti, May 23, 2002).

A third plan includes installing a tour bus stop and concession stand along Henry Bacon Drive, on the north side of the Lincoln Memorial traffic circle. This would accommodate non-rush hour tour bus drop-offs and pick-ups. This bus stop and concession stand would complement the existing stop and concession stand along Daniel French Drive on the south side of the traffic circle (Lorenzetti, May 23, 2002).

3.6.2.3 Chesapeake and Ohio Canal National Historical Park

Size, Extent, and Ownership

The C&O Canal NHP preserves and interprets the entire 184.5-mile 19th-century canal that runs from Washington, DC to Cumberland, MD. The canal encompasses 19,551 gross acres and is managed by the C&O Canal NHP, headquartered in Hagerstown, MD. A total of 12.8 acres is located within the study area, including historic canal features and Thompson's Boathouse (administered by the Rock Creek Park unit of NPS).

Access and Usage

The C&O Canal NHP consists of the canal channel, canal towpath, and several original structures including locks, lockhouses, and aqueducts found along the C&O canal route. From its mouth to the level of L Street, where it turns west, the canal coincides with Rock Creek. The most important elements of the canal within the study area are the remnants of the old bulkhead and the Tide Lock that once provided access to and from the Potomac. These are located immediately southeast of Thompson's Boathouse and are accessible only via the pedestrian bridge that connects the boathouse to the path along the Rock Creek Parkway. The canal towpath, starting at 29th Street and proceeding westward, functions as a linear park for pedestrians, joggers, hikers, and bikers. The park's Georgetown Visitor Center is located at 1057 Thomas Jefferson Street.

Visitor statistics indicate that in 2001, 19,975 people visited the Georgetown center, and 362,336 people used the Georgetown towpath (C&O Canal NHP, 2002). In 2000, 21,515 people visited the Georgetown Visitor Center and 331,878 people used the towpath in Georgetown.

Unusual Characteristics

The canal is located within the Potomac River's floodplain and has a history of flooding. As was the case during the operational period of the canal (1828-1924), floods are a primary management concern for the park's administrators.

The C&O Canal NHP has compiled documentation on flooding from 1840-1996, and has developed a *Flood Recovery Plan* (C&O Canal NHP, 1998). The 1996 flood is considered to have been

the worst in the history of the canal. It occurred in January, following two major snowstorms that produced 42 inches of snow, which were in turn followed by a warming trend, rain, and extensive melting in the Potomac River valley. Record-high water and heavy winter ice caused extensive damage to the canal, towpath, and associated structures (C&O Canal NHP, 1998).

The *Flood Recovery Plan* sets forth a plan to spend \$23.2 million obtained from Congress and other public and private sources to repair the damage caused by flooding. The plan also prioritizes repair needs, integrates sustainability features to prevent damage from future floods, sets forth an implementation schedule, and highlights future needs beyond the scope of the plan. The plan is actively used by the C&O Canal NHP to manage park resources following disastrous floods.

Historic Designation Status

As indicated in Subchapter 3.7.4, the canal has special cultural value, as it is designated a District of Columbia Landmark and listed on the National Register. Consequently, it is subject to the protections afforded by the District of Columbia landmarks law and Section 106 of the National Historic Preservation Act. Other historical resources within the study area include the Tide Lock, canal channel, and towpath.

Applicable Clauses Affecting Ownership

The parcel of the park north of Thompson's Boathouse is subject to a restrictive covenant with the Baltimore and Ohio Railroad (B&O). The covenant indicates that the height of buildings on the parcel should not exceed 20 feet. A historic map indicates that in 1938 the land was occupied by a B&O freight house and a cement, lime, and stone company that was serviced by railroad sidings operated by B&O (C&O Canal, 1938).

3.6.3 L'Enfant Plan Reservations

The L'Enfant Plan is characterized by the presence of multiple reservations or parks at the intersections of diagonal avenues and orthogonal streets. Reservations form an integral part of the plan. Ten rectangular, triangular, or semi-circular L'Enfant Plan reservations, ranging in size from 0.4 acres to 60 square feet, are located within the study area. These reservations are managed by the NPS National Capital Parks-Central office and are listed below in Table 3.6-1. Two of the ten reservations include monuments (Reservation 134, Juarez Circle and Reservation 720). The location of each reservation is shown in Appendix A, Figure 3.6-1.

Access and Usage

Access to the reservations is the same as access to the streets where they are located. The reservations primarily function as landscaped or paved intersections or medians. No visitor statistics exist (Lorenzetti, May 15, 2002).

Unusual Characteristics

Within the study area, the reservations are generally grassy patches. Some have a more complicated landscape scheme, consisting of a variety of young and mature trees and shrubs. These include Reservation 134 (Juarez Circle) and Reservation 720. Both are also adorned with a memorial statue (see Subchapter 3.6.4.2 below).

Historic Designation Status

As described in Subchapter 3.7.4, reservations are also contributing features to the L'Enfant Plan, a District of Columbia landmark also listed in the National Register. Thus, they are afforded protection under the District of Columbia landmarks law and Section 106 of the National Historic Preservation Act.

**Table 3.6-1
L'Enfant Plan Reservations in Study Area**

Reservation	Location
26G-26M	New Hampshire Avenue Medians
95	Virginia Avenue at I Street
98	Virginia Avenue at G Street
99	Virginia Avenue at G Street
103	Virginia Avenue at E Street
104	Virginia Avenue at E Street
106	Virginia Avenue at 21 st Street
134 (Juarez Circle)	New Hampshire Avenue at Virginia Avenue
135	New Hampshire Avenue at Virginia Avenue
720	Virginia Avenue and E Street
Source: Robinson & Associates, 2000.	

3.6.4 Existing Memorials and Monuments

3.6.4.1 Major Memorials

Kennedy Center

The Kennedy Center is both the primary performing arts venue in Washington and a living memorial to President John F. Kennedy. As a memorial, it receives federal funding each year to pay for the maintenance and operation of the building. Artistic programs and education and outreach initiatives are paid for almost entirely through ticket sales and gifts from individuals, corporations, and private foundations. Information on Kennedy Center operations is provided in Subchapter 3.10.

Lincoln Memorial

The Lincoln Memorial (1914-22) stands at the west end of the National Mall, in West Potomac Park, in the South Sector of the study area. The NPS National Capital Parks-Central office manages it. The Lincoln Memorial and associated grounds (including the Reflecting Pool, Rainbow Pool, and elm tree-lined walks flanking the Reflecting Pool) are listed in the National Register. Visitor statistics for the Lincoln Memorial are provided in Subchapter 3.6.2.2.

Future plans for the memorial include upgrading roads, ramps, and security barriers (see Subchapter 3.6.2.2). Improved security barriers may include sensitively-designed retaining walls and bollards placed on the inside of the traffic circle and extending east from the circle to the Reflecting Pool.

Vietnam Veterans Memorial

The Vietnam Veterans Memorial (1982) serves as a testament to the sacrifice of American military personnel during one of the nation's least popular wars. It is located northeast of the Lincoln Memorial, just outside the South Sector of the study area. In 2000 and 2001, 3,782,445 and 3,704,008 people, respectively, visited the memorial.

Future plans for the memorial include installation of a plaque to honor soldiers who died after the war of war-inflicted wounds. Future plans may also include the construction of an education center near the memorial site, either below grade or above ground (Lorenzetti, May 23, 2002).

Korean War Veterans Memorial

The Korean War Veterans Memorial (1995) honors those Americans who participated in the Korean War (1950-53). The memorial is located southeast of the Lincoln Memorial, just outside the South Sector of the study area. The NPS National Capital Parks-Central office manages it. In 2000 and 2001, 2,923,716 and 2,961,477 people, respectively, visited the memorial.

3.6.4.2 Minor Memorials

Gálvez Statue

The Gálvez statue is located north of the State Department complex, in Reservation 720, fronting Virginia Avenue at 23rd Street. The statue is maintained by the NPS National Capital Parks-Central office and honors Marshal Bernardo de Gálvez (1748-1786), Governor of Spanish Louisiana, who defeated the British in Baton Rouge, Mobile, Pensacola, St. Louis, and Fort St. Joseph during the Revolutionary War. Visitor statistics are not collected for this monument.

Juarez Statue

The Juarez Statue is located in Reservation 134 (Juarez Circle), at the intersection of New Hampshire and Virginia Avenues. The statue is maintained by the NPS National Capital Parks-Central office and honors Benito Juarez (1806-72), a Mexican liberal statesman revered as one of Mexico's greatest political figures for his promotion of democracy. Visitor statistics are not collected for this monument.

Memorial Bridge Statuary

The eastern approach to Memorial Bridge is adorned with allegorical statues representing the Arts of Peace and the Arts of War. These gilded bronze sculptures were erected in 1951 and are approximately 17 feet tall. They sit atop granite pedestals. The NPS National Capital Parks-Central office maintains the Arts of Peace statues. The Arts of War statues are maintained by the George Washington Memorial Parkway unit of NPS (Lorenzetti, May 15, 2002). Visitor statistics are not collected for these monuments.

Key of Keys (Braddock's Rock)

This small landmark, which consists of a benchmark and plaque, is located south of the ramp connecting Constitution Avenue westbound to the Roosevelt Bridge, just north of National Capital Parks-Central land. The site nonetheless is managed and maintained by the NPS National Capital Parks-Central office. Visitor statistics are not collected for this monument.

Braddock's Rock is named for British General Edward Braddock, who is thought to have landed there in 1755 on his way to Fort Duquesne (now Pittsburgh). The promontory served as the starting point for the first land survey of the District of Columbia and was used for leveling operations on the Washington Monument grounds. The District Bridge Division personnel who supervised the construction of the Roosevelt Bridge donated the plaque in 1964.

3.6.5 Plans and Proposed Memorials and Parks

3.6.5.1 Memorials and Museums Master Plan

NCPC, CFA, and the National Capital Memorial Commission (NCMC) are the federal agencies responsible for the location and design of new commemorative works on federal land. In 1997, the agencies formed a joint task force to explore issues affecting future memorials and museums in the District of Columbia and environs. The task force developed a *Memorials and Museums Master Plan* (NCPC, 2001) based on the vision for Washington's monumental core articulated in the 1997 *Extending the Legacy* plan (NCPC, 1997). *Legacy* called for placing memorials and museums and other public buildings beyond Washington's traditional monumental core as a way to preserve the historic open space and vistas of the Mall and surrounding areas, and to distribute cultural and commemorative resources to all quadrants of the city. The *Memorials and Museums Master Plan* identifies potential sites for future memorials and museums and provides general guidelines for where and how these facilities should be accommodated, as well as siting criteria and implementation strategies.

Ultimately, 100 candidate sites were identified for future memorials and museums. Evaluation of site suitability was based on planning and urban design criteria, economic criteria, transportation criteria, and environmental criteria. Of the 100 sites, 20 – sites numbered 1 through 20 – were designated prime sites. Because of their high visibility and strong axial relationships with the US Capitol and the White House, prime sites should be reserved for subjects of lasting historical and national importance. The remaining 80 sites – those numbered 21 through 100 – were recommended as candidate sites because of existing or potential visual connections, roles in reinforcing the overall

design of the city, or support they could provide to federal and local planning objectives. Within and immediately adjacent to the Kennedy Center study area, three sites were identified as prime, and three were identified as candidate. The three prime sites are:

- **Site 2**, east of the Kennedy Center in the axis of E Street. This site is currently occupied by the Potomac Freeway and E Street Expressway. For this location, the plan proposes building a new civic plaza and redesigning adjoining roads and ramps that restrict pedestrian access. Also proposed in connection with this site is a link from the Kennedy Center River Terrace to the riverfront and the Rock Creek Parkway trail.
- **Site 6**, multiple locations between the Belvedere and 23rd Street within West Potomac Park, near the historic alignment of Constitution Avenue. The plan identifies Site 6 as affording opportunities for a memorial that would provide civic enhancement and complement waterfront parkland.
- **Site 11**, on E Street, just east of 20th Street. For this site, known as Walt Whitman Park, the plan proposes to retain and enhance the current park setting and to incorporate interpretive resources relating to the life of Whitman as well as developing the site as a major pedestrian-oriented destination as part of a thematic E Street corridor.

The three candidate sites are:

- **Site 46**, within the Rock Creek Parkway corridor, just north of Pennsylvania Avenue. For this site, the plan envisions commemorative elements of varying scales that would take advantage of the open-lawn setting and that would be appreciated by neighbors, visitors, and commuters.
- **Site 55**, between the Rock Creek Parkway and the Potomac River, south of Rock Creek. For this site, the plan indicates that the existing pedestrian trail could be reconfigured to include a small or medium-sized memorial within the existing landscape. Should a link from the Kennedy Center River Terrace to the riverfront be constructed, it could also provide memorial opportunities.
- **Site 56**, West of the Rock Creek Parkway, near Thompson's Boathouse. For this site, the plan envisions an opportunity to create a new focal point at the western terminus of Virginia Avenue, with a visual link to Georgetown.

The main characteristics of these six sites are summarized in Appendix D, Table D1. Their location is shown in Appendix A, Figure 1-6.

3.6.5.2 Proposed Parks

The Georgetown Waterfront Park is currently being developed as a 10-acre park along the Georgetown waterfront. The park will lie between K Street to the north, the Potomac River to the south, 31st Street to the east, and the Francis Scott Key Bridge to the west. The Washington City Council granted the land to the NPS in the 1980s in conjunction with the Whitehurst Freeway rehabilitation project. The park project is currently being managed by the Rock Creek Park branch of NPS (Wheelock, May 10, 2002).

3.7 Cultural Resources

3.7.1 Regulatory Framework

Several federal laws and executive orders as well as District of Columbia regulations require that cultural resources that either are listed in the National Register of Historic Places or meet the eligibility criteria for listing in the National Register be identified, evaluated, and considered during federally-funded, -licensed, -permitted, or -approved undertakings. Federal and local statutes and regulations offering protection to cultural resources include:

- The National Historic Preservation Act (NHPA), as amended.
- The Historic Landmark and Historic District Protection Act (DC Law 2-144).
- Executive Order 11593, Protection and Enhancement of the Cultural Environment.
- The Archaeological Resources Protection Act (ARPA).
- The Native American Graves Protection and Repatriation Act (NAGPRA).
- The National Environmental Policy Act (NEPA).

For this project, NHPA and DC Law 2-144 are the most relevant regulations. However, as FHWA's compliance process progresses, other statutes and regulations may be triggered.

3.7.1.1 National Historic Preservation Act

Section 106 of NHPA (16 USC 470 *et seq.*) mandates that federal agencies take into account the effects of their actions on any district, site, building, structure, or object listed or eligible for listing in the National Register of Historic Places that may be present in the Area of Potential Effect (APE) established for the project. Section 106 also protects listed or eligible National Historic Landmarks (NHL). Federal regulations (36 CFR 65) define NHLs as cultural resources that are more than fifty years old and possess national significance in illustrating or interpreting the heritage of the United States in history, architecture, archaeology, and engineering, and that possess a high degree of integrity. Historic resources are designated NHLs by the NHL program of the NPS.

Implementing regulations for Section 106, issued by the Advisory Council on Historic Preservation (ACHP), are contained in 36 CFR Part 800, *Protection of Historic Properties*. These regulations provide specific criteria for assessing the effects of federally-funded, -licensed, -permitted, or -approved undertakings on historic properties, or of undertakings subject to local regulation administered pursuant to approval by a federal agency, as well as criteria identifying adverse effects on historic properties.

3.7.1.2 DC Law 2-144

DC Law 2-144 sets forth procedures for nominating prehistoric resources and historic buildings (including interiors), structures, monuments, works of art, objects, areas, places, sites, neighborhoods, networks, and cultural landscapes to the DC Inventory of Historic Sites. The DC inventory consists of historic resources originally included in the DC Landmarks List (created in 1964) combined with the catalog of DC properties listed in the National Register. As a result, criteria for designating properties as DC landmarks and historic districts are similar to the National Register criteria for historic significance and integrity. Proposed changes to locally-designated properties in

Washington must be reviewed and approved by the DC Historic Preservation Review Board. Federally funded projects are also reviewed by the DC SHPO in accordance with procedures set forth in Section 106 of NHPA.

3.7.1.3 Coordination with Other Federal Agencies

Because Washington is the nation's capital, federal agencies such as FHWA must adhere to additional regulations whose goal is to maintain the historic character and appearance of the city. These regulations are enforced by planning and design review agencies such as NCPC and CFA, which work closely together to guide development in the District and the surrounding region.

National Capital Planning Commission

NCPC was established by Congress in 1924 and provides overall planning guidance for federal land and buildings in the National Capital Region. Through its planning policies and review of development proposals, the commission seeks to protect and enhance the historical, cultural, and natural resources of the nation's capital. NCPC approves or denies the locations and designs of all federal buildings, museums, memorials, and monuments proposed in the District of Columbia.

In general, any project that would alter the exterior appearance of a building or site must be submitted for commission review. In its project review analysis, NCPC staff examine all submitted projects for their historic preservation implications and certifies to the commission that the Section 106 review has been satisfactorily completed. In the case of the proposed project, NCPC must review the project for compliance with the Comprehensive Plan, as well as with federal environmental and historic preservation laws, including NEPA and Section 106 of NHPA.

Commission of Fine Arts

Congress established the CFA in 1910. It is a federal design review agency, comprised of seven Presidential appointees, that provides expert advice on architecture, landscape architecture, and the related arts to the President, Congress, and federal and District of Columbia government agencies when such matters affect (1) construction on federal property in Washington and (2) private construction in Georgetown, in the monumental core of the city, and directly facing Rock Creek Park. In accordance with 40 USC 104, 36 Stat. 371, CFA must review all plans for new structures erected in Washington that affect the appearance of the city.

In accordance with Executive Order 1862 and the Shipstead-Luce Act (40 USC 121, 46 Stat. 366), CFA is also charged with overseeing the design of proposed public buildings within the boundaries of the District of Columbia and of semi-public and private buildings in the city's monumental core (areas bordering the Mall, White House, Judiciary Square, Lafayette Square, Rock Creek Park, the Capitol, and Union Station). As a result, the lead agency or applicants for any such projects must submit proposed building plans documenting the height, appearance, color, and texture of exterior materials to CFA for review. CFA then provides its recommendations, including any changes that may be necessary to prevent impairment of the city's appearance. Following reasonable compliance with recommended changes, CFA permits are issued for the project.

3.7.2 Area of Potential Effect

In consultation with the DC SHPO (Maloney, April 9, 2002), an APE was delineated encompassing an adequate geographic area to include all reasonable direct or indirect potential effects of the proposed project on known cultural resources. The APE is based on the Kennedy Center study area described in Subchapter 1.2. It is delineated conservatively to include all areas that are immediately adjacent to roads and highways that may be reconfigured. These areas include:

- **In the North Sector:** Rock Creek Parkway, Whitehurst Freeway, and Virginia Avenue approaches.
- **In the Center Sector:** E Street Expressway from the Kennedy Center to 20th Street, and the roads and ramps immediately surrounding the Kennedy Center.
- **In the South Sector:** Constitution Avenue, E Street Expressway, and Roosevelt Bridge interchange; Rock Creek Parkway, Potomac Freeway and Ohio Drive approaches north of the Lincoln Memorial.

For archaeological purposes, research focused particularly on those portions of the three sectors for which subsurface impacts are anticipated.

For architectural purposes, the L'Enfant Plan is included within the APE. However, the APE has not been delineated to include all scenic vistas and viewsheds that are attributes of the L'Enfant Plan, since that would result in an overly expansive APE that would extend far beyond the Kennedy Center and the areas where construction work would likely occur. Key vistas associated with the L'Enfant Plan in the study area are documented separately in Subchapter 3.8.

3.7.3 Known Archaeological Resources

For background purposes, a narrative overview of the prehistory and history of the study area is provided in Appendix C, Section C2. Both previously-identified archaeological resources and areas of archaeological potential were assessed for each sector. The following discussions concerning previously-identified archaeological resources are based on a review of relevant compliance documentation and personal communications. Areas of archaeological potential are based on a windshield survey of the entire project area and a reconnaissance walkover of the north and center sectors.

3.7.3.1 North Sector

Previously-Identified Archaeological Resources

In 1981, soil borings were collected in connection with plans to improve the access ramps of the Whitehurst Freeway. These soil borings were archaeologically considered and did not reveal substantial 20th-century construction impacts (DC Department of Consumer and Regulatory Affairs, 1984: A-18). The area was found to possess a high potential for archaeological remains. In 1984, DeLeuw, Cather, P.C. in association with Kresscox Associates, P.C. conducted a Phase 1 Documentary Study for the Whitehurst Freeway access improvement project. This study involved

extensive cartographic and archival research to identify potential archaeological resources as well as any past impacts to those resources. It concluded that the area had high potential for archaeological resources and recommended a Phase 2 subsurface testing program. Engineering Science conducted a Phase 2 testing program in two parts during 1991 and 1993. Field tests analyzed City Squares 1, 4, and 5 (the locations of historic city squares are shown in Appendix A, Figure 3.7-1). During 1996-1997, Engineering Science conducted Phase 3 excavations in Squares 1 and 5.

As a result of these surveys, six National Register-eligible archaeological sites have been identified in the North Sector in the vicinity of the Whitehurst Freeway within historic Squares 1, 4, and 5 (see Appendix A, Figure 3.7-2; historic City Squares are shown in Appendix A, Figure 3.7-1). The sites date to both prehistoric and historic times and were intact beneath varying depths of historic and modern fill deposits. Three of these National Register-eligible sites have been partially excavated as part of the Phase 3 archaeological survey. These sites are:

- The historic Peter House site, located southeast of the Whitehurst Freeway/27th Street intersection, between 27th Street and the Potomac Freeway, in historic City Square 5. Phase 3 excavations revealed 18th- and 19th-century foundation remains of the Thomas Peter house, and a multi-component Middle Archaic through Late Woodland period prehistoric site directly below.
- The Whitehurst West prehistoric site, located southwest of the Whitehurst Freeway/Rock Creek Parkway intersection, north of the overhead eastbound ramp connecting the Whitehurst Freeway to the southbound Potomac Freeway, in historic City Square 1. Phase 3 excavations recovered a Late Archaic through Middle Woodland period site.
- The Ramp 3 prehistoric site, located southwest of the Whitehurst Freeway/27th Street intersection, east of the northbound Rock Creek Parkway, north of the overhead eastbound ramp from the Whitehurst Freeway to the southbound Potomac Freeway, in historic City Square 1. Phase 3 excavations revealed a Middle to Late Woodland period site, which contained a Middle Woodland period cremation burial.

Three additional National Register-eligible sites have been identified and partially excavated during the Phase 2 archaeological surveys. These three sites, dating to the prehistoric and historic periods, are located in the North Sector, within historic City Squares 1 and 4. These sites are:

- The Cammack and Decker Lime Works, located between the Rock Creek Parkway and 27th Street, south of the overhead eastbound ramp connecting the Whitehurst Freeway to the southbound Potomac Freeway, in the southern portion of historic City Square 1. This National Register-eligible historic resource dating to the mid-19th century was located during prior Phase 1 archaeological survey work. Brick elements relating to the lime kiln's fire box walls, arched door opening, and floor were encountered. Wall segments of Seneca, Maryland red sandstone and wooden lime barrels were also encountered during archaeological testing.
- The Hayman Brewery/Arlington Bottling Company site is located just northeast of the Whitehurst Freeway/27th Street intersection, within historic City Square 4. This National Register-eligible historic site was located during prior archaeological surveys. Red brick elements were encountered at less than four feet below grade, including the top of a

large vault and associated wall segments. The location is that of the ca. 1827 Hayman Brewery, in turn the ca. 1864 Washington Brewery, then the ca. 1873 Arlington Brewery, and finally the Arlington Bottling Company, which was demolished in 1949.

- An unnamed Prehistoric Site, located to the northeast of the brewery site, northeast of the Whitehurst Freeway/27th Street intersection, near the overhead ramp connecting the Potomac Freeway to the westbound Whitehurst Freeway, within historic City Square 4. This National Register-Eligible prehistoric site, located during prior archaeological surveys, dates to the Woodland Period.

The locations of these sites are shown in Appendix A, Figure 3.7-2 (Known and Potential Archaeological Resources).

Areas of Archaeological Potential

The area adjacent to the intersection of Whitehurst Freeway/K Street and 27th Street – Squares 1, 4, and 5, and areas west and north of Square 4 – possesses high potential for the presence of additional intact archaeological resources (Appendix A, Figure 3.7-2). This conclusion is based on the fact that prior fieldwork encountered intact resources beneath modern fill deposits (Crowell, July 23, 2003). Both prehistoric and historic archaeological remains are anticipated to be present. Additionally, the area along the east bank of Rock Creek from I to G Streets (portions of Squares 2 and 3) is considered to possess high archaeological potential due to the age of historic land filling in this area. These areas of archaeological potential are approximate and are not based on field tests. Square- and lot-specific archival and documentary research and, if necessary, field testing, would be required to refine this assessment.

3.7.3.2 Center Sector

Previously-Identified Archaeological Resources

There are no known archaeological resources located in the Center Sector. *The Theodore Roosevelt Memorial Bridge Study, Draft Existing Conditions Report* states that there is a moderate to high potential for the presence of archaeological sites on the Washington, DC shoreline dating to both the prehistoric and historic periods.

Areas of Archaeological Potential

A portion of the area immediately east of the north side of the Kennedy Center possesses low to moderate potential for the presence of intact archaeological resources (Appendix A, Figure 3.7-2). This portion of the project area is located in the general vicinity of the intersection of New Hampshire Avenue and F Street, historically the site of 19th-century and possibly late 18th-century structures and businesses, on historic Square 20. The presence of several large-diameter trees on the north side of the street suggests that the historic grade of F Street, from its intersection with New Hampshire Avenue eastward towards the Potomac Freeway, appears to be intact. The grassy areas immediately east and west of the existing underground access tunnel and ramp, on the south side of F Street, also appear to reflect an historic grade. A small number of large-diameter deciduous trees are located in these two areas, and the grade rises slightly to the south. The area immediately west of

the access ramp contains a recently-installed asphalt pedestrian walkway, picnic tables, and flowerbeds.

This area of archaeological potential is considered approximate and is based solely on a walkover survey; no subsurface testing has been conducted in this area. Additional Square 20, lot-specific archival and documentary research as well as subsurface testing would be required to refine this assessment.

Eastward along F Street, the grade rises slightly until the Potomac Freeway blocks access. At this location, which is the former intersection of F and 25th Streets, the Potomac Freeway lies in a wide cut, far below historic grade. Visual inspection of the grassy median and embankment areas of the Freeway, from the line of F Street on the north to the elevated approach to the Roosevelt Bridge on the south, indicates that construction of the Freeway entailed much downcutting of the original grade, and has, in all likelihood, already adversely impacted any potential archaeological resources. This area, comprised of portions of historic Squares 21 and 22, is considered to have no archaeological potential.

Construction of the E Street Expressway from 25th Street to 20th Street involved grading to a depth of up to 50 feet below the early 20th-century street grid, and included taking part of the high ground of Reservation 4, thereby precluding the presence of any archaeological deposits. This area is considered to have no archaeological potential. As a result of both historic and modern disturbances, the area immediately west of the Kennedy Center is also not considered archaeologically sensitive .

3.7.3.3 South Sector

There are no previously-identified archaeological resources in this sector. There is no potential for encountering intact archaeological remains in this sector. The entire area is within reclaimed land dating from the 1882-1891 dredging operations.

3.7.4 Known Architectural Resources

For background purposes, a narrative overview of the history of the study area is provided in Appendix C, Section C2.2. A review of the files at the DCOP, Historic Preservation Division, indicates that 16 historic architectural resources have been identified in the APE. These resources are listed below in Table 3.7-1 and are featured in Appendix A, Figure 3.7-3 (Known Architectural Resources). Site numbers in Appendix A, Figure 3.7-3 are keyed to resource numbers in Table 3.7-1 (the L'Enfant plan is not numbered, but is highlighted in blue on the map). The sixteen historic resources in Table 3.7-1 can be divided into five categories, according to their designation status:

- **Category A:** Two resources are National Register-listed, National Historic Landmarks, and DC landmarks.
- **Category B:** One resource is National Register-listed, a DC landmark, and a National Historical Park.
- **Category C:** Seven resources are National Register-listed and DC Landmarks.

- **Category D:** Three resources are National Register-eligible.
- **Category E:** Three resources are DC Landmarks.

Brief descriptions of these resources according to category are provided below.

3.7.4.1 Category A Resources

Georgetown Historic District (Resource No. 1): Bounded by Reservoir Road and Dumbarton Oaks Park on the north, Rock Creek Park on the east, Potomac River on the south, and the Glover-Archbold Parkway on the west, the Georgetown Historic District consists of approximately 4,000 primary buildings constructed between c. 1765-1940. The district has a rich variety of residential, commercial, and industrial buildings in a range of styles including Federal, Greek Revival, Italianate, Queen Anne, Romanesque, Classical Revival, and other vernacular examples. The district is located just outside of the Kennedy Center APE, west of the Rock Creek Parkway.

Old Naval Observatory (Resource No. 8a): The US Navy constructed the Old Naval Observatory (Building 2) in 1843. It is located at 23rd and E Streets in Reservation 4 of the L'Enfant Plan. From 1843 to 1893 the structure housed the Naval Observatory, site of important advancements in astronomy, navigation, and oceanography.

3.7.4.2 Category B Resource

Chesapeake & Ohio Canal Historic District (Resource No. 2): Spanning approximately 184.5 miles between Washington, DC and Cumberland, MD, the C&O Canal was built between 1828 and 1850. Active until 1924, the canal was acquired by the US government in the 1930s. It was designated a National Historical Park in 1971. The C&O Canal is eligible under National Register criteria A and C for the role it played in commerce and transportation (1828-1924) and as a well-preserved example of 19th-century canal-building technologies. A small portion of the canal is located in the APE, including remnants of the tide lock and dam at the confluence of Rock Creek and the Potomac River in Georgetown.

3.7.4.3 Category C Resources

Foggy Bottom Historic District (Resource No. 4): Bounded by K Street to the north, H Street to the south, 24th Street to the east, and 26th Street to the west, the Foggy Bottom Historic District consists of approximately 135 contributing resources occupying part or all of five city squares in the Foggy Bottom neighborhood. The district primarily consists of 19th-century urban vernacular worker housing, including freestanding single homes and row houses. The district is eligible under criteria A and C (1860-1915) and survives as an intact example of a 19th-century residential neighborhood in Washington.

Godey's Lime Kilns (Resource No. 5): Located at Rock Creek and Potomac Parkway and 27th and L Streets, the c. 1864 lime kilns survive as remnants of a prominent Georgetown lime manufacturing facility. The remnants consist of 16- to 18-foot-high stone walls with brick, arched openings for lime processing. The kilns are on a site dominated by two access ramps to the Whitehurst Freeway located above the structure.

**Table 3.7-1
Known Architectural Resources in the APE**

No.	Resource	Designation Status
1	Georgetown Historic District	District of Columbia Landmark (1964) National Register-listed (1967) National Historic Landmark (1967)
2	Chesapeake & Ohio Canal Historic District	District of Columbia Landmark (1964) National Register-listed (1966) National Historic Park (1971)
3	Rock Creek and Potomac Parkway	District of Columbia Landmark (1964) National Register-listed (pending, 2002)
4	Foggy Bottom Historic District	District of Columbia Landmark (1986) National Register-listed (1987)
5	Godey's Lime Kilns	District of Columbia Landmark (1973) National Register-listed (1973)
6	Sweeney Plowman Houses (Cooper Houses)	District of Columbia Landmark (1984)
7	American Red Cross DC Section House	District of Columbia Landmark (1996)
8a	Old Naval Observatory (Building 2)	District of Columbia Landmark (1964) National Register-listed (1966) National Historic Landmark (1965)
8b	Potomac Annex Historic District, including Old Naval Observatory (Building 2)	National Register-eligible
9	2430 E Street Buildings	National Register-eligible
10	American Institute of Pharmacy	District of Columbia Landmark (1977) National Register-listed (1977)
11	Northwest Rectangle Historic District	National Register-eligible
12	West Potomac Park Historic District	District of Columbia Landmark (1964) National Register-listed (1973)
13	Lincoln Memorial and Statue of Lincoln	District of Columbia Landmark (1964) National Register-listed (1966) (<i>Contributes to West Potomac Park Historic District</i>)
14a	Arlington Memorial Bridge	District of Columbia Landmark (1964) National Register-listed (1980)
14b	Arlington Memorial Bridge Watergate	District of Columbia Landmark (1964) National Register-listed (1980)
14c	Arlington Memorial Bridge Terminus of Rock Creek and Potomac Parkway	District of Columbia Landmark (1964) National Register-listed (1980)
15	Theodore Roosevelt Island	District of Columbia Landmark (1964) National Register-listed (1966) National Monument
N/A	L'Enfant Plan	District of Columbia Landmark (1964-97) National Register-listed (1997)

American Institute of Pharmacy (Resource No. 10): Located at 2215 Constitution Avenue, the American Institute of Pharmacy was built in 1932 (John Russell Pope, architect). The Neo-Classical style building exemplifies the ideals of the McMillan Plan and the City Beautiful Movement, and functions as a key element in the frame for the Lincoln Memorial. The symmetrical, temple-like building blends well into its historically important surroundings north of the Lincoln Memorial. It is eligible under criteria A, B, and C for its historic and architectural importance and association with John Russell Pope.

West Potomac Park Historic District (Resource No. 12): This historic district is a park of approximately 400 acres, bounded to the north by Constitution Avenue, to the east by 17th Street and the Tidal Basin, to the south by the Potomac Railroad Bridge, and to the west by the Potomac River. West Potomac Park forms part of a collection of national park lands around the District, and along with East Potomac Park, comprises a large portion of the monumental core of the city. Contributing resources include the Lincoln Memorial and associated grounds (Lincoln Memorial Circle, Reflecting Pool, Rainbow Pool, Elm Walks), Tidal Basin, seawalls flanking the Tidal Basin, Memorial Bridge, Jefferson Memorial and associated grounds, and other resources erected during the District's period of significance from 1882 to 1997.

Lincoln Memorial and Statue of Lincoln (Resource No. 13): Located at the south terminus of 23rd Street in West Potomac Park, the Lincoln Memorial is a Greek-style temple housing a monumental statue of President Abraham Lincoln. The McMillan Plan of 1901-02 reserved the site as the location of a major monument. By putting the Lincoln Memorial in the newly-reclaimed marshlands of West Potomac Park, thus extending the monumental core of the Mall westward, the plan sought to restore L'Enfant's 1791 plan for the District of Columbia. Henry Bacon (1866-1942) designed the building and noted American sculptor Daniel Chester French (1850-1931) designed the Lincoln statue.

Memorial Bridge (Resource No. 14 a,b,c): Memorial Bridge extends across the Potomac River, joining the Lincoln Memorial Circle and Columbia Plaza on Columbia Island with Arlington House in Arlington, Virginia. The nine-span, reinforced concrete, granite-faced, Neo-Classical-style bridge is over 2,000 feet long, with a central bascule draw span that no longer functions. Other elements of the bridge include the Watergate Steps, the terminus of Rock Creek Parkway, Columbia Plaza, Boundary Channel Bridge, Memorial Avenue, and the Arlington Hemicycle. The Watergate Steps, a broad flight of steps curved in an arc concentric with the granite wall at the river's edge and the Parkway terminus are located in the APE. The parkway terminus, a balustraded river wall that extends northwestward along the riverbank to terminate at the west end of Constitution Avenue, was isolated from Constitution Avenue during the construction of the Roosevelt Bridge in 1959. Four sculptures located at the eastern terminus of the bridge are also within the APE. The bridge complex is important as a major element in the Neo-Classical urban design of the national capital as it evolved during the early 20th century.

Theodore Roosevelt Island (Resource No. 15): Located in the Potomac River between Georgetown and Arlington, Virginia, the island's legal boundaries include Swan Island lying to the south. The 91-acre island includes contributing prehistoric (Native American) and historic archaeological sites. Historic sites date from multiple periods, including 1717 to 1833, and the Civil War (1861-1865) and post-Civil War (1865-1931) periods. In 1932, the island was given to NPS and during the 1960s a memorial was built there to honor President Theodore Roosevelt. The Roosevelt Bridge (I-66) passes above the south tip of the island and does not contribute to the island's historic significance.

L'Enfant Plan of the City of Washington, DC: Pierre Charles L'Enfant designed the L'Enfant Plan of the City of Washington, DC in 1791. The plan was mapped in 1792 and remains largely in place today. Throughout the 19th century, the city was developed largely according to the L'Enfant Plan. In 1901-02, the McMillan Commission recommended physical improvements in accordance with the L'Enfant Plan. These improvements were implemented during the first three decades of the 20th century and continued sporadically thereafter. In 1997, the L'Enfant Plan, with modifications

made in accordance with the McMillan Plan, was listed in the National Register under criteria A, B, and C for its historic importance, association with important individuals, and its architectural importance from 1791 to 1942. The nominated area encompasses 3,565 acres and contributing streets, avenues, bridges, large and small parks within the historic city, including numbered reservations designated by the Office of Public Buildings and Grounds in 1894. Within the APE, contributing elements to the plan include only those elements under the jurisdiction of NPS; these are described in Table 3.7-2.

**Table 3.7-2
Contributing Resources to the L'Enfant Plan**

Contributing Resource	Characteristics of Resource within APE
Reservations	
Reservation No. 4: US Navy Bureau of Medicine & Surgery	12.5-acre site at 23 rd and E Streets. Includes Old Naval Observatory and surrounding National Register-eligible buildings.
Reservation No. 332: West Potomac Park	Small portion of the approximately 400-acre park, including Lincoln Memorial and associated features, amongst other monuments of national importance. Forms part of monumental core of city.
Avenues and Streets	
New Hampshire Avenue	Portion of 1.9-mi avenue extending from the Kennedy Center to the intersection of W Street and Florida Avenue, including Washington Circle and associated parks with US reservation markers.
Pennsylvania Avenue	Portion of a 4.3-mi avenue extending from Rock Creek in NW to Anacostia River in SE, including Washington Circle and associated parks.
Virginia Avenue	Portion of 1.6-mi avenue extending from Rock Creek & Potomac Parkway to Constitution Avenue. Includes Reservation No. 134 (Juarez Circle) and Reservation No. 720 (Gálvez statue).
Constitution Avenue	Portion of 4.2-mi avenue from 23 rd Street, NW, to 21 st Street, NE. Avenue originally terminated at Rock Creek and Potomac Parkway terminus associated with National Register-listed Arlington Memorial Bridge.
C Street	Portion of a 0.9-mi part of C Street from 23 rd to 17 th Street.
E Street	Portion of a 2.3-mi section from 23 rd Street to North Capitol Street, with interruptions.
F Street	Portion of a 1.9-mi section from 23 rd Street to North Capitol Street.
G Street	Portion of a 1.9-mi section from Virginia Avenue to North Capitol Street.
H Street	Portion of a 1.9-mi section from New Hampshire Avenue to North Capitol Street.
I Street	Portion of a 2.25-mi section from the Whitehurst Freeway to North Capitol Street with jogs at 20 th Street.
K Street	Portion of 3.5-mi street between Rock Creek in NW and Florida Avenue, NE, including seven minor parks.
L Street	Portion of a 2.35-mile street from 26 th Street to North Capitol Street.
20 th Street	Portion of 1.62-mile street from Constitution Avenue to Florida Avenue.
21 st Street	Portion of 1.57-mile street from Constitution Avenue to Florida Avenue.
22 nd Street	Portion of 1.2-mile street from Constitution Avenue to Florida Avenue.
23 rd Street	Portion of 1.35-mile street from the Lincoln Memorial Circle to P Street, with interruptions.
24 th Street	Portion of 0.65-mile street from G to N Streets.
25 th Street	Portion of 0.55-mile street from Virginia Avenue to N Street.
26 th Street	Part of 0.3-mile street from I to M Streets.
Structures	
Memorial Bridge	Structure extending over Potomac River between Lincoln Memorial and Columbia Island and Arlington National Cemetery.
Vistas*	
Primary Vistas	US Capitol along the Mall to the Lincoln Memorial.
Vistas Along Radiating Avenues	Oblique views of major buildings indicating their orientation in the plan, and between monuments and parks along Pennsylvania (US Capitol; White House), New Hampshire (various parks), and Virginia Avenues (Washington Monument).

Contributing Resource	Characteristics of Resource within APE
Vistas Along Orthogonal Avenues	Frontal views of major buildings and flanking or connecting major parks on axis, including K Street (various parks) and Constitution Avenue (Capitol Grounds, National Mall, Potomac Parks).*
Tangential Vistas	Providing views of major buildings marking the location of cross-axes, including E Street (Judiciary Square).
Axial Street Vistas	23 rd Street (Washington Circle to Lincoln Memorial).
* Notes: Vistas are considered attributes of streets and are not enumerated as contributing resources to the L'Enfant Plan. Within the APE, obstructed vistas include Interstate 66 ramps at Constitution Avenue. Source: Leach & Barthold, 1994.	

3.7.4.4 Category D Resources

Potomac Annex Historic District (Resource No. 8b): Located at 23rd and E Streets in Reservation 4 of the L'Enfant Plan, the National Register-eligible Potomac Annex Historic District consists of seven buildings occupied by the US Navy Bureau of Medicine & Surgery. The National Register-listed and NHL Old Naval Observatory anchor the district. Building 1 and Buildings 3-7 of the Historic District were constructed between 1906 and 1926, when the parcel was taken over by the medical branch of the US Navy. A Naval Hospital was subsequently built at the site. By the 1930s, it housed the first National Naval Medical Center.

2430 E Street (Resource No. 9): The Center, East, and South buildings are located at 23rd and E Streets on the west edge of Reservation 4 of the L'Enfant Plan. The brick, limestone, and slate buildings were constructed between 1900 and 1930 and are good examples of Neo-Classical Revival and Renaissance Revival-style architecture. The South Building is a four-story, H-shaped, limestone-clad building; the East Building is located between the South and Center buildings and is a two-story, rectangular-shaped, limestone-clad building. The brick Center Building is three-storied and U-shaped. According to the General Services Administration (GSA), which acts as property manager for the three buildings, they are National Register-eligible. The buildings are currently leased to the State Department.

Northwest Rectangle Historic District (Resource No. 11): Bounded by E Street to the north, Constitution Avenue to the south, 17th Street to the east and 23rd Street to the west, the Northwest Rectangle Historic District is eligible National Register Criteria A and C for its historic and architectural importance from 1891 to 1963. The rectangle was marked in the L'Enfant Plan of 1791 as the future site of a grouping of buildings. During an 80-year period that started with the first unofficial construction in 1891, the rectangle developed as a monumental district, with semi-public and institutional buildings framing the Ellipse. By the mid-1920s, the neighborhood had developed along Constitution Avenue, framing West Potomac Park and the Lincoln Memorial. Contributing resources within the APE include the State Department and the American Institute of Pharmacy building. The contributing National Academy of Sciences building stands east of the APE boundary.

3.7.4.5 Category E Resources

Sweeney Plowman Houses (Cooper Houses) (Resource No. 6): Located at 2521 and 2523 K Street, the Cooper Houses are two of the oldest documented houses in Foggy Bottom. The first Cooper House, at 2521 K Street, was built c. 1843 and updated when 2523 K Street was constructed in 1868. The buildings form a cohesive unit of intact 19th-century urban vernacular architecture.

American Red Cross DC Section House (Resource No. 7): Located at 2025 E Street, the American Red Cross DC Section House was built between 1950 and 1952. It was decorated with sculptural reliefs by Edmond Romulus Amateis, a nationally renowned sculptor. The building was considered to be of significance because of its association with Otto R. Eggers, an architect who contributed to the design of the National Archives, National Gallery of Art, and Jefferson Memorial, and also because it survived as an excellent example of Neo-Classical architecture in the District. The building has recently undergone extensive reconstruction.

Rock Creek and Potomac Parkway (Resource No. 3): Extending between the Theodore Roosevelt Memorial Bridge and the tunnel entrance at the National Zoo along the Potomac River and Rock Creek, the Rock Creek and Potomac Parkway is a 2.5-mile road that traverses 174.23 acres in Reservation 360. According to the NPS, a National Register of Historic Places nomination is currently being prepared for the parkway (Wheelock, May 10, 2002). The parkway is of significance for its association with the McMillan Plan and with Frederick Law Olmsted, Jr., and for its status as a natural resource in a major metropolitan area. Historic resources associated with the parkway within and adjacent to the APE include the Higgins (Watergate Exxon) Service Station at 2708 Virginia Avenue (1932), the K Street Bridge (1939-41; 1947-49), the Pennsylvania Avenue Bridge (1915-16), the M Street Bridge (1929-30) over the parkway, and the seawall flanking the western edge of the parkway between the confluence of Rock Creek and the Potomac River and West Potomac Park.

3.8 Aesthetics and Viewsheds

3.8.1 Area of Visual Influence

The area of visual influence (AVI) for the proposed project (Appendix A, Figure 3.8-1, Area of Visual Influence) is defined so as to encompass the main locations from which the study area can be seen. The AVI provides the basis for evaluating impacts to the visual environment that may arise from the proposed project. Buildings, monuments, and walls, together with natural topography, trees, and other vegetation, control view corridors within the AVI.

3.8.2 Streetscapes and the Plan for the District of Columbia

The L'Enfant Plan of 1791 aimed to create majestic vistas throughout the city that would reflect the power and grandeur of the nation. Using the natural topography of the District, L'Enfant envisioned grand axial boulevards terminating with monumental public buildings at points of topographical importance. The McMillan Plan of 1901-02 reaffirmed this vision. It reinforced and expanded the National Mall and created a system of parks along the shorelines of the Potomac and Anacostia Rivers. Both the L'Enfant and McMillan plans still serve as a blueprint for the development of Washington and a source of guidance for agencies regulating new development.

An important component of the AVI for this project is the series of streetscapes and vistas that either incorporate or originate from one element or another of the study area. A streetscape is an urban landscape. It is comprised of the visual elements along a street, including the roadways,

sidewalks, building styles and masses, and any street improvements, such as trees, lightposts, and street furniture. Streetscapes are dynamic places, animated by the pedestrians and vehicles using them. They must be taken into consideration when establishing a hierarchy of streets and sidewalks that is efficient and visually coherent, enhances the pedestrian environment, and provides for the orderly movement of goods and services.

In urban areas, views or vistas typically take the form of narrow visual corridors down a street and are defined by the buildings and other elements lining the roadway. Within the context of the L'Enfant plan and its intentions, vistas down the radiating avenues and the grid streets are particularly important.

3.8.3 General Visual Characteristics of the Study Area

3.8.3.1 North Sector

The North Sector includes the Potomac Freeway Corridor from just north of the Whitehurst Freeway/K Street corridor south to Juarez Circle. Included are the ramps that connect the Potomac Freeway, K Street, the Whitehurst Freeway, the Rock Creek Parkway, Virginia Avenue, and 27th Street. Bridge and ramp abutments define the character of the north end of the North Sector (Appendix A, Photo 3.8-1). The ashlar-patterned, granite-faced ramps and abutments of the Whitehurst Freeway/K Street grade transition, and the Pennsylvania Avenue Bridge over the Rock Creek Parkway contribute to the quality of the visual environment. In this area, the Potomac Freeway follows the landform and runs parallel to the parkway. Grassy expanses dotted with mature trees surround the roadway corridor, creating a park-like atmosphere.

The Potomac Freeway corridor becomes more obviously urban as the road moves south toward the tunnel below Juarez Circle (Appendix A, Photo 3.8-2). The road corridor is enclosed by the ashlar-patterned, granite-faced retaining walls that define the edge of the roadway. Visible above the walls to the east is the Foggy Bottom Historic District. Visible above the walls to the west are some of the larger buildings along the Virginia Avenue Corridor, including the Watergate complex and George Washington University's Hall on Virginia Avenue. The Kennedy Center is generally not visible from most points of the North Sector.

3.8.3.2 Center Sector

For this discussion, the Center Sector of the study area can be divided into three segments:

- West of the Kennedy Center.
- East of the Kennedy Center.
- The E Street/E Street Expressway Corridor.

West of the Kennedy Center is the narrow corridor of the Rock Creek Parkway, visually defined by the Watergate complex and the Kennedy Center to the east. From the center, wide panoramic views of the Potomac River, the Georgetown waterfront, Theodore Roosevelt Island, and the Roosevelt Bridge are available. The Rock Creek Parkway passes below the west terrace of the Kennedy Center, creating a partial tunnel effect (Appendix A, Photo 3.8-3). The Parkway is roughly 90 feet wide in

this sector, with approximately 50 feet devoted to the paved parkway and 40 feet devoted to parkland adjacent to the Potomac River. A 12-foot pedestrian path is a popular route along the river for bikers, rollerbladers, joggers, and walkers. The parkway corridor widens at the level of the Watergate complex, whose elements are set back roughly 100 feet from the edge of the roadway (Appendix A, Photo 3.8-4).

The area east of the Kennedy Center is one of the more visually confusing, least aesthetically appealing portions of the study area. However, the Potomac Freeway visually connects Virginia Avenue to the Potomac River, especially from the sidewalks of 25th Street and Columbia Plaza's frontage driveway. This segment of the Center Sector is defined by the Potomac Freeway corridor from the Juarez Circle tunnel to the north down to roughly C Street to the south. Construction of the Potomac Freeway required removing large amounts of soil, so that the freeway runs at the bottom of a sort of artificial valley between the Kennedy Center to the west, and Columbia Plaza and the Potomac Naval Annex to the east (Appendix A, Photo 3.8-5). Throughout this valley, the dominant visual elements are the massive ashlar-patterned granite walls retaining Columbia Plaza and the Potomac Naval Annex. Other important elements are the access ramps leading to the E Street Expressway. In general, the corridor offers a harsh visual environment and does not create an appropriate setting for the entrance of the Kennedy Center (Appendix A, Photo 3.8-6).

The E Street/E Street Expressway corridor runs from the area where the expressway ramps merge with the Potomac Freeway eastward to 20th Street, where the expressway ends and merges with surface traffic on E Street. The visual character of the corridor is varied. Between the Potomac Freeway and 23rd Street, the expressway looks very much like the nearby freeway and is visually dominated by the ashlar-patterned granite walls retaining Columbia Plaza and the Potomac Naval Annex (Appendix A, Photo 3.8-7). The walls adjacent to the Potomac Naval Annex reach a height of 30 feet in certain places.

A variety of visual environments exists between 23rd and 20th Streets. The corridor in this segment is roughly 320 feet wide between building faces. On the north side, the surface segment of E Street is visible, with a typical urban District sidewalk and building façades (Appendix A, Photo 3.8-8). The expressway runs roughly 20 feet below the surface street, from which it is separated by a retaining wall. South of the expressway is the State Department complex, separated from the roadway by roughly 190 feet of land featuring retaining walls, access ramps to and from the expressway to E Street and Virginia Avenue, and moderately-sloping segments of lawn and trees. The E Street Expressway enters a tunnel as it approaches Virginia Avenue and emerges from the tunnel east of 21st Street. Between 21st Street and 20th Street, the expressway ramps up the depressed tunnel to 20th Street within the park-like setting of President's Park, defined by gently sloping panels of lawn with mature shade trees (Appendix A, Photo 3.8-9).

3.8.3.3 South Sector

Traveling south from the Center Sector, the study area opens up in the South Sector to segments of West Potomac Park. This sector includes stretches of the Rock Creek Parkway and Ohio Drive that pleasantly follow the topography of the land and are surrounded by recreational fields, monuments, and expanses of lawn and tree groves (Appendix A, Photo 3.8-10). However, the numerous ramps and abutments connecting the Roosevelt Bridge to Constitution Avenue, the Rock Creek Parkway, the E Street Expressway, and the Potomac Freeway detract from the visual character of the sector

(Appendix A, Photo 3.8-11). The Kennedy Center is partially visible from many points of the South Sector. Views vary with the seasons and are more expansive in the winter, when trees are bare.

3.8.4 Study Viewsheds

This subchapter discusses more specifically the 18 viewsheds that were selected for visual analysis in this EA. Figure 3.8-2 in Appendix A shows the origin point and direction of each viewshed. Photos of the selected viewsheds are included in Subchapter 4.8 and are not repeated here.

3.8.4.1 E Street Corridor and Potomac Freeway (Viewshed #1)

The Kennedy Center is located in the Center Sector of the study area, nearly on-axis with E Street. Because of its prominent location, the Center is visible westbound on E Street and E Street is clearly visible from the lower and upper terraces of the Center. Views from the upper east terrace also overlook the Potomac Freeway and the ramps that carry vehicular traffic to the E Street Expressway. Views of the Potomac Naval Annex are also of interest because the site is a historic resource (see Subchapter 3.7.5).

3.8.4.2 Columbia Plaza Frontage Drive (Viewshed #2)

The view is to the east along the axis of E Street. Pedestrians walking along this portion of the street overlook the E Street Expressway, with the associated visual distraction and noise of its high-speed traffic. There is little streetscape improvement in this area to mitigate these effects on the pedestrian environment. This view was selected because one objective of the proposed action is to improve access, including pedestrian access, from the east.

3.8.4.3 Lincoln Memorial, Potomac Freeway, and Roosevelt Bridge Approaches (Viewshed #3)

The roof terrace of the Center offers one of the area's highest vantage points over the Washington skyline. This view was selected because it includes major landmarks such as the Lincoln Memorial, Lincoln Circle, West Potomac Park, and Memorial Bridge.

3.8.4.4 Rock Creek Parkway Passing beneath the Kennedy Center River Terrace (Viewshed #4)

In addition to being a major commuting route, the Rock Creek Parkway corridor is extensively used for recreational purposes. In the Center Sector of the study, the parkway offers wide, panoramic views of the Potomac River, Georgetown waterfront, and Roosevelt Island. The provision of pedestrian access from the riverfront to the Kennedy Center has the potential to affect these views.

3.8.4.5 Georgetown Historic District (Viewshed #5)

A dramatic, sweeping view down the Potomac River from the Georgetown Waterfront terminates on the river terrace of the Kennedy Center. This panorama is visible from much of the Georgetown waterfront beyond Rock Creek, including Thompson's Boathouse, the boardwalk of the Washington

Harbour, waterfront buildings with southeasterly facing windows, and the riverfront parkland along K Street. The provision of pedestrian access from the riverfront to the Kennedy Center has the potential to affect these views.

3.8.4.6 Potomac Freeway Corridor and Virginia Avenue Streetscape (Viewshed #6)

Bounded by Columbia Plaza on the left and the Saudi Arabian Embassy on the right, views of the Potomac Freeway dominate the open space visible from Virginia Avenue. This section of Foggy Bottom suffered a major intrusion by the Potomac Freeway. Access improvements to the Kennedy Center have the potential to substantially affect this view.

3.8.4.7 Watergate Complex (Viewshed #7)

The Watergate Office Building entrance at 600 New Hampshire Avenue is a major source of pedestrian traffic throughout the day. Because the entry is a few feet above street level, users have a commanding view of the F Street and New Hampshire Avenue intersection, and of the Kennedy Center beyond. The proposed action has the potential to substantially affect this view.

3.8.4.8 25th and F Streets Intersection (Viewshed #8)

Phase 1 of the Kennedy Center Garage Expansion and Site Modification Project relocated the Center's main entry approach to 25th Street. The approach will be improved further when the Garage Expansion and Site Improvement project is completed. As the principal approach to the Center from Virginia Avenue and the Foggy Bottom neighborhood, and a connection between the Kennedy Center and the historic street grid, it has the potential to be substantially affected by the proposed action.

3.8.4.9 Southbound Potomac Freeway at Juarez Tunnel (Viewshed #9)

After emerging from the southbound lane of the Juarez Circle tunnel, drivers have a view of the ramp connections with the E Street Expressway. Twin bridges block the views to the south and the highway's visual character quickly changes to a semi-urban setting with mass shrub plantings and turfgrass side slopes. Rock-faced walls also characterize this alignment, which was excavated from the original street grades. The proposed action has the potential to affect this view substantially.

3.8.4.10 East Approach to the Kennedy Center from E Street (Viewshed #10)

This view, taken from the 23rd Street overpass toward the Kennedy Center's east facade, is possibly the principal example of how roadways affect the Kennedy Center's setting and cut the Center off from the urban fabric of the District. From this point, there is no obvious route to the Center. This view was selected because it has the potential to be substantially affected by the proposed action.

3.8.4.11 Potomac Naval Annex Historic District to the Northwest (Viewshed #11)

The Potomac Naval Annex Historic District sits prominently on a hill above the Center Sector of the study area. Large granite walls retain the site and form the border with the E Street Expressway, the Roosevelt Bridge westbound approach, and the Potomac Freeway toward the northwest. The

view extends across the roadways toward the Saudi Arabian Embassy, the Watergate, and the Kennedy Center. Though access to the site is restricted to Naval personnel and visitors, this view from a historic resource is important and has the potential to be substantially affected by the proposed action.

3.8.4.12 Potomac Naval Annex Historic District to the West (Viewshed #12)

Westward views from the site described above also have the potential to be substantially affected by the proposed action. Toward the west, the Potomac Freeway, Kennedy Center south terrace, Potomac River, and Roosevelt Bridge are visible.

3.8.4.13 Roosevelt Bridge Approach from Constitution Avenue (Viewshed #13)

The Roosevelt Bridge is a major element in the District's transportation network. For traffic heading west from Constitution Avenue, this view is prominent as one crosses over the Potomac Freeway. The approach road is elevated as it passes the Potomac Naval Annex. The ramp offers a partial view of the Kennedy Center that has the potential to be substantially affected by the proposed action.

3.8.4.14 Lincoln Circle (Viewshed #14)

Although limited when trees are in leaf, this view from Lincoln Circle offers glimpses of the Kennedy Center roof terrace. With West Potomac Park in the foreground, the view also shows the Potomac Naval Annex. Pedestrians at the Lincoln Memorial may enjoy that view, but it is mostly afforded to drivers on their way to Memorial Bridge. Because of the historic status of Lincoln Circle and West Potomac Park, any action affecting this view could potentially affect the integrity of these resources as well.

3.8.4.15 West Potomac Park (Viewshed #15)

In this view from the east sidewalk of Rock Creek Parkway as it descends from Lincoln Circle toward the Belvedere, upper portions of the Kennedy Center and the Potomac Naval Annex are visible in winter, though filtered through the branches of many trees. In the foreground are volleyball pits and open lawn areas. The view is important because of the historic status of West Potomac Park. Views of the Kennedy Center also exist from the Watergate Steps, Memorial Bridge, and the Belvedere. However, these views are partially obscured by the Roosevelt Bridge.

3.8.4.16 Potomac Freeway in the South Sector (Viewshed #16)

The visual character of the South Sector of the study area looking north is dominated by bridge ramps over and across the Potomac Freeway. The Constitution Avenue approaches are clearly visible in the foreground of this view. The bridge materials and design standards are more typical of a parkway than an interstate freeway. However, the spans are massive. This view has the potential to be substantially affected by the proposed action.

3.8.4.17 Roosevelt Bridge East Abutment (Viewshed #17)

Pedestrians and bicyclists using the north Roosevelt Bridge walkway can see the south terrace of the Kennedy Center, presently under construction. When completed, this area will be heavily planted to screen parked buses. Only glimpses of the Potomac Freeway are visible. The proposed action has the potential to substantially affect this view.

3.8.4.18 Roosevelt Island and Roosevelt Bridge (Viewshed #18)

Roosevelt Island is located directly west of the Kennedy Center in the Potomac River. Nature trails traverse the island, including the Swamp Trail along the east shoreline. From certain points of this trail, the Washington shore of the Potomac and the Kennedy Center are visible. However, relatively few pedestrians use this trail. More commonly used is the north walkway of Roosevelt Bridge, which affords a panoramic view of the Center from the Roosevelt Island end of the bridge. This vista shows the broad Potomac River valley and the Potomac Naval Annex, which rises to a commanding height above the river. The proposed action has the potential to affect this view.

3.9 Socioeconomics and Community Facilities

3.9.1 Demographics

Although the proposed project is not of a nature to have major direct or indirect demographic impacts either locally or regionally (i.e., to require population displacement or lead to major demographic shifts), existing demographic conditions nonetheless need to be described to provide a general understanding of the population likely to be most directly affected by other types of potential impacts, such as those relating to economics, community facilities, or noise. In particular, a demographic overview of the study area is needed in order to determine whether the proposed project is likely to give rise to environmental justice- or children-related issues.

3.9.1.1 Environmental Justice and the Protection of Children

Signed on February 11, 1994, Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs all federal departments and agencies to incorporate environmental justice considerations in achieving their mission. Each federal department or agency is to accomplish this by conducting programs, policies, and activities that substantially affect human health or the environment in a manner that does not exclude communities from participation in, deny communities the benefits of, nor subject communities to discrimination under such actions because of their race, color, or national origin.

According to Council on Environmental Quality (CEQ) guidance on EO 12898, “Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis [...] Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census” (CEQ, 1997).

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was signed on April 21, 1997. Because the scientific community recognized that children may suffer disproportionately from environmental health and safety risks, the EO directs federal agencies to identify and assess such risks, and consequently to ensure that its policies, programs, activities, and standards address effects on children. “Environmental health and safety risks” are defined as “risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest.” Regulatory actions that are affected by this EO are those substantive actions that concern an environmental health risk or safety risk that an agency has reason to believe may disproportionately affect children.

The main purpose of the demographic (race and age) and economic (income and poverty) profile of the study area’s population provided below is to establish whether the study area is home to large concentrations of minority, low-income, or under-18 populations requiring special attention under EO 12898 or EO 13045.

3.9.1.2 Existing Demographic Conditions

General Demographics

The demographic study area (Appendix A, Figure 3.9-1, Demographic Study Area) was delineated to match, as closely as possible, the base study area. However, because most information in this section is derived from Census 1990 and Census 2000 data (as available on the Census Bureau web site), the demographic study area also had to be made consistent as much as possible with census geography. As a result of this compromise, it includes one census tract in its entirety (Census Tract 56); a portion of another census tract (Census Tract 62.02); and one block group and two blocks from a third census tract (Block Group 5 and Blocks 2005 and 2006 of Census Tract 57.01). Total 1990 and 2000 population figures for those areas are shown in Table 3.9-1, along with similar data for the District of Columbia, for purposes of comparison.

**Table 3.9-1
Total Study Area Population (1990 and 2000)**

Area	1990	2000	Change (%)
Census Tract 56	4,658	5,946	27.7
Part of Census Tract 62.02 in study area	8	6	-25
Block Group 5 of Census Tract 57.01	1,316	1,090	-17.2
Block 2005 of Census Tract 57.01	N/A	791	N/A
Block 2006 of Census Tract 57.01	N/A	0	N/A
Total Demographic Study Area	5,974 ¹	7,833	N/A
District of Columbia	606,900	572,059	-5.7

Note: 1. Because no Census 1990 block-level data are available, this number does not include Block 2005 or Block 2006.
Source: US Bureau of the Census, April 2002.

Altogether, in 2000, the demographic study area had 7,833 residents (approximately 1.4 percent of the District’s population). Census Tract 62.02 roughly coincides with the monumental and federal core of the city. It is both one of the largest census tracts in Washington and one of the least populated. In 2000, a total of twelve people were reported to reside in Census Tract 62.02. The

portion of this tract west of 20th Street and north of the Mall's centerline that makes up the south half of the study area for this analysis is occupied almost exclusively by large governmental and public compounds and facilities (e.g., the Kennedy Center, the Potomac Naval Annex, the State Department); roadway systems (e.g., the E Street Expressway, the Potomac Freeway, the ramps to and from the Roosevelt Bridge); and large expanses of parkland (i.e., West Potomac Park). In 2000, six of the tract's twelve residents lived in the study area, namely within Census Block 1105, which overlays the Potomac Naval Annex.

The part of the demographic study area north of Census Tract 62.02 has a more markedly urban character and is much more densely populated. In 2000, it was home to a total of 7,827 people. Table 3.9-1 suggests that in the 1990s, Census Tract 56 experienced a large increase in population, which sets it apart from the other portions of the demographic study area, which appear to have followed the downward trend characteristic of the city as a whole. The unavailability of block-level data for 1990 makes a comparison difficult; however, it can be noted that the block group to which Blocks 2005 and 2006 belong – Block Group 2 of Census Tract 57.01 – decreased from 2,296 residents in 1990 to 1,871 in 2000. Census Tract 57.01 itself decreased from 5,156 residents in 1990 to 4,361 in 2000.

The apparent demographic dynamism of Census Tract 56 is very likely linked to the growth of the George Washington University (GWU) and its large student population (approximately 8,500 undergraduate students and 4,700 graduate students in Fall 2001). Indeed, in 2000, 17.7 percent (1,055 individuals) of the residents of Census Tract 56 were students living in dormitories. In 1990, no dormitory residents were recorded in Census Tract 56. The acquisition in the late 1990s of a former Howard Johnson hotel at Virginia Avenue and 27th Street and its transformation into a dormitory with a capacity of 350 residents exemplifies the demographic impact of GWU on this portion of the study area.

Age Structure

Altogether, the demographic study area in 2000 had 1,636 of its inhabitants living in student dormitories (20.9 percent, as against 3.4 percent for the District of Columbia as a whole). It is likely that still more students lived in private housing nearby. This strong student presence is one of the most visible demographic characteristics of the study area and of the Foggy Bottom neighborhood as a whole. In general, college students tend to be more mobile and less wealthy than more settled populations. They rent rather than own their housing and do not live in a given neighborhood for more than a few years. By definition, college student populations are also mostly made up of young adults: in 2000, 41 percent of the population of Census Tract 56 was between the ages of 18 and 24, as opposed to 12.7 percent for the District of Columbia as a whole. In Block Group 5 of Census Tract 57.01, 79.6 percent of the residents were between 18 and 24 years old. The atypical age structure of the demographic study area is summarized in Table 3.9-2.

Table 3.9-2
2000 Study Area Age Structure (%)

Area ¹	<18	18-24	24-55	>55
Census Tract 56	1.4	41	29.4	28.1
Block Group 5 of Census Tract 57.01	1.1	79.6	14.5	4.8
Block 2005 of Census Tract 57.01	0.7	50.7	36	12.5
Total Demographic Study Area	1.3	47.4	28	23.3
District of Columbia	20.1	12.7	46.3	20.9
Note: 1. Only those areas with statistically significant numbers of residents are shown. However, the six residents of Census Tract 62.02 who live within the study area are included in the total for the study area. Source: US Bureau of the Census, April 2002.				

As can be seen in Table 3.9-2, the demographic study area is home to very few children and proportionally fewer adults between the ages of 24 and 55 than Washington as a whole. Conversely, people between 18 and 24 and people over 55 years of age make up a much higher proportion of the population than in the city as a whole.

Aside from the demographic characteristics associated with the presence of GWU, these numbers likely reflect another characteristic of the neighborhood north of the Kennedy Center, namely the presence of several large apartment buildings and condominiums (e.g., The Watergate, Columbia Plaza, Potomac Plaza), which are more likely to be home to both younger and older single adults or childless couples than to families with young children. The latter may also be precluded from settling in the area by the relatively high cost of living there. Unsurprisingly, the area with the highest proportion of residents over 55 is Census Tract 56, which includes both the expensive Watergate condominium and the St. Mary's Elderly Housing complex.

Racial and Ethnic Makeup

Table 3.9-3 shows that the demographic study area is also atypical in the racial and ethnic distribution of its population. Whereas in 2000, non-white minorities made up almost 70 percent of the District of Columbia's population, they accounted for only 22 percent of the demographic study area's population. Persons of Asian descent were the largest minority group in the study area, with 11.9 percent of the population there as compared to only 2.7 percent for Washington, DC as a whole. While a majority of the population of the district was black, only 6 percent of the residents of the study area were black. The proportion of Hispanics among the study area's population also was below that for the city as a whole.

**Table 3.9-3
Racial and Ethnic Makeup of Study Area (2000)**

Area ¹	White		Black		Asian		Other ²		Hispanic ³	
	Number	%	Number	%	Number	%	Number	%	Number	%
CT 56	4,721	79.4	359	6	626	10.5	240	4	363	6.1
CT 62.02 ⁴	6	100	0	0	0	0	0	0	0	0
BG 5 of CT 57.01	864	79.3	60	5.5	141	12.9	25	2.3	49	4.5
Block 2005 of CT 57.01	521	65.9	52	6.6	162	20.5	56	7.1	41	5.2
Demographic Study Area	6,112	78	471	6	929	11.9	321	4.1	453	5.8
District of Columbia	176,101	30.8	343,312	60	15,189	2.7	37,247	6.5	44,953	7.9

Note: 1. Block 2006 of Census Tract 57.01, which has no residents, is not shown.
2. Includes the following census categories: American Indian and Alaskan Native; Native Hawaiian and Other Pacific Islander; Some Other Race; Two or More Races.
3. Any Race.
4 Part in study area only
Source: US Bureau of the Census, April 2002.

Income and Poverty

Census 2000 data (for 1999) are summarized in Table 3.9-4. The high median family incomes for Census Tract 56 and Block Group 5 suggest a population that is far better off overall than that of the city as a whole, in keeping with the reputation of the Foggy Bottom area as a solid middle- and upper-middle-class neighborhood. However, the median household income in both Census Tract 56 and Block Group 5 is below that for the city as a whole. Also, poverty levels appear to be remarkably high throughout the study area, particularly in Block Group 5 of Census Tract 57.01. In the study area as a whole (minus Blocks 2005 of Census Tract 57.01 and 1105 of Census Tract 62.02, which, given their size, would be unlikely to make a substantial difference), 26.3 percent of all people lived under the census' poverty threshold in 1999 as opposed to slightly over 20 percent in the District. Relatively low median household income and the high poverty level likely reflect the high proportion of GWU students living in that area on typical student budgets, rather than indicating the presence of a settled impoverished population.

3.9.2 Economic Conditions

The Kennedy Center is the premier center for the performing arts in Washington, DC. As such, it represents not only a major cultural facility but also a dynamic economic institution that employs over 1,200 persons (FY 2001), to which should be added approximately 20,000 visiting performers and staff each year (Fink, May 21, 2002). The Center attracts more than a million performance attendees each year, and by some estimates, several million more visitors to the monument itself (FHWA, September 2000).

**Table 3.9-4
Income and Poverty in Study Area (1999)**

Area ¹	Median Household Income	Median Family Income	Percentage of Persons below Poverty level
Census Tract 56	\$39,286	\$114,152	24.6
Block Group 5 of Census Tract 57.01	\$11,118	\$50,536	43.5
Total Demographic Study Area ¹	N/A	N/A	26.3
District of Columbia	\$40,127	\$46,283	20.2
Note: 1. Because Census block-level data are not available, Block 2005 of Census Tract 57.01 and Block 1105 of Census Tract 62.02 are not included. Source: US Bureau of the Census, May 2003.			

Foggy Bottom is an important center of the federal government, with dozens of major agencies and institutions located in the area. In particular, it is the location of the US State Department, the Federal Reserve Board, the World Bank, the Interior Department, the International Monetary Fund, the National Academy of Sciences, the National Academy of Engineering, the General Services Administration, and the US Navy Bureau of Medicine and Surgery. Numerous non-governmental, international, and foreign-governmental institutions are also located in the area, including the American Red Cross, the Organization of American States, the Saudi Arabian embassy, and GWU.

One basic measure of economic activity is the number of employees. However, obtaining employment data for government agencies is problematic because the primary source of employment information is the US Department of Labor employment ES202 data (collected for unemployment insurance purposes), and most governmental employees are not included in that dataset. Nonetheless, the scale of economic activity in the area can be gauged, at least minimally, by reference to available data.

The Kennedy Center is located in zip code 20037 and is surrounded to the south by zip code 20024, to the east by 20006, to the northeast by 20036, to the north by 20008, and to the northwest by 20007. In 1997, total employment (ES202) in zip code 20037 was 17,171 in 892 establishments; and in all six zip codes, it was 151,609 in 8,245 establishments.

In the Kennedy Center's zip code 20037, the major employers are the US State Department and the Center itself. However, because of the limitations of ES202 data, the numbers provided are far less than the actual numbers of employees. Moreover, of the 892 employers, only a handful is identified, the others being too small or restricted by confidentiality. Two other nearby major employers are: GWU, which employs between 10,000 and 25,000 people; and the US Chamber of Commerce, which employs between 1,000 and 2,500.

Another perspective on employment in the vicinity of the Kennedy Center is provided by proprietary data sources. Economics Research Associates (ERA), in their market analysis that comprises Appendix N of the *Kennedy Center Access Study*, cites the existence of almost 3.6 million square feet of office space in Foggy Bottom in 1998, of which four percent was vacant space (Spaulding & Slye and ERA in FHWA, September 2000). In total, Foggy Bottom accounts for 3.8 percent of the DC office market. ERA noted that 20,000 office jobs are located in Foggy Bottom, of which 7,000 are located within five blocks of the Kennedy Center. It is not clear on what these

office employment numbers are based. The number of square feet per employee implied in their study is 173; this is a reasonable ratio, especially for government workers in the District.

3.9.3 Community Facilities

3.9.3.1 Schools, Daycare Centers, and Playgrounds

The principal educational institution in and near the study area is GWU, whose facilities occupy most city blocks between 19th and 24th Streets, Pennsylvania Avenue, and F Street. GWU caters to more than 13,000 undergraduate and graduate students from all over the United States and the world. GWU is an important contributing element to the demography, character, and atmosphere of Foggy Bottom. In the last few years, however, the growth of its student body and physical plant has been a source of tension within the community.

The District of Columbia's School Without Walls Senior High School is located at 2130 G Street, between 21st and 22nd Streets. It enrolls approximately 320 students from throughout the metropolitan area. Approximately 70 percent of the student body is African-American. The school was established in 1971 to offer an alternative to conventional programs by "using the city as a classroom" (School Without Walls, 2002).

Since 1997, the Columbia Plaza complex has been home to the Diplotots Childcare Center, sponsored by the nearby US State Department. Diplotots has a capacity of 83 children between six weeks and five years of age.

There is a playground south of K Street, just west of 26th Street, at the level of Queen Anne's Lane, which, based on its location, appears to be used mostly by families living nearby. The playground immediately overlooks the roadways and ramps that constitute the north terminus of the Potomac Freeway.

3.9.3.2 Fire and EMS Services

The closest Fire-EMS station to the project site is Fire Engine Company No. 23, located at 2119 G Street. Between October 1, 2000, and September 30, 2001, Engine Company No. 23 responded to 2,619 calls (fire and EMS), making it the 27th (out of 33) busiest such company in the District. Engine Company No. 1-Truck Company No. 2 is located at 2225 M Street. Both stations serve the project area. During the same period – October 1, 2000 to September 30, 2001 – Engine Company No. 1 responded to 3,611 calls (ranking 18th among the 33 engine companies) and Truck Company No. 2 to 874 calls (ranking 13th of 16 truck companies) (FEMS, 2002). To respond to calls, fire and EMS engines and trucks use the local street network rather than the freeways that cut through the area, as the function of these freeways is primarily regional.

3.9.3.3 Police

The project area is located within the Washington Metropolitan Police Department's (MPDC) District 2, Police Service Area (PSA) 207. District 2 is headquartered at 3320 Idaho Avenue. MPDC statistics for District 2 show that by March 31, 2002, 12.9 percent fewer crimes had been reported for the year than over the same period in 2001; this compared to a very slight increase – 0.2 percent

– citywide. The most common type of crime reported was simple theft, which amounted to 70 percent of all crimes reported in the first three months of 2002, followed by burglary (13 percent). No PSA-level statistics are available (MPDC, 2002). GWU has its own police force, based at 2033 G Street. In 2000 (the most recent year for which statistics available), approximately 1,300 offenses were reported, about 600 of which were liquor law violations. PS land in the study area is under the jurisdiction of the National Park Police.

3.9.3.4 Hospitals

The closest hospital to the project site is the new 380-bed GWU hospital, just south of Washington Circle. This hospital is one of the largest in Washington. Its emergency room serves 46,000 patients a year, and approximately 15,000 patients are admitted each year (GWU Hospital, 2003).

3.9.3.5 Places of Worship

The closest church to the project area is Western Presbyterian Church, at the corner of Virginia Avenue and 24th Street, behind the Potomac Plaza complex. Services are held on Sunday mornings at 11:00 AM from September to June, and at 10:00 AM in July and August. Additionally, throughout the year, special services are held on certain days, such as Christmas Eve or Good Friday. Other religious and community activities are regularly scheduled on Sundays or on certain weekday evenings (generally starting at 7:00 PM).

St. Paul's Episcopal Church stands farther from the project site, on the south side of K Street between 24th and 25th Streets. Sunday morning masses are held at 7:45 AM, 9:00 AM, and 11:15 am; weekday masses are at 7:00 AM and 6:00 PM. Special services, ceremonies, and activities take place at other times, most in the morning or early evening.

St. Stephen Catholic Church stands one block north of St. Paul's Episcopal Church, at the corner of 25th Street and Pennsylvania Avenue. Masses are celebrated at 9:00 AM, 11:00 AM, and 1:00 PM on Sundays; and at 6:30 AM, 12:10 PM, and 5:30 PM on weekdays.

3.10 Kennedy Center Operations and Management

The Kennedy Center is a unique living monument and tribute to President Kennedy and his belief that the arts and cultural achievement should be an integral part of human experience. The Kennedy Center originated as a National Cultural Center created by a law signed by President Eisenhower on September 2, 1958 (a summary of the Center's history is provided in Subchapter 1.3.2). By law, the Kennedy Center is "the sole national memorial to the late John F. Kennedy within the city of Washington and environs" (US Code Title 20, Chapter 3, Subchapter 5). Its board is mandated to "promote and maintain the John F. Kennedy Center for the Performing Arts as the National Center for the Performing Arts."

The Center fulfills this vision and represents not only the dynamic center of Washington's cultural entertainment but is America's showcase for the performing arts. It is the home base of the National Symphony Orchestra (NSO). In addition, the Kennedy Center hosts performances by a dazzling array of visiting artists offering programs as diverse as the nation's capital.

Each year the Kennedy Center presents more than 3,000 performances of music, theater, and dance for audiences of more than a million visitors, sometimes as many as 10,000 a day. Its diverse offerings, specially-priced, low-cost, and free performances make the programs available to everyone. Tours take many of the Kennedy Center productions on the road, extending its national dimension. The Center is free for visitors who want to tour its public spaces. Millions of visitors per year pass through, many of whom take guided tours.

The Kennedy Center includes several performance spaces:

- **Concert Hall** – the largest space, with 2,450 seats; it is home to the NSO and hosts performances by visiting artists and orchestras from around the world.
- **Opera House** – the second-largest space, with 2,300 seats; it hosts musical theater, opera, and ballet.
- **Eisenhower Theater** – this 1,100-seat theater presents theater, opera, and dance productions.
- **Terrace Theater** – this 500-seat theater on the Roof Terrace level provides space for a variety of chamber music recitals, family theater, and dance.
- **Theater Lab** – a 350-seat theater, also on the Roof Terrace, that stages experimental theater and family theater productions.
- **Film Theater** – provides 250 seats for presentations of screen classics, as well as live staged performances.
- **Terrace Gallery** – a 160-seat space used for jazz performances and art exhibitions.
- **Millennium Stage** – free daily performances at 6 PM are offered on stages at each end of the Grand Foyer.

Public spaces include:

- **Hall of States and Hall of Nations** – the Hall of Nations is located between the Concert Hall and Opera House and displays flags of the world's nations; the Hall of States is between the Opera House and the Eisenhower Theater and displays flags of the US states and territories.
- **Grand Foyer** – 630 feet long, it occupies the full length of the Kennedy Center on the Potomac River side; the River Terrace is outside the building, adjacent to the Grand Foyer.
- **Roof Terrace** – it offers panoramic riverfront views of Theodore Roosevelt Island, Georgetown, and the Monumental Core of Washington, DC.

Gift shops, an Information Center, an Education Resource Center, and guided tours are additional services and amenities available at the Kennedy Center. These services are operated mostly by a dedicated corps of volunteers.

Several restaurants are located in the Kennedy Center, all of them on the Roof Terrace. The Roof Terrace Restaurant, operated by Restaurant Associates, is a full-service restaurant, offering dinner two hours before performances and Sunday Brunch. The Kennedy Center Café is a self-service café

offering casual fare daily. Additional food and beverages are available in the Grand Foyer, before performances and during intermissions.

Parking for automobiles and buses is available at the Kennedy Center on a limited basis and represents one of the most severe constraints on its operations. The Center's parking garage has 1,454 spaces. Parking demand meets or exceeds supply on 150 days of the year, is at 75% capacity for 100 days of the year, and is at 40% capacity for 115 days of the year. The parking improvements presently underway will add 525 spaces. However, even with the additional 525 spaces, demand is expected to exceed capacity on about 50 nights per year for many evenings' performances. Alternative parking spills onto nearby streets and into the parking facilities at the Watergate and Columbia Plaza. A parking survey of Friday-evening patrons conducted in January 1998 revealed that:

- 48 percent parked on site.
- Four percent arrived by taxi.
- Seven percent arrived by tour bus.
- 18 percent used the Show Shuttle from the Foggy Bottom Metrorail station.
- 11 percent parked at the Watergate garages.
- Ten percent parked at the Columbia Plaza garage.
- Three percent were pedestrians or on-street parkers.

Access to the Kennedy Center by mass transit is limited by the almost half-mile distance to the nearest Metrorail station and the pedestrian-unfriendly route via New Hampshire Avenue and Juarez Circle. The Center provides shuttle buses to help with this problem, but during peak periods, because of the circuitous route, long waiting lines result, and travel to the Center takes almost as long as walking.

Additional parking and loading problems affect the numerous buses and trucks that unload their passengers and equipment at the Center. Many must unload on the plaza directly in front of the building, along with other drop-offs, quick ticket purchasers, and television trucks. Equipment for operas, for example, may involve unloading/loading for two to three days. This adds to confusion, conflict, and clutter at the ceremonial entrance to the facility. Bus parking, particularly for hundreds of school buses, is a chronic problem. Many buses now park at the National Zoo, about four miles away.

Another critical problem for the Kennedy Center is the extremely limited space availability for its operations. Both stage and administrative support functions are severely constrained, with areas devoted to unintended uses, such as locker rooms used for rehearsal space and service tunnels and garage areas used for storage. Although some off-site storage is utilized, this often results in problems retrieving stored material. On-site observation in April 2002 revealed extremely tight conditions backstage regarding administrative personnel, performers, and other equipment and operations needs. There is clearly a major demand for all kinds of operational space, but staff particularly voiced the need for additional rehearsal space.

In fiscal year 2001, the Kennedy Center employed 1,245 people, of which 515 were full-time and 730 part-time (Kennedy Center, 2002). These 1,245 employees may be categorized into broad functional categories as shown in Table 3.10-1. In addition to these regular employees, the Center

accommodates approximately 20,000 performers and staff per year. Volunteers at the Center are a major component, with between 60 and 75 working on a typical day and approximately 530 in total.

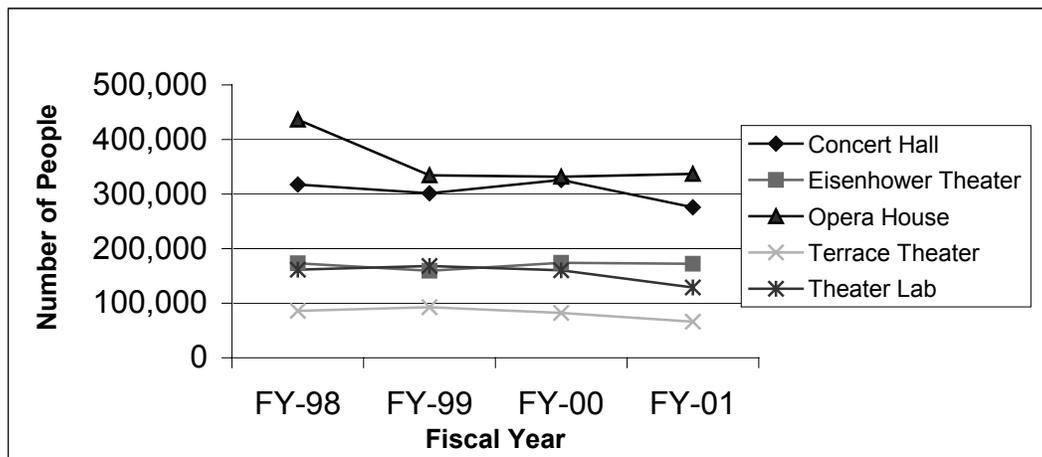
**Table 3.10-1
Kennedy Center Employment by Function**

Function	Number of Employees
Professional	250 (includes 100 NSO musicians)
Administrative	207
Technical	40
Clerical	98
Other	576 (part-time, mostly ushers)
Blue Collar	74
TOTAL	1245
Source: Kennedy Center, May 2002.	

Total wages/salaries that are reflected in operating expenses amounted to \$40,717,751 in FY 2001. Other financial data from the fiscal year 2000 Annual Report (citation) indicate that the Center had total operating revenues of \$91.26 million, of which about \$36 million were box office receipts and \$31.6 million federal appropriations (both operating and capital). Other revenues were derived from a variety of fees and receipts. Expenses over the same period were \$130.48 million, leaving a deficit, before contributions, of \$39.22 million. A total of 26,000 contributors accounted for over \$44.5 million in that year.

Kennedy Center attendance has been relatively flat in recent years, with total attendance declining from about 1.2 million in FY 1998 to about 1 million in FY 2001. Total attendance by venue over FY98-FY01 is shown below in Figure 3.10-1. Kennedy Center staff offered no specific reason for this decline, but the constraints on space and parking noted above may have contributed to the trend.

**Figure 3.10-1
Kennedy Center Attendance**



The number of registered tours has also been volatile, and has exhibited some decline in recent years, as shown in Table 3.10-2. These registered tours do not include the large numbers of visitors who arrive under no formal auspices or attend performances.

**Table 3.10-2
Kennedy Center Tour Statistics**

Year	No. of Tours	No. of Patrons
1998	4,001	60,975
1999	5,002	72,426
2000	4,583	61,169
2001	4,355	60,536
Source: Kennedy Center, April 2002.		

It is the strong desire of the Kennedy Center management to maintain and expand visitation to the Center, especially during the day, when facilities are not fully utilized. In order to do so, the Center needs to enhance access by all modes of transportation, to provide more amenities and programs, and to expand the required rehearsal and administrative support spaces.

3.11 Urban Systems

3.11.1 Sewerage

3.11.1.1 Pumping Stations

Two of the DC Water and Sewer Authority's (DCWASA) five sewage-pumping stations occur in the study area – a small pumping station in the North Sector and a large pumping station in the South Sector. In the North Sector, the Rock Creek Sewage Pumping Station is located just north of K Street, adjacent to the off-ramp connecting northbound Rock Creek Parkway to westbound Whitehurst Freeway (DC Government, 1986). It has the capacity to pump 45 million gallons of sewage per day (Tanner, 2003) from surrounding northwest neighborhoods, such as Georgetown and Dupont Circle, to the larger pumping station in the South Sector.

The Potomac Sewer Pumping Station in the South Sector is just east of the Rock Creek Parkway, within the Roosevelt Bridge DC Abutment, between the ramps to and from the bridge. This large pumping station has a rated capacity of 460 million gallons per day (DCWASA, 2003). From the pumping station, sewage flows south along the riverside through West Potomac Park to the Blue Plains Treatment Plant (FHWA, September 2000).

3.11.1.2 Combined and Separate Sanitary Sewers

As shown in Appendix A, Figure 3.11-1 (Existing Urban System Conduits), two sewers from the northwest quadrant of the District – each rectangular and approximately 14 feet by 14 feet – originate as distinct sewers but become stacked near the confluence of Rock Creek and the Potomac River. One is the Upper Potomac Interceptor Connection – a large separate sanitary sewer entering

the study area from the west, just south of K Street. The other is the East Side Rock Creek Diversion Sewer – a combined sewer that enters the study area just northeast of the Rock Creek Sewage Pumping Station. In addition, two four-foot combined sewers join the East Side Rock Creek Diversion Sewer at the pumping station. The stacked sewers pass south to F Street, then east, then south beneath the east side of the Kennedy Center and continue to the Potomac Sewer Pumping Station.

Another large combined sewer, approximately six feet in diameter, enters the study area in a similar fashion to the East Side Rock Creek Diversion Sewer. Parts of this sewer date back to the late 19th century. It follows the stacked sewers around the east side of the Kennedy Center but bypasses the Potomac Sewer Pumping Station, turning east beneath the Potomac Freeway in the Center Sector to join three sewers carrying sewage from the east beneath Constitution Avenue near 22nd Street. One large combined sewer beneath C Street, about 11 feet in diameter, and two beneath Constitution Avenue (one two by three feet; the other six and half feet in diameter) also meet near 22nd Street and Constitution Avenue. From there, headed east, the sewer splits. One conduit takes sewage to the Potomac Sewer Pumping Station, passing beneath the Potomac Freeway in the South Sector. The other heads to the southwest, passes beneath Ohio Drive and discharges sewage directly into the Potomac River.

Finally, a large combined sewer, nine feet six inches by seven feet seven inches, enters the study area west of Rock Creek. Two four-foot combined sewer trunk lines join this sewer, which then discharges directly into the Potomac River just northwest of Thompson’s Boathouse.

3.11.1.3 Storm Sewers

A 96-inch main storm sewer enters the study area beneath New Hampshire Avenue, just north of Juarez Circle. It passes west and discharges into the Potomac River at the mouth of Rock Creek. From that main trunk, two 48-inch sewers (which narrow to 27 inches) service the Juarez Circle area beneath New Hampshire Avenue, Virginia Avenue, and F Street. There is also a separate two-foot by three-foot storm sewer that passes beneath the west edge of the Kennedy Center and discharges into the Potomac River on the north and south axes of the Center. Finally, a 36-inch storm sewer in the South Sector discharges into the Potomac River at the base of the Roosevelt Bridge.

3.11.2 Potable Water

DCWASA classifies most water mains in the study area as “low” service – supplying water to facilities up to an elevation of 70 feet. Two parts of the study area require stronger pressure to deliver water to elevations up to 140 feet (“first high” service); these first high service lines are both small water lines. One is for the Potomac Plaza, located between H and 24th Streets and Virginia Avenue. The other first high service line serves the Potomac Naval Annex. (DC Department of Public Works, 1985).

As shown in Appendix A, Figure 3.11-1, a large water trunk (ranging from 20 to 36 inches in diameter) flows beneath 26th Street south where it is joined by a 12-inch line and passes east to Juarez Circle. A 24-inch water main crosses the study area beneath K Street. In the Center Sector, there is a 16-inch low service water main that travels beneath New Hampshire Avenue from Juarez

Circle to the Kennedy Center, where it continues south along the Rock Creek Parkway into the South Sector. After passing the Potomac Sewer Pumping Station at the base of the Roosevelt Bridge, the main water line then heads east beneath Constitution Avenue and out of the study area.

3.11.3 Electricity

Offset lighting illuminates the ramp approaches in the study area. Electrical lines from underground conduits along the roadsides supply power to those lights and to overhead signage (FHWA, September 2000). In the South Sector, an underground transmission pipe runs beneath 23rd Street south of Lincoln Memorial Circle. Another underground transmission pipe continues beneath 23rd Street between Constitution Avenue and the E Street Expressway along the east edges of the South and Center Sectors. Underground power lines, which run beneath the ramp from the Roosevelt Bridge to Constitution Avenue, supply the Potomac Sewer Pumping Station (see Appendix A, Figure 3.11-1). Finally, an underground transmission pipe travels along the north border of the North Sector underneath M Street (PEPCO, 2003).

There are large electrical transformers, duct banks, and utility rooms adjacent to the existing parking garage (at parking levels A and B) beneath the main entrances on the east side of the Kennedy Center. This central utility corridor parallels the north-south axis of the Center and abuts the east side of the parking garage. The aboveground electrical lines feed in from lines that run along the Rock Creek Parkway.

3.11.4 Gas Lines

Underground gas lines supply the Kennedy Center through connections via F Street lines to larger New Hampshire and Virginia Avenue lines (Washington Gas and Light Company, 1984). Gas lines enter the Kennedy Center complex at the garage access point near the northeast corner of the facility.

There are two places, both in the Center Sector, where abandoned gas lines pass under the Potomac Freeway. One crosses underneath the Potomac Freeway directly east of the entrance to the Eisenhower Theater. The other crossing occurs immediately south of the split where the Roosevelt Bridge approach ramp splits off from the Potomac Freeway southbound lanes. Additionally, there are several active gas lines servicing other facilities that cross beneath the Potomac Freeway (see Appendix A, Figure 3.11-1).

3.11.5 Telephone Lines

Verizon Communications provides telephone and internet service to the Kennedy Center. Underground lines run along the Rock Creek Parkway and enter the Center at the northwest corner of level C in the parking garage (Levine, 2003).

3.12 Natural Resources

The study area is mostly urbanized, but with natural and park areas that could be considered only moderately disturbed. These areas are located along the east bank of Rock Creek, upstream of the Rock Creek and the Potomac Parkway/Whitehurst Freeway interchange, and along the Potomac River. The banks of Rock Creek are in a more natural condition than the banks of the Potomac River, but major greenway areas and parks exist along the Potomac River. The portion of Rock Creek downstream of the Rock Creek Parkway/Whitehurst Freeway connection was channelized in the mid 1800s as part of the construction of the C&O Canal and is characterized by very steep banks. These banks have been repopulated with dense native forest and shrub communities. The remaining acreage of the study area is comprised of freeways, interchanges, and city blocks with buildings, sidewalks, manicured lawns, and park or park-like areas.

3.12.1 Topography, Geology, and Soils

The District of Columbia is divided between the Piedmont Physiographic Province (western third) and the Coastal Plain Physiographic Province (eastern two-thirds). The north-northeast trending Fall Line separates the two provinces. The study area straddles the Fall Line, with most of the site to the east, within the Coastal Plain Province.

Much of the District is dissected by erosion and is characterized by nearly-level to gently-rolling uplands, steep valley walls, widely-separated interstream divides, and narrow valley bottoms. The swift and turbulent Rock Creek is incised in a narrow, steep valley that drains the Piedmont. The areas of the National Mall and West Potomac Park differ in that they are composed of dredged fill overlying old building debris and other fills, tidal marsh deposits, and bedrock. Elevations within the District range from zero to as much as 415 feet above mean sea level (MSL). At the project site, the range is narrower – about ten feet to 90 feet MSL, with the highest elevations occurring southeast of the Kennedy Center at the Potomac Naval Annex (Appendix A, Figure 3.12-1, Topography).

The Piedmont part of the District is underlain by old, metamorphosed igneous and sedimentary rock, while the Coastal Plain part is underlain by much younger, poorly-consolidated sediment. Some areas in both provinces are covered by unconsolidated terrace and alluvial deposits (US Department of Agriculture [USDA], July 1976).

The Piedmont Province is characterized by a series of ridges descending gradually to the Coastal Plain to the south and east. The Coastal Plain Province is a low and partially-submerged surface of varying width, bounded by the Piedmont Plateau on the west and the edge of the continental shelf on the east. The boundary between the Coastal Plain and the Piedmont Plateau is sinuous and ill-defined, being marked mainly by the feathering out of the softer Cretaceous formations as they lap the harder crystalline rocks of the Piedmont Plateau. The boundary is most marked in the stream valleys, where the softer strata have been more easily eroded (Vokes and Edwards, 1957).

The bedrock underlying the Coastal Plain is composed of gneiss, which is weathered to saprolite in its upper layers. (TAMS Consultants, 2000). In some places, the overburden or fill on the site is less than 10 feet thick, and bedrock outcrops within the site area are common (USDA, 1975). The

differentiation of the dredged fill and tidal marsh deposits at some locations is difficult to establish. In some cases there is no obvious change in soil type, color, or texture, and each group may contain variable soil types (TAMS Consultants, 2000). The tidal marsh deposits are composed of silt and sandy silts, and the recent fill material is described as clayey sands and fat clays.

The Soil Survey of the District of Columbia (USDA, 1975) identifies four soil types within the study area: Udorthents (U1), Urban Land (Ub), Chillum - Urban land Complex (CdB, 0 to 8 percent slopes), and Urban Land – Chillum Complex (UeC, 8 to 15 percent slopes). The Chillum and Urban Land Complexes occur together in such an intricate pattern that it was not practical to separate them during the soil mapping.

The Soil Survey of the District of Columbia describes these mapping units as follows:

- U1- Udorthents: very heterogeneous, earthy fill material that has been placed on poorly-drained to somewhat excessively-drained soils on uplands, terraces, and flood plains to provide sites for buildings, roads, railroads, recreation areas, and other uses. Slopes are very complex and irregular but are predominantly nearly level to moderately sloping. The thickness of the fill is variable, but is more than 20 inches. The source of fill is a mixture of organic and inorganic waste from human activity and various soil materials. Permeability as well as runoff and internal drainage are variable. Most areas of this unit are subject to subsidence and therefore have poor potential for use as building sites. A detailed onsite investigation is needed to determine the potential and limitations of these areas for any proposed use.
- Ub - Urban Land: this mapping unit consists of areas where more than 80 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. These areas are nearly level to moderately sloping. Included in the mapping are large areas that are mostly miscellaneous artificial fill. In many areas, several feet of this fill have been placed over streams, swamps, floodplains, and tidal marshes. Careful onsite investigation is needed to determine the potential and limitations for any proposed use.
- CdB - Chillum-Urban Land Complex and UeC - Urban Land-Chillum Complex: these units are described together here because the two soil complexes are very similar. These soil complexes consist of nearly-level to gently-sloping, well-drained soils of the Chillum and Urban soils series and characterize most of the areas that have been altered by grading for housing developments, shopping centers, industrial areas, and similar uses. Chillum-Urban Land and Urban Land-Chillum complexes are found in urbanized upland areas of the Coastal Plain. Where these soils have not been urbanized, they support yards and open areas between buildings.

Udorthents and Urban Land are predominant at the site of the proposed access improvements, such as interchange and freeway ramps. Udorthents comprise the east bank of Rock Creek and the Potomac River south to the Lincoln Memorial. The Urban Land soil type occupies the remainder of the study area to the east. The Chillum - Urban land Complex and Urban Land – Chillum Complex are co-located in the small portion of the study area that is bordered by E street to the north, 23rd Street to the east, and the Roosevelt Bridge Interchange to the south and west.

3.12.2 Hydrology/Water Resources

3.12.2.1 Waterways

The study area is adjacent to the Potomac River and Rock Creek. The Potomac River and the channelized portion of Rock Creek (south of the Rock Creek Parkway/Whitehurst Freeway interchange) are considered “navigable waters” under Section 10 of the Rivers and Harbors Act (RHA), as well as “waters of the US” under Section 404 of the Clean Water Act (CWA). Both types of waters are regulated by the US Army Corps of Engineers (USACE). The landward extent of USACE Section 10 RHA jurisdiction is the mean high water (MHW) in tidal waters, and the ordinary high water (OHW) in non-tidal waters. The landward extent of jurisdiction under Section 404 of the CWA is the high tide line in tidal waters, and the ordinary high water line in non-tidal waters, when no adjacent wetlands are present. The exact limits will be determined through coordination with USACE or estimated from tide tables and field observations as engineering plans are developed.

Potomac River

The Potomac River is the second-largest tributary of the Chesapeake Bay. It flows for 383 miles along its main stem from Fairfax Stone, West Virginia to Point Lookout, Maryland through five signature landscapes: the North Branch Landscape, the Cacapon and Lost River Watershed, the Northern Shenandoah Valley, the Middle Potomac Corridor, and the Monocacy and Antietam watershed. Washington, DC is located in the Middle Potomac Corridor. The Potomac’s largest tributaries are the South Branch, Anacostia, Cacapon, Monocacy, Occoquan, Savage, and Shenandoah Rivers.

The Potomac River Watershed drains a nine-million-acre (14,670-square-mile) area, which includes Washington, DC (drainage area of 69 square miles) and portions of Maryland, Virginia, West Virginia, and Pennsylvania. The Potomac River Basin has a population of 5.25 million, including 3.7 million in the metropolitan area, representing almost three quarters of the basin’s population. An average of approximately 486 million gallons of water is withdrawn daily in the Washington area as water supply for approximately 80 percent of the region’s residents. Public water treatment plants treat approximately 83 percent of the basin’s wastewater, with private septic systems treating the remainder. The largest flow ever recorded on the Potomac at Washington was 275 billion gallons per day in March 1936, and the lowest flow ever recorded at the same location was 388 million gallons per day in September 1966. The average flow at this location is about 7 billion gallons per day.

Water quality in the District of Columbia is monitored by the Water Quality Division of the Department of Health’s Environmental Health Administration. Pursuant to Section 305(b) of the Clean Water Act, the District of Columbia Department of Health issues a report to U.S. EPA and Congress every two years describing the water quality within the District. In these reports, water bodies are categorized based on the degree to which water quality affects their use. According to the most recent reports, the water quality of the Potomac River does not support requirements for primary-contact recreation, defined as “those water-contact sports or activities which result in frequent whole body immersion and/or involve significant risks of ingestion of water” (DC

Register, 2000). The water quality does support secondary-contact recreation, where whole body immersion does not involve significant risks of ingestion of the water.

The Potomac River's water and sediment quality has improved over the past decades as progress has been made in improving wetlands and in wetland creation. Thirty areas of freshwater tidal marshes have been constructed in the Kenilworth Marsh Area, which is the site of the last remaining stand of original tidal marshes in the basin. The District of Columbia and the USACE have plans to restore a 46-acre marsh in the area of Kingman Lake. As aquatic plants take hold, the amount of sediment in the water column will decrease, and benthic organisms and fish populations will increase (Hoch, 1996).

Rock Creek

The following information is taken from the *Draft General Management Plan Environmental Impact Statement for Rock Creek Park and the Rock Creek and Potomac Parkway*, prepared by the National Park Service (May, 2003).

Rock Creek flows generally south for 33 miles from its headwaters near Laytonsville, Maryland, to its confluence with the Potomac River in the study area. Land uses within the 77-square mile watershed include urban, suburban residential, agricultural, and parkland. An estimated 500,000 people reside in the watershed. Approximately 70 percent of the watershed, mostly upstream of Rock Creek Park, is developed, and most of the developed area is characterized by impervious surfaces (buildings, roads, parking lots, etc.). This development has led to increased flooding from rapid runoff, abnormal streambed scouring and sedimentation patterns, bank erosion, organic and chemical pollution, and accumulation of litter and other solid waste.

In the District, numerous municipal storm sewers converge in the Rock Creek valley and discharge stormwater from city streets directly into park waters. The pollutants associated with stormwater from roadways and parking lots are a major source of contamination of Rock Creek and its tributaries during precipitation events. Numerous municipal sanitary sewers are also located within Rock Creek Park, which can leak raw sewage and pollute park waters. The antiquated system of combined sanitary and storm sewers located in the southeastern portion of the park is a serious source of pollution. When rainfall exceeds 0.3 inches per hour, these sewers overflow and discharge raw, untreated sewage directly into Piney Branch (a major tributary) and Rock Creek. The Washington, DC Water and Sewer Authority is proposing a system of diversion tunnels that would route overflow water during most storm events directly to the Blue Plains Wastewater Treatment Plant and dramatically reduce overflow discharges to Rock Creek.

The District Water Quality Division has designated Rock Creek and its tributaries for restoration to meet all five beneficial use classes. At this time, it does not meet standards for primary-contact recreation or secondary-contact recreation and aesthetic enjoyment. The water quality of Rock Creek itself does not meet standards for propagation of fish, shellfish, and wildlife. Below the Pierce Mill Dam, Rock Creek partially supports standards for human health related to fish and shellfish consumption. The fifth classification – navigation – is met.

Rock Creek and its tributaries have been designated as “Special Waters of the District of Columbia” for their scenic and aesthetic importance. It is intended that the water quality of such designated waters be maintained and not allowed to degrade (USDOJ, May 2002).

3.12.2.2 Floodplains

Floodplains are important considerations for all proposed development activities at and near the Kennedy Center. Executive Order 11988, Floodplain Management, directs all federal agencies to determine whether a proposed federal action would occur in a floodplain. Often these determinations are made by consulting Flood Insurance Rate Maps (FIRMs) or are based on detailed hydrologic/hydraulic studies conducted specifically for a proposed action. If the action is to be located within a floodplain, the Executive Order requires that the agency consider alternatives so as to avoid adverse effects and incompatible development within the floodplain. If avoidance is not feasible, the federal agency must construct facilities in accordance with the standards and criteria of the National Flood Insurance Program (44 CFR 59, et seq.) to minimize potential harm to or within the floodplain.

Appendix A, Figure 3.12-2 (Floodplain) shows the 100-year floodplain (i.e., probability of flooding in any given year is one percent) in the study area. Two large portions of the study area lie within the 100-year floodplain: the western edge bordering the Potomac River, and the southern portion from approximately the E Street Expressway Interchange to the Lincoln Memorial. There is also a small pocket of floodplain within the Roosevelt Bridge interchange. Small areas of the site directly east and adjacent to the 100-year floodplain are designated as 500-year floodplain (i.e., probability of flooding in any given year is 0.2 percent).

3.12.3 Biological Resources

3.12.3.1 Terrestrial Vegetation

The study area is landscaped and maintained by District and NPS workers. Manicured grassy areas dominate the study area, and trees and ornamental shrubs are located within these grassy areas. Tree size depends on the age of the surrounding development. There are very large American elm (*Ulmus americana*) trees adjacent to Constitution Avenue and the Roosevelt Bridge interchange that may date back to the time when the avenue extended all the way to the Belvedere.

The banks of Rock Creek constitute the only location within the study area that is not maintained in a park-like condition and that approaches a natural state. Native and foreign invasive vines such as poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), and Virginia creeper (*Parthenocissus quinquefolia*) are prevalent among the trees on the creek’s banks. Table 3.12-1 is a list of tree and shrub species that were either observed during a site reconnaissance or would be expected to occur in the habitats that comprise the project site.

FHWA is in the process of coordinating with the NPS regarding the presence of specific plantings of historic or cultural importance within the study area.

**Table 3.12-1
Tree Species Occurring or Likely to Occur within the Study Area**

Common Name	Scientific Name
American Elm	<i>Ulmus americana</i>
Black Cherry	<i>Prunus serotina</i>
Black Locust	<i>Robinia pseudoacacia</i>
Box Elder	<i>Acer negundo</i>
Eastern Flowering Dogwood	<i>Cornus florida</i>
Green Ash	<i>Fraxinus pennsylvanica</i>
Red Maple	<i>Acer rubrum</i>
Red Oak	<i>Quercus rubra</i>
Silver Maple	<i>Acer saccharinum</i>
Sycamore	<i>Platanus occidentalis</i>
Yellow Poplar	<i>Liriodendron tulipifera</i>
White Oak	<i>Quercus alba</i>
Willow Oak	<i>Quercus phellos</i>

3.12.3.2 Aquatic Organisms

Potomac River

Monitoring of water quality in the Potomac River by multiple agencies has indicated a trend toward recovery. Dissolved oxygen (DO) south of Washington, DC, no longer drops below 5 milligrams per liter, the minimum level acceptable for aquatic life, and algal blooms do not have the intensity they once had, chiefly because of large phosphorus reductions since 1965. The introduction of biological nitrogen reduction (BNR) at wastewater treatment plants over the next ten years will further improve water quality. The diversity of food web organisms, such as copepods and benthic invertebrates, is increasing in the middle “transition zone” (Interstate Commission on the Potomac River Basin, website accessed June 21, 2003).

Because the Potomac River is a major tributary of the Chesapeake Bay, the goals of the Chesapeake Bay Program relate directly to this project. The Program’s most recent agreement, Chesapeake 2000 (Chesapeake Bay Program, 2001), outlines several applicable themes and their goals:

- **Sound Land Use:** Develop, promote, and achieve sound land use practices that protect and restore watershed resources and water quality, maintain reduced pollutant loadings for the Bay and its tributaries, and restore and preserve aquatic living resources. (This theme includes a goal of a 30% expansion of environmentally-sound public access to the Bay, its tributaries, and related resource sites by 2010.)
- **Vital Habitat Protection and Restoration:** Preserve, protect, and restore those habitats and natural areas that are vital to the survival and diversity of the living resources of the Bay and its rivers.
- **Water Quality Protection and Restoration:** Achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health.

- Living Resource Protection and Restoration: Restore, enhance, and protect the finfish, shellfish, and other living resources, their habitats and ecological relationships to sustain all fisheries and provide for a balanced ecosystem.

The Potomac River is classified as an “area of emphasis” regarding the effects of chemical contaminants on living resources. Due to poor water clarity, the Potomac River fails to meet the Bay habitat requirement for submerged grasses, and there is no evidence indicating improvement (Chesapeake Bay Program, 2001). However, some submerged aquatic vegetation (SAV) is surviving despite persisting poor water clarity in the upper estuary. For example, the Potomac River in the Washington Metropolitan Area has, over the last 20 years, been heavily invaded by hydrilla (*Hydrilla verticillata*). Hydrilla can be problematic in that it often clogs navigation channels, but it also absorbs nutrients, oxygenates the water, and provides habitat for many species of fish and aquatic organisms. The river in the vicinity of the Kennedy Center shoreline is characterized by hydrilla. The total amount of SAV in the upper tidal Potomac River (calculated using the Chesapeake Bay Program segment “POTTF”) was approximately 3,880 acres in 2000; the amount of SAV in the vicinity of the study area (i.e., the Potomac River between the Memorial Bridge and Washington Harbour) was less than 116 acres in 2000 and 84 acres in 2001 (VIMS, 2002). Most SAV in the study area occurs close to the west bank of the Potomac River from the southern tip of Roosevelt Island extending south about 1,500 meters. The SAV coverage density is less than 50 percent (VIMS, 2002).

A coalition of federal, state, regional, and local agencies and nonprofit groups, organized as a task force, is working towards opening historic spawning and nursery habitats for native and anadromous fishes in the Potomac River. An important milestone was met in January 2000, with the completion by the USACE of the fishway at Little Falls (Brookmont) Dam, upstream of the study area. In addition, as migratory fish species have been excluded from the areas of the river above Little Falls Dam for more than fifty years, task force members have been working at re-imprinting these fish species to areas above the falls.

The American shad (*Alosa sapidissima*) stocking project began in 1995. In the eight years of the project, over 15.6 million shad fry were stocked into the Potomac River. Since program initiation, the number of adult American shad collected during the spring brood-stock collections has more than doubled, and the number of fry stocked has tripled. Young-of-the-year shad have become more numerous (Interstate Commission on the Potomac River Basin, website accessed June 21, 2003).

Sport fisheries exist throughout the Potomac River, with popular fishing spots immediately south of Washington, DC (e.g., the hydrilla beds at the Woodrow Wilson Bridge) and north of the city (e.g., the Potomac Gorge, Palisades, and Washington Channel). Sport fish include smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis* spp.), carp (*Cyprinus carpio*), bullhead (*Ictalurus* spp.), shad (*Alosa sapidissima*), herring (*Alosa aestivalis* and *A. pseudoharengus*), white perch (*Morone saxatilis*), and striped bass (*Morone americana*) (Interstate Commission on the Potomac River Basin, website accessed June 21, 2003).

Rock Creek Park

Recent surveys of Rock Creek have found approximately 35 fish species in Rock Creek. Resident, native species include five shiners (*Notropis* spp.), two bullheads (*Ictalurus* spp.), and three sunfish (*Lepomis* spp.). Blacknose dace (*Rhinichthys atratulus*) are relatively common and can be found in the

main stream and tributaries. Introduced resident species include carp (*Cyprinus carpio*), bluegill (*Lepomis macrochirus*), and largemouth bass (*Micropterus salmoides*) (USDOJ, May 2002).

At least two native, anadromous species – the blueback herring (*Alosa aestivalis*) and the alewife (*Alosa pseudoharengus*) – migrate from saltwater up Rock Creek to spawn each spring. An abandoned sewer line and an abandoned gauging station near Q Street that interrupted their migrations have been removed from Rock Creek (Madaras, 2001, in: USDOJ, May 2002). The planned removal of eight other barriers to fish passage and the installation of a fish bypass at Pierce Mill Dam as part of the Woodrow Wilson Bridge mitigation are expected to allow these species to migrate from the mouth of the creek upstream to Needwood Lake in Montgomery County, Maryland (Madaras, 2001, in USDOJ, May 2002). The removal of these barriers is also expected to enhance habitat for the catadromous species (those that migrate downriver to breed in marine waters), such as the American eel (*Anguilla rostrata*) (USDOJ, May 2002).

Urban pollution and stormwater runoff have adversely affected fish numbers and diversity in the park, but the tributaries of Rock Creek are affected more severely than the main channel.

3.12.4 Threatened and Endangered Species

3.12.4.1 Agency Involvement

Section 7 of the Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) to ensure that the actions they authorize, fund, or carry out will not jeopardize species or critical habitat listed as threatened or endangered under the Endangered Species Act. NMFS has jurisdiction over most marine species, including sea turtles and most marine mammals. The USFWS has jurisdiction over terrestrial species, certain marine mammal species, and some migratory fishes.

The DC Natural Heritage Program has not identified any rare, threatened, or endangered species in the study area. However, sightings of several species have been recorded near the study area, as identified in Table 3.12-2.

The U.S. Fish and Wildlife Service (USFWS) determined that, with the exception of occasional transient individuals, there are no federally-listed species in the study area (see Appendix A). USFWS concluded that no Biological Assessment or further Section 7 consultation is necessary for species under its jurisdiction.

The National Marine Fisheries Service (NMFS) has jurisdiction over some aquatic species that may use the Potomac River in the study area. The only listed species that NMFS identified as potentially being in the study area is the shortnose sturgeon (see Subchapter 3.12.4.2). Coordination with NMFS is ongoing.

**Table 3.12-2
Native Potomac River Species**

Common Name	Scientific Name	Last Recorded Observation	DC Conservation Status Rank
Triangle floater	<i>Alasmidonta undulate</i>	Unknown	Possibly extirpated
Yellow lampmussel	<i>Lampsilis cariosa</i>	Unknown	Possibly extirpated
Virginia mallow	<i>Sida hermaphrodita</i>	1899	Presumed extirpated
Lancater's umbrella sedge, also Many-flowered umbrella sedge	<i>Cyperus lancastris</i>	1900	Imperiled
Greater siren	<i>Siren lacertian</i>	Pre-1902	Possibly extirpated
Spotfin killifish	<i>Fundulus luciae</i>	1911	N/A
A fly	<i>Pelastoneurus comatus</i>	1991	Unranked
A fly	<i>Pelastoneurus potomacus</i>	1991	Unranked
Rigid sedge	<i>Carex tetanica</i>	1995	Presumed extirpated
White trout-lily	<i>Erythronium albidum</i>	1995	Imperiled
Field chickweed, also Mouse-ear chickweed	<i>Cerastium arvense</i>	1998	Critically imperiled
Sources: NatureServe, 2003; letter from Christina Wright in Appendix A.			

3.12.4.2 Sturgeons

The portion of the Potomac River included in the study area may be critical habitat for two sturgeon species: the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*A. oxyrinchus*). Both species are benthic and anadromous. Although they have high fecundity, they do not reach reproductive maturity for several years, which makes them vulnerable to rapid population decline. While sturgeon populations were abundant and stable in the past, overfishing depleted local stocks in the late 19th century, and there are few left in the Chesapeake Bay estuary (Secor, 2002).

On March 11, 1967, the USFWS listed the shortnose sturgeon as endangered under the Endangered Species Preservation Act. NMFS took over jurisdiction of the listed species in 1974 following the passage of the Endangered Species Act in 1973 (FHWA, March 2000). Of the 19 Distinct Population Segments identified in NMFS's Final Recovery Plan for the shortnose sturgeon, the Chesapeake Bay segment includes those that may spawn in the Potomac River. Although the shortnose sturgeon is extremely rare in the Potomac River, there have been recent collections of a total of six adults: three at the mouth of Potomac Creek in 1996 and 2002, one near the mouth of the St. Mary's River in 1998, and two at the mouth of the river near Ophelia, Virginia, in 2000 and 2001 (Welsh *et al.*, 1999 in FHWA, March 2000; Appendix A, letter from M. Colligan, NMFS, 2003).

The Atlantic sturgeon is not listed as endangered under the Endangered Species Act, but its populations have been the subject of concern. The Atlantic States Marine Fisheries Commission approved a Fishery Management Plan for the Atlantic sturgeon in 1990. The plan requires states to implement measures for sustainable harvests (NOAA, 2003). There are no sport fisheries for Atlantic sturgeon.

Both sturgeons require high DO concentrations, low salinity, rocky bottoms during the spawning season, and relatively warm water temperatures. Shortnose sturgeons spend more time in brackish waters than do other sturgeon species. The best spawning location for shortnose sturgeon in the Potomac River is most likely just downstream from Little Falls (FHWA, March 2000), which is a few miles upstream from the study area. The optimal spawning season is from late March through April, when water temperatures are ideal at 48-64 °F (9-18 °C) (FHWA, March 2000). Fertilized eggs are deposited on the benthos and affix to rocky bottom substrate; eggs and recent hatchlings are most vulnerable from late spring to early summer. Notwithstanding the effects of human activities on environmental conditions of the Potomac River, it is likely that shortnose sturgeon migrate up the Potomac River, passing the study area (and possibly entering it) on their way to the Little Falls spawning site. Also, juveniles and non-spawning adults may move upstream to feed from April through early December, when water temperatures are typically above 45 °F (7 °C) (FHWA, March 2000). The young of the year and most juveniles (the most at-risk stages in the life history) stay in the cooler, deep channels of the river where they forage mostly on amphipods, isopods, and insect larvae, as opposed to mollusks, which would be found in shallow, shoal areas (FHWA, March 2000). Likewise, during a spawning run, prespawning adults also tend to concentrate in the deep channels, as they prefer the warmer water temperatures during the winter.

3.12.4.3 Amphipods

The Hay's spring amphipod (*Stygobromus hayi*), endemic to Rock Creek Park and federally listed as endangered in 1982, was discovered in a spring located on the grounds of the National Zoological Park in 1938 (USDOJ, January/February 2002). It has since been found in four other springs in Rock Creek Park. Another rare species, Kenk's amphipod (also known as the Rock Creek Park groundwater amphipod, *Stygobromus kenki*), is not currently listed under the Endangered Species Act but is under consideration for listing by the USFWS. Three other *Stygobromus* species that are listed by the state of Maryland as rare or uncommon have been found in or near the park (Maryland Department of Natural Resources, 1995, in USDOJ, May 2002).

All groundwater amphipods are sensitive to environmental pollution, making the present concentration of these species an extremely rare occurrence in the Piedmont region. Their presence in the park is attributed to the long-term protection of groundwater quality afforded by the park. Threats to groundwater amphipods include alterations of groundwater flows, groundwater pollution, loss of detritus as a food source, and disturbance of spring sites (USDOJ, May 2002). Considering the altered nature and poor water quality, it would be highly unlikely for these amphipods to occur within the portion of Rock Creek Park within the study area.

3.13 Hazardous Materials

A Phase I Environmental Site Assessment (ESA) was conducted for this study in spring 2002 and updated in 2003. The objective of a Phase I ESA is to assess a project area for the potential presence of environmental contamination. This site assessment was conducted in general accordance with American Society for Testing and Materials (ASTM) standard E-1527-00 and other industry standard practices, as part of a due diligence effort for anticipated construction activities in the project area. Therefore, the ESA is focused on the freeway/highway interchange and roadway areas where access improvements would occur.

The site assessment included:

- A review of selected federal, state, and local regulatory agency databases for listings of the project area and for sites within selected radii around the project area (EDR, 2002).
- Limited reconnaissance of the project area on May 2, 2002 to make observations for the evidence of past or present releases, or threats of releases, of oil and hazardous materials (OHM) to the environment.
- A reconnaissance of properties within the study area, to ascertain property uses.
- A review of environmental data associated with on-going expansion of the Kennedy Center parking garages (Apex Environmental, 2002; Specialized Engineering, 2003).

The roadway interchanges and expressway areas within the study area are bordered by memorial buildings (The Kennedy Center and Lincoln Memorial), mixed-use complexes (Watergate Complex), and institutional and industrial buildings (Saudi Arabian Embassy, West Power Plant). The land where access improvements would occur is already highly urbanized; consequently, hazardous substances that are typical of urban settings, such as heavy metals and polynuclear aromatic hydrocarbons (PAHs), are likely to be encountered in soils throughout the study area during construction of the proposed access improvements. As part of this investigation, available federal and District records and databases pertaining to the site and surrounding properties were researched, along with available historical information documenting past industrial activity in the study area and environmental data provided by the Kennedy Center, as discussed further below.

3.13.1 District and Federal Records Database Search

The federal databases reviewed and associated search radii are listed in Table 3.13-1. The District databases are listed in Table 3.13-2. The District databases are maintained by the DC Department of Consumer and Regulatory Affairs and include underground storage tanks (USTs) and leaking underground storage tanks (LUSTs), as well as other potential contamination sources. In addition, a proprietary database, namely the Former Manufactured Gas (coal gas) Sites, was also reviewed (radius of 1 mile) (EDR, 2002).

**Table 3.13-1
Federal Database Review**

Database	Radius Searched
National Priorities List (NPL)	1 mile
Proposed NPL	1 mile
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	½ mile
CERCLIS No Further Remedial Action Planned	¼ mile
Corrective Action Report	1 mile
Resource Conservation and Recovery Information System ³ (RCRIS) Treatment, Storage and Disposal Sites	½ mile
RCRIS Large Quantity Generators	¼ mile
RCRIS Small Quantity Generators	¼ mile
Biennial Reporting System	1 mile
Emergency Response Notification System	Target Property
Superfund Consent Decrees	1 mile
Delisted NPL	1 mile
Superfund Records of Decision	1 mile
Facility Index System/Facility Identification Initiative Program Summary Report	Target Property
Hazardous Materials Information Reporting System – spill incidents reported to the Department of Transportation	Target Property
Material Licensing Tracking System – sites using or processing radioactive materials subject to licensing requirements	Target Property
Mines Master Index File	¼ mile
Federal Superfund Liens (NPL Liens)	Target Property
PCB (Polychlorinated Biphenyl) Activity Database System	Target Property
RCRA Administrative Action Tracking System	Target Property
Toxic Chemical Release Inventory System	Target Property
Toxic Substances Control Act – identifies manufacturers and importers of TSCA substances	Target Property
Federal Insecticide, Fungicide, and Rodenticide Act	Target Property ⁴
<p>¹ The Comprehensive Environmental Response, Compensation, and Liability Information System, No Further Remedial Action Planned database is a compilation by the USEPA of the sites which have been removed from CERCLIS for a variety of reasons, including sites where the contamination was either removed quickly, or was not serious enough to require Federal Superfund action or NPL consideration.</p> <p>² The RCRA Corrective Action Reports database identifies hazardous waste handlers, which are undertaking or have undertaken RCRA corrective action activities.</p> <p>³ The USEPA's Resource Conservation and Recovery Information System Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRIS Facilities database is a compilation by USEPA of reporting facilities that generate, store, transport, treat, or dispose of hazardous waste.</p> <p>⁴ An "Orphan Summary" (sites not mapped by Environmental Data Registry due to poor or inadequate address information) was also conducted, and no adjacent sites were listed as "orphan sites".</p>	

**Table 3.13-2
District of Columbia Database Review**

Database	Radius Searched
Registered Underground Storage Tanks	¼ mile
Leaking Underground Storage Tanks	½ mile
Registered Aboveground Storage Tanks	Target Property
Pollution Complaint Database	Target Property
Comprehensive Environmental Data System – Virginia Water Protection Permits, point discharge permits, and non-point discharge permits	Target Property
State Hazardous Waste Sites – District of Columbia waste sites requiring assessment and/or remediation	1 mile
District of Columbia Landfill – Solid Waste Management facilities	½ mile

The database search identified 13 UST sites, two former coal gas sites, three LUST sites, and four Resource Conservation and Recovery Act (RCRA) hazardous waste small quantity generator (SQG) sites within or adjacent to the project area. Of these sites, five UST sites, one LUST site, one former coal gas site, and two RCRA SQG sites are located within or immediately adjacent to proposed roadway and pedestrian access improvements associated with Alternatives 4 and 4V. This subset of sites is listed in Table 3.13-3, along with the potentially-affected access improvement areas. As Table 3.13-3 indicates, the sites potentially affecting access improvements are located in the North and Center Sectors of the study area.

**Table 3.13-3
Sites Located Within Study Area**

Site Type	Street Address	KCAI Study Sector	Alternative 4	Alternative 4V
Exxon Service Station: UST and RCRA SQG	2708 Virginia Avenue, NW	North Sector	Intersection of I Street, 27 th Street, and Virginia Avenue to be reconstructed.	Intersection of I Street, 27 th Street, and Virginia Avenue to be reconstructed.
Sunoco Service Station: LUST (gasoline, diesel), UST and RCRA SQG	2643 Virginia Avenue, NW	North Sector	Not directly affected by this alternative.	Reconstruction of entrance ramp to Potomac Freeway from 27 th Street.
Washington Gas Light Company: Former Coal Gas Site	610 26 th Street, NW ¹	Center Sector	Reconstruction of New Hampshire Avenue.	Reconstruction of New Hampshire Avenue.
Former Watergate Development: UST	600 New Hampshire Avenue, NW	Center Sector	Not directly affected by this alternative.	Reconstruction of New Hampshire Avenue and F Street.
Plaza Condominium: UST	800 25 th Street, NW	Center Sector	Reconstruction of Potomac Freeway north of Juarez Circle; pedestrian improvements at Juarez Circle.	Reconstruction of New Hampshire Avenue and Potomac Freeway near Juarez Circle; pedestrian improvements at Juarez Circle.
Doubletree Hotel: UST	801 New Hampshire Avenue, NW	Center Sector	Reconstruction of Potomac Freeway north of Juarez Circle; pedestrian improvements at Juarez Circle.	Reconstruction of New Hampshire Avenue and Potomac Freeway near Juarez Circle; pedestrian improvements at Juarez Circle.
1 The coal gas site is bordered to the west by the extension of 27 th Street, to the south by F Street, to the southeast by New Hampshire Avenue, to the northeast by Virginia Avenue, and to the north by H Street.				

The likely hazardous substances that may be encountered during roadway or trail construction work include metals and fossil fuel compounds, such as benzene, toluene, ethylbenzene, xylenes (BTEX compounds), and PAHs. These substances are commonly found in urban environments because of the extensive past and present uses of fossil fuels (coal, petroleum) for heating buildings, paving roads, and fueling motor vehicles and past industrial activities (i.e., paving, brewery, and manufactured gas operations). U.S. EPA Region III risk-based concentrations (RBCs) for some of the more common fuel compounds are listed in Table 3.13-4. These RBCs are based on default exposure and assumptions about human health risks, and are typically used to screen soils for potential use as fill material for industrial or residential development work.

**Table 3.13-4
U.S. EPA Region III Risk-based Concentrations (RBCs) of Selected Fuel Compounds for Soils Under Residential and Industrial Use Scenarios**

Hazardous Substance	RBC for Residential Use (mg/kg)	RBC for Industrial Use (mg/kg)
Benzene	10.2	50.2
Ethylbenzene	7,800	100,000
Toluene	16,000	200,000
Xylenes	16,000	200,000
Naphthalene (a PAH)	1,600	20,000
2-Methylnaphthalene (a PAH)	1,600	20,000
Benzo(a)pyrene (a PAH)	0.087	0.39
Benz(a)anthracene (a PAH)	0.87	3.9
Fluorene (a PAH)	3,100	41,000
Arsenic	0.43	1.9
Antimony	31	410
Lead ¹	400	1,000
1 Values for lead are based on U.S. EPA Soil Lead Guidance; they are not U.S. EPA Region III RBC values		

3.13.2 Historical Overview of the Study Area

As discussed in Subchapter 3.7, the study area near the Potomac River was predominantly industrial until the mid 1900s. The waterfront served as a shipping and receiving area for coal, limestone, and all types of goods of the day that were transported by water.

Until the end of the 19th century, local lime kilns, most located in the North Sector, used limestone that was transported along the C&O Canal from Harper's Ferry in the manufacture of plaster. The plaster was transported back up the C&O Canal. The area also had coal dealers who used the wharves along the Potomac River (Sherwood, 1978).

The Washington Gas Light Company had a defining presence in the Center Sector of the study area from the 1850s to 1957. The offices and coal-gas manufacturing facility of Washington Gas Light Company were located along the Potomac River south of H Street and east of Virginia and New Hampshire Avenues and north of F Street. Washington Gas Light Company dismantled the manufacturing plant in the late 1940s to the early 1950s. The Watergate Complex is currently located on the former gas-manufacturing site.

Two breweries were located in the Center Sector of the study area. The more famous of the two -- the Heurich Brewery -- was located at the southeast corner of D and 26th Streets, an area now occupied by the Kennedy Center and the adjacent Potomac Freeway. The Abner Drury Brewery (and later Abner soft drinks) was located south of the intersection of G Street and Virginia Avenue and west of 25th Street, in an area now occupied by the Potomac Freeway and Columbia Plaza. This brewery and beer-bottling plant remained operational (except during prohibition) until 1960. The 1928 and 1959 Sandborn maps reviewed for this project also depict US Naval housing and a hospital (which later became US Government offices) south of the Abner soft drinks facility on the other side of F Street between 24th and 25th Streets (EDR, 2002). The Columbia Plaza and Potomac Freeway now occupy this former US Navy site. A paving works asphalt plant and coal storage warehouse was located just west of the Heurich Brewery on the other side of 26th Street south of D Street, an area now occupied by the Kennedy Center. A cement products company was later located on the property. In the 1930s, Riverside Stadium was constructed on the site. Riverside Stadium was removed in the late 1950s, and roadways and ramps associated with the Roosevelt Bridge were constructed.

3.13.3 Review of Environmental Data for Kennedy Center Parking Garage Expansion

Soil contaminated with fossil fuel compounds, such as those listed above in Table 3.13-4, was found during excavation work associated with the Kennedy Center parking garage expansion in 2002 and 2003. The contaminants and concentration levels encountered were indicative of coal tars from the former coal gas site located north of the Center in the Watergate Complex. Tables 3.13-5 and 3.13-6 list soil and groundwater concentrations, respectively, for those BTEX and PAH compounds listed in Table 3.13-4. Also shown for reference only are the U.S. EPA Region III RBCs for those fuel compounds.

**Table 3.13-5
Selected Fuel Compounds Detected in Kennedy Center Soils**

Hazardous Substances	Concentration Range for Parking Garage Expansion (mg/kg) (Apex 2002)	RBC for Industrial Use (mg/kg) ²
Benzene	BQL ¹ -15	50.2
Ethylbenzene	BQL-56	100,000
Toluene	BQL-18	200,000
Xylenes	BQL-200	200,000
Naphthalene (a PAH)	BQL-10,000	20,000
2-Methylnaphthalene (a PAH)	BQL-2,500	20,000
Benzo(a)pyrene (a PAH)	BQL-1,100	0.39
Benzo(a)anthracene (a PAH)	BQL-1,300	3.9
Fluorene (a PAH)	BQL-1,800	41,000

1. BQL indicates a concentration below the quantitation limit for analysis of the sample
2. Industrial RBC Value selected for reference only, since the site is not used for residential purposes.

**Table 3.13-6
Selected Fuel Compounds Detected in Groundwater from the Kennedy Center**

Hazardous Substances	Groundwater Concentration Near Northern Parking Garage Expansion (µg/kg) (Apex 2002)	Groundwater Concentration Near Southern Parking Garage Expansion (µg/kg) (Apex 2002)	RBC for Tap Water Use (µg/kg) ¹
Benzene	1,470	ND ³	50.2
Ethylbenzene	1,140	ND	100,000
Toluene	700	ND	200,000
Xylenes	3,150	ND	200,000
Naphthalene (a PAH)	1,000-9,100	ND	6.5
2-Methylnaphthalene (a PAH)	200	NA ⁴	20,000
Benzo(a)pyrene (a PAH)	BQL ²	NA	0.39
Benz(a)anthracene (a PAH)	BQL	NA	3.9
Fluorene (a PAH)	120	NA	41,000
1 Tap water RBC is used only for reference. Groundwater beneath the Kennedy Center is not used for drinking water; therefore, tapwater RBCs are not directly applicable screening criteria. 2 BQL = Below quantitation limit for analysis of the sample. 3 ND = Not detected above the practical quantitation limit 4 NA = Not analyzed			

3.13.4 Conclusion

Due to the past industrial and current urban activities within and adjacent to the study area, most of the soils that would be contacted during construction of the proposed access improvements likely contain fossil fuel compounds, such as BTEX and PAHs, and metals at varying concentrations. Subchapter 4.13 discusses the potential environmental impact from roadway and trail improvement activities and possible mitigation measures to be taken to minimize them.

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