4.2.3.b Travel Time

Travel time studies were performed along the MacArthur, Foxhall and Canal corridor to estimate the roadway level of service during the peak hours. Both formal and informal surveys were performed on various days of the week and times of the year. Travel times varied substantially; which indicates that delays, queues and travel speed are not consistent along this corridor. This is partially explained by the fact that the **roadway** network is over saturated and any small stoppage or delay dominos and multiplies through the corridor. This is evidenced by the example that on some occasions, the intersection at Foxhall and MacArthur could be cleared in one signal cycle while on other occasions it took three or four cycles.

On average, the data indicated a corridor travel speed of 9.6 to 12.8 kilometers per hour (km/h) (six to eight miles per hour (mph)). Based on the 1994 Highway Capacity Manual, a principal arterial with an average travel speed of 20.8 km/h (13 mph) or less has a LOS F. LOS F characterizes arterial flow at extremely low speeds below one-third to one-fourth of the free flow speed. Intersections are congested with high delays and extensive queuing.

Alternative 2 would increase travel time because of introducing another signalized intersection. The over all increase in delay is estimated at 10 to 15 seconds based upon assumed signal timing. This increase is very small compared to the overall corridor travel time. Alternative 2A would not affect the a.m. peak hour traffic flow**, since traffic can still use the Prospect Street entrance, unlike with Alternative 2.** Again the p.m. peak hour traffic would be minimally disrupted causing only a slight increase in travel time. Alternative 3B and 3H have lesser impacts since they don't require a traffic signal. It is estimated these alternatives may increase travel time about 6 to 10 seconds.

See Chapter 5 – "Additional Traffic Analysis on the Preferred Alternative " for detailed comparison of travel time between the Preferred Alternative and the No Build.

4.2.3.c Queuing Analysis

For the DEIS, queuing analysis was considered for the new signalized intersection, proposed under Alternatives 2 and 2A. The queue at the Canal Road/South Entrance intersection for Alternatives 2 was estimated for 1996 using the Signalized Intersection Capacity Analysis Program (SICAP) model. This showed an average morning peak hour eastbound queue of 55 autos. The queue, in this case, was equivalent to the number of vehicles who would otherwise have progressed through the intersection had there been no traffic signal; it represents a cumulative total for the entire hour. The model also showed an afternoon peak hour average queue westbound of 50 autos. These average queue lengths would be exceeded about half of the time. Thus the cumulative maximum queues for the duration of the peak hours would be about 110 and 100 autos respectively.

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TABLE 4-6

Intersection Summary of Levels of Service/Delay

LOCATION		NO BUILD			BUILD 2/3B/3H		BUILD 2A		BUILD 2A-MODIFIED		CYCLE LENGTHS		
											DEIS	2A-Mod.	
		1993	1996	2016	1996	2016	1996	2016	1996	2016	Alts.	1996	2016
MacArthur Blvd. & Foxhall Road	AM	*B/7.8*	*B/7.8*	*B/10.7*	*B/8.6*	*B/11.7*	*B/8/1*	*B/10.8*	*B/13.4*	*C/16.1*	*70*	*70*	*100*
	PM	*B/9.3*	*B/9.4*	*B/11.0*	*B/9.8*	*B/11.8*	*B/9.4*	*B/11.1*	*C/15.1*	*C/18.0*	*90*	*90*	*90*
Canal Road & Foxahall Road	AM	*D/26.2*	*D/31.8*	*	*	*	*D/38.3*	*	*	*	*90*	*90*	*130*
	PM	*	*	*	*	*	*	*	*	*	*90*	*90*	*90*
Canal Road & G.U. Entrance	AM	*N/A*	*N/A*	*N/A*	*D/29.0*	*	*D/29.2*	*	*B/12.8*	*	*120*	*120*	*130*
	PM	*N/A*	*N/A*	*N/A*	*	*	*D/33.7*	*	*	*	*120*	*90*	*100*
Canal Road & Whitehurst Freeway	AM	*	*	*	*	*	*	*	*B/12.6*	*B/10.4*	*120*	*120*	*130*
	PM	*E/56.0*	*	*	*	*	*	*	*	*	*90*	*90*	*100*
Canal Road & Key Bridge	AM	*E/45.6*	*E/51.1*	*	*E/51.6*	*	*E/52.0*	*	*	*	*80*	*120*	*130*
	PM	*	*	*	*	*	*	*	*	*	*90*	*90*	*100*
M Street & 34th Streets	AM	*B/9.1*	*B/9.5*	*B/13.6*	*B/8.8*	*B/11.6*	*B/9.4*	*B/13.5*	*B/9.4*	*B/13.5*	*80*	*80*	*80*
	PM	*	*	*	*	*	*	*	*	*	*90*	*90*	*90*
Reservoir Road & Foxhall Road	AM	*	*	*	*	*	*F/60.4*	*	*F/60.4*	*	*120*	*120*	*120*
	PM	*	*	*	*	*	*	*	*	*	*90*	*90*	*120*
Reservoir Road & 35th Street	AM	*D/39.7*	*	*	*D/34.2*	*	*D/32.8*	*	*D/32.8*	*	*80*	*80*	*80*
	PM	*	*	*	*	*	*	*	*	*	*80*	*80*	*80*

* = Intersection capacity exceeds F LOS; this means the volume-to-capacity (V/C) ratio is greater than 1.2 ***for at least one approach.***

Notes: Existing intersection signal timings and geometrics remain constant throughout the analysis, ***except that the Preferred Alternative has been added since DEIS. The HCS LOS of the Preferred Alternative is shown for comparison. Year 1996 also was maintained for comparison purposes. Intersections at 34th and 35th Streets assume same signal timings and results for Alternative 2A-Modified as under Alternative 2A. Some phases of signal timings are <u>not</u> identical between 2A and 2A-Modified. See NETSIM summary in Chapter 5 for detailed systems analysis results between No Build and Alternative 2A-Modified.***

Subsequent to the DEIS, agencies and the public expressed concerns over many categories including the desire to have more traffic flow studies prepared. The results of the network-type analysis that includes timing optimization or simulation, appears in Chapter 5.

4.2.3.d Weaving Analysis

No weaving occurs under the Preferred Alternative, nor Alternatives 2 or 2A. Eastbound traffic desiring to turn left into the entrance has a stacking lane. Eastbound traffic exiting the University has a signal (when activated) to access either lane of Canal Road. Eastbound traffic at the Whitehurst Freeway entrance would be permitted to remain in two lanes for through movement. Westbound traffic exiting the University at the current (and to remain) exit has a signal at the new entrance to provide a controlled right turn opportunity to access onto either lane of Canal Road. [Note: "Weaving" occurs at ramps, or where there is no dedicated lane or signal control device for turning traffic or traffic entering a flow.]

For both Alternatives 3B and 3H, the interchange concepts, the traffic from downstream signalized intersections would back up to the on-ramps from the University to Canal Road during the peak periods in the peak directions. This would prevent free flow of traffic from the ramps onto Canal Road. However, because this situation is not at all unusual in the metropolitan area, it is expected that driver behavior would accommodate stop-and-go merging into the arterial road without problems.

Westbound on Canal Road, for both Alternatives 3B and 3H, a weaving section would be created from the on ramp onto the right-hand lane of Canal Road toward the intersection of Canal Road and Foxhall Road. Traffic entering westbound Canal Road that wanted to continue westbound on Canal Road would have to weave from the right lane into the left lane to reach the left-turn lane that takes traffic to westbound Canal Road. For Alternative 3B, the on ramp enters westbound Canal Road only about 30.5 meters (100 feet) from the beginning of the left-turn lane at this intersection. For Alternative 3H, the on ramp enters westbound Canal Road just at about the beginning of the left-turn lane for the intersection. This weaving movement could prove difficult, especially under backed-up peak-period traffic conditions, and could even prove to be a safety problem.

Eastbound on Canal Road, the two grade-separated alternatives face different weaving and merging problems. With Alternative 3B, traffic from the interchange entering eastbound Canal Road enters onto the left-hand lane about 152.4 meters (500 feet) from the Whitehurst Freeway intersection. Since this lane is for through or right turn traffic at Whitehurst, this should present no problem for drivers going in either direction at this intersection.

For Alternative 3H, the situation is more difficult. Traffic from the interchange ramp to eastbound Canal Road enters onto the right-hand lane of Canal Road only about 91.4 meters (300 feet) from the Whitehurst Freeway intersection. Since the right-hand lane is for right turns only at Whitehurst, traffic continuing east at this intersection to Key Bridge or M Street would have to weave into the left-hand through lane. During peak hours this lane is often backed up at this point.

4.3 AIR, NOISE, AND ENERGY IMPACTS

4.3.1 Air Quality

Note: The Air Quality Analysis was entirely redone for the FEIS. Based on additional consultation subsequent to the DEIS with the Air Resources Management Division of the District of Columbia, the base concentrations were revised. (The relative comparison among the alternatives remains the same. There continues to be no exceedance of standards under any alternative.)

4.3.1.a Introduction and Methodology

The air quality analysis for this project was prepared in accordance with procedures contained in the Federal Aid Highway Program Manual (Vol. 7, Chapter 7, Section 9). **This section describes air quality impacts associated with operation of the Build Alternatives.**

A microscale dispersion analysis of carbon monoxide (CO) emissions was used to predict the impact of the proposed improvements to the Georgetown University Entrance at Canal Road on future air quality in the project vicinity. The microscale analysis was accomplished using the MOBILE5a Vehicle Emission Rate Model and CAL3QHC Intersection Dispersion Model. According to the FHWA these programs are the appropriate computer models to use when completing a NEPA document for a detailed and complex project, such as the Proposed Action. In addition to evaluating air quality impacts at this intersection, impacts were also evaluated at the Foxhall Road/Canal Road and Foxhall Road/MacArthur Boulevard/44th Street intersections.

Of the three pollutants associated with motor vehicle operation, only carbon monoxide impacts are quantified in this analysis. As mentioned in Chapter 3, although the Metropolitan Washington area has been designated an ozone non-attainment area, ozone is addressed as a regional issue rather than at the specific project level. The project area currently meets National Ambient Air Quality Standards (NAAQSs) for particulate matter; therefore, no further discussions regarding particulate matter are provided.

4.3.1.b Carbon Monoxide Analysis

Carbon monoxide impacts associated with operation of the Build Alternatives was evaluated using the CAL3QHC line source dispersion model. This model is a consolidation of the CALINE 3 line source dispersion model and an algorithm that internally estimates the length of queues formed by idling vehicles at signalized intersections. Input parameters required to run CAL3QHC include traffic volumes, free flow and idling emission rates, number of moving lanes in each link and the signal timing of each intersection. A background concentration of 2 parts per million (ppm) was used.

Carbon monoxide levels were modeled based on p.m. peak-hour traffic volumes and flow. Carbon monoxide concentrations were modeled for existing condition (i.e., 1998), year 2016

under the No Build Alternative, and year 2016 assuming operation of Build Alternatives 2,2A, 3B and 3H. (Because the Preferred Alternative, 2A-Modified promotes better traffic flow and higher speeds than the original configuration under Alternative 2A, Alternative 2A represents a worse case than Alternative 2A-Modified for air quality purposes. Because Alternative 2A did not violate standards or require mitigation for air quality, no additional modeling of the Preferred Alternative was determined necessary.)

Carbon monoxide emission rates used in the CAL3QHC model were calculated using the U.S. Environmental Protection Agency MOBILE5a emission factor program. Input parameters were identical to those used by the Metropolitan Washington Council of Governments for summer ozone emission calculations; however, winter temperatures were used and the effects of reformulated gasoline were not modeled. Idle emission factors were calculated using methodologies defined in the *MOBILE5a Information Sheet #2: Estimating Idle Emission Factors Using MOBILE5a, July 30, 1993.*

4.3.1.c "Worst Case" Location Determination

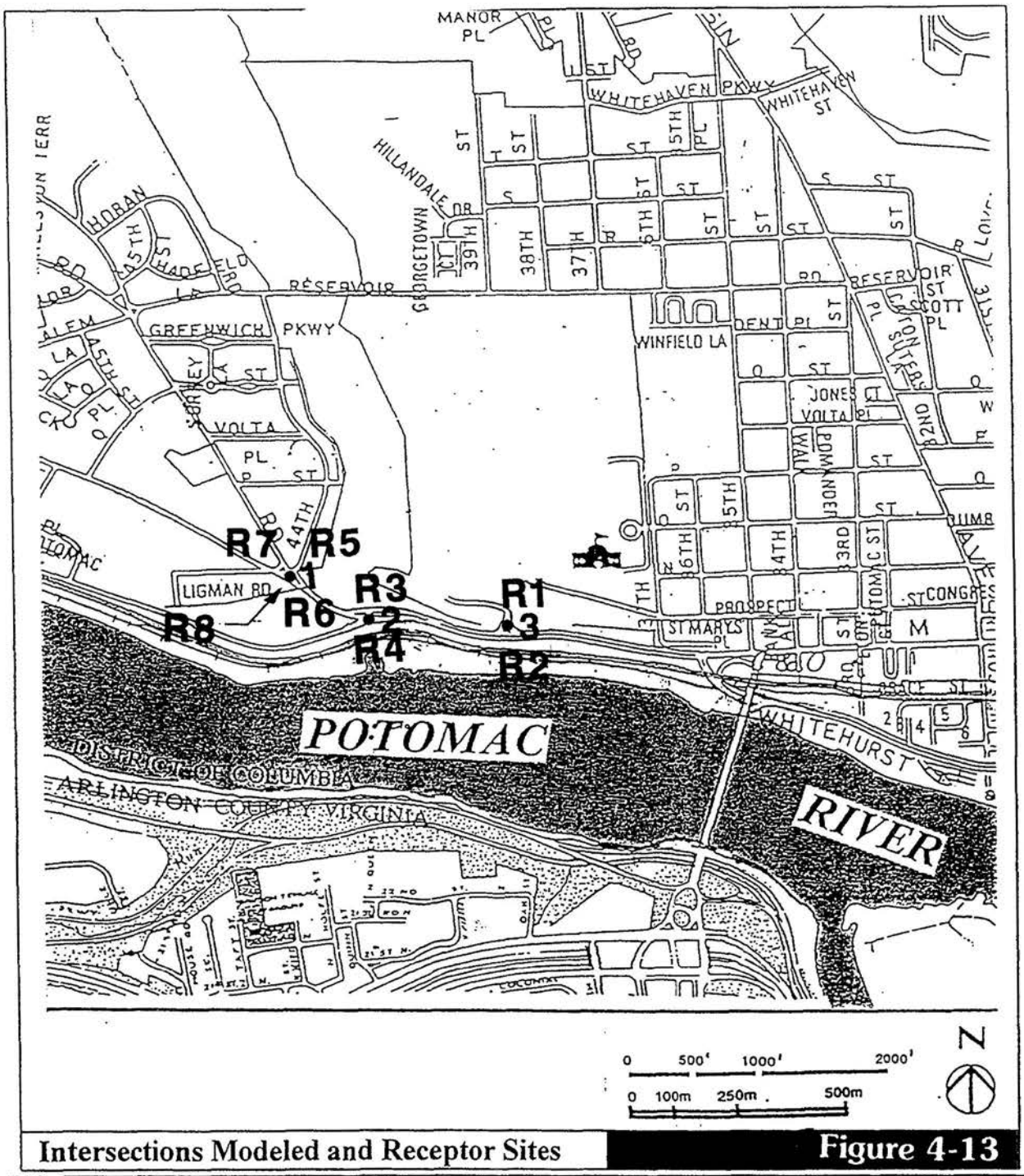
CO concentrations were calculated for a "Worst Case" site for the existing year 1998 and future-year 2016. A "Worst Case" receptor is defined theoretically as a location where the highest CO concentrations are likely to occur and where the general public is likely to have continuous access.

For each alternative, carbon monoxide concentrations were estimated at eight locations within the study area. Receptor sites are those locations where the highest CO concentrations are likely to occur and where the general public is likely to have continuous access (e.g., sidewalks, residences, etc.). In this case, sidewalks adjacent to each intersection were assumed to be "worst case" receptor sites. Receptor sites are identified in **Table 4-7** and shown in **Figure 4-13**.

One set of receptors was used to model CO concentrations under both existing (1998) and future-year (2016) conditions to facilitate comparison. **Because the configuration of the Canal Road/Georgetown University entrance would vary between build alternatives, receptor locations were modified for year 2016. In general, the receptors are located on the west, east and south corners of the signaled intersection.**

4.3.1.d Air Quality Impacts

The National Ambient Air Quality Standards (NAAQS) include primary standards, designed to protect public health, and secondary standards, designed to protect public welfare from effects such as air pollution damage to property and vegetation. For the pollutants addressed in this study, the primary and secondary standards are identical (see Table 3-7). The peak 1-hour CO standard is 35 ppm; the 8-hour standard is 9 ppm.



Intersections Modeled and Receptor Sites **Figure 4-13**

Intersections Modeled (•#)	Receptor Sites (R#)
1. Foxhall Rd./MacArthur Blvd./44th St. 2. Foxhall Rd. and Canal Rd. 3. Canal Rd. and Entrance	1. NE corner of Entrance & Canal Rd. 2. SE corner of Entrance & Canal Rd. 3. NE corner of Canal Rd. & Foxhall Rd. 4. SE corner of Canal Rd. & Foxhall Rd. 5. NE corner of Foxhall Rd. & 44th St. 6. SE corner of Foxhall Rd. & 44th St. 7. South side of 44th St. between Foxhall Rd. and MacArthur Blvd. 8. South side of MacArthur Blvd. at the 44th St. intersection

TABLE 4-7

Air Quality Sensitive Receptor Locations

SITE	LOCATION
1.	Sidewalk at the northeast corner of the South Access Road/Canal Road intersection.
2.	Sidewalk at the southeast corner of the South Access Road/Canal Road intersection.
3.	Sidewalk at the northeast corner of the Canal Road/Foxhall Road intersection.
4.	Sidewalk at the southeast corner of the Canal Road/Foxhall Road intersection.
5.	Sidewalk at the northeast corner of the Foxhall Road/44th Street intersection.
6.	Sidewalk at the southeast corner of the Foxhall Road/44th Street intersection.
7.	Sidewalk on the south side of 44th Street between Foxhall Road and MacArthur Road.
8.	Sidewalk on the south side of MacArthur Road at the 44th Street intersection.

Note: **In the DEIS, five different locations were analyzed. The locations analyzed in the FEIS have higher CO concentrations than those in the DEIS. The locations in the DEIS were sites that had high concentrations of people, not necessarily highest concentrations of CO.**

***Table 4-8* shows carbon monoxide concentrations at each of the eight receptors under existing, 1998 and 2016 No Build, and 2016 Alternatives 2, 2A, 3B, and 3H conditions. (Build Alternative 2A was used instead of Alternative 2A-Modified since Alternative 2A represents the worst case scenario.)**

TABLE 4 -8

Carbon Monoxide Concentrations at Sensitive Receptor Sites
In Parts Per Million

SITE	1998	2016 ALTERNATIVE				
	Exist-ing	No Build	2	2A	3B	3H
1.	2.0	2.1	4.5	4.0	1.3	9.1
2.	2.6	2.2	3.3	3.1	1.6	8.5
3.	3.4	3.3	3.3	3.3	3.3	3.3
4.	2.3	2.5	2.5	2.5	2.5	2.5
5.	2.0	3.3	3.4	5.6	3.4	3.4
6.	2.1	6.3	6.2	6.5	6.2	6.2
7.	4.7	5.5	5.9	5.5	5.9	5.9
8.	2.8	3.3	3.9	3.4	3.9	3.9

Note: ***Table shows revised CO concentrations from DEIS.*** *Alternative 2A represents the worst case scenario for Alternative 2A – Modified.*

Alternative 2A was used instead of Alternative 2A-Modified because Alternative 2A is a worst case scenario of the modifications. Build Alternative 2A involves reconfiguring the existing Georgetown University Main Academic Campus entrance and installing a traffic signal at the entrance road and Canal Road intersection. The improved traffic flow along Canal Road that is provided under 2A-Modified would renders it superior to Alternative 2A in air quality also.

As shown, peak-hour CO levels are below both the one-hour (35 ppm) and eight-hour (9 ppm) NAAQS. Eight-hour levels were not calculated because the one-hour concentrations were below 9 ppm at all receptors under each condition.

In general, the concentrations decrease between existing conditions and 2016 No Build conditions primarily because of a decrease in overall vehicle emission rates from 1998 to 2016. With the exception of Sites 6 and 7, projected traffic volume increases do not outweigh the estimated reduction in emission rates; thus, CO concentrations are lower than under existing conditions. Increases in CO levels at Sites 6 and 7 are most likely a result of increased vehicle queuing at the Foxhall Road/44th Street intersection. However, a 0.2 ppm increase is considered negligible.

For Alternative 2A, the highest increase in CO concentrations (i.e., 1.9 ppm) would occur at Site 2. Site 2 is located at the sidewalk on the southeast corner of the entrance/Canal Road intersection. Under Alternative 2A, the revised entrance would result in the receptor location being surrounded on three sides by roadways. Additionally, increased eastbound queuing on Canal Road during the p.m. peak hour caused by operation of the proposed traffic signal would contribute to higher peak-hour CO levels. However, year 2016 CO levels would not exceed the NAAQSs under either the No Build or Alternative 2A options.

While the receptor sites and intersection configurations would remain the same under both alternatives, the opening of Prospect Street under Alternative 2A would reduce traffic volumes at some locations within the study area. Thus emissions and resulting CO concentrations would be higher at most sites than under Alternative 2.

Carbon monoxide levels and Sites 1 and 2 would increase from those calculated under the No Build alternative. The higher CO levels would be caused by vehicles queuing along Canal Road and the Georgetown South Access Road during the red portion of each signal phase. Currently, traffic along Canal Road is free flowing in this area. CO levels along Foxhall Road and MacArthur Boulevard would increase. This would be caused by an increased number of vehicles queuing at the signalized intersections. The largest difference between alternatives would be 2.2 ppm with CO levels being higher under Alternative 2A at Site 5. CO concentrations would remain below the 9 ppm 8-hour standard at all receptor sites.

As noted, Alternative 2A represents a "worse case" scenario for the Preferred Alternative. The NAAQS would also not be exceeded under Alternative 2A-Modified.

Under Alternative 3B, the westbound lanes of Canal Road would be elevated and free flowing. Under Alternative 3H, both west and eastbound lanes of Canal Road would be depressed and free flowing. For the purpose of this discussion, it was assumed the ramp intersections with Canal Road were stop sign controlled rather than signalized.

The only change in CO levels associated with Alternatives 3B and 3H would occur at Sites 1 and 2. It was assumed that operation of the Foxhall Road/Canal Road and Foxhall Road/MacArthur Road intersections would be identical to Alternative 2. Free flowing traffic along Canal Road under Alternative 3B would reduce CO levels at both Sites 1 and 2 over that estimated under Alternatives 2 and 2A. As shown in the table, operation of the depressed sections of Canal Road under Alternative 3H would create a street canyon affect; thus, inhibiting pollutant dispersion. This is evident in the CO levels shown for Sites 1 and 2 under Alternative 3H. CO levels at Sites 1 and 2 would increase by 7.8 and 6.9 ppm, respectively, over those estimated for Alternative 3B.

Because peak hour CO levels at Site 1 (i.e., 9.1 ppm) are estimated to be greater than the 8-hour standard of 9.0 ppm for Alternative 3H, a persistence factor is used to estimate the 8-hour concentration. The value recommended by the U.S. Environmental Protection Agency for screening analyses is 0.7. Multiplying 9.2 by 0.7 would result in an 8-hour concentration of 6.37 ppm, which is below the 8-hour standard of 9 ppm.

4.3.1.e Conformity with State Implementation Plan

As mentioned in Chapter 3, the Clean Air Act and its amendments and FHWA policy require that projects comply with the State Implementation Plan (SIP) and with the Transportation Improvement Plan (TIP).

The Metropolitan Washington, as an ozone non-attainment area, has an approved State Implementation Plan (SIP). The proposed project is included in the conforming transportation plan (Plan) and also the Transportation Improvement Plan (TIP) for the region. The project is included within an approved Plan and TIP and the Federal Highway Administration has determined that both the Plan and TIP conform to the SIP. Therefore, pursuant to 23 CFR 770.9(c)(2), the project meets SIP conformity requirements.

The Preferred Alternative meets the conformity requirements listed.

4.3.2 Noise

4.3.2.a Federal Regulations

The Federal Highway Administration (FHWA) policies and procedures, as promulgated in the United States Code of Federal Regulations, 23 CFR, Part 772, served as the procedural guidelines in the analysis. Incorporated into the regulations are Noise Abatement Criteria (NAC) which are based on the type of land use and activities performed at the respective sites (presented earlier in Table 3-8). For example at sensitive noise receptor sites within a project area, noise abatement must be examined and evaluated if an equivalent steady state level of 67 dBA for an hourly period is approached or exceeded.

4.3.2.b Traffic Generated Noise Levels

Three receptors were selected as representing their surrounding area. The locations of these receptors are shown in **Figure 4-14.** Noise levels from these receptors were used to assess impacts from existing and predicted conditions of a Base Case, relative to the alternatives under consideration. All receptors are sited on the C&O Canal towpath, on the south side of the C&O Canal. Existing noise was measured at these three receptor locations.

Receptor 1: Located 152.4 m (500 ft) east of the centerline of the existing Canal Road entrance.

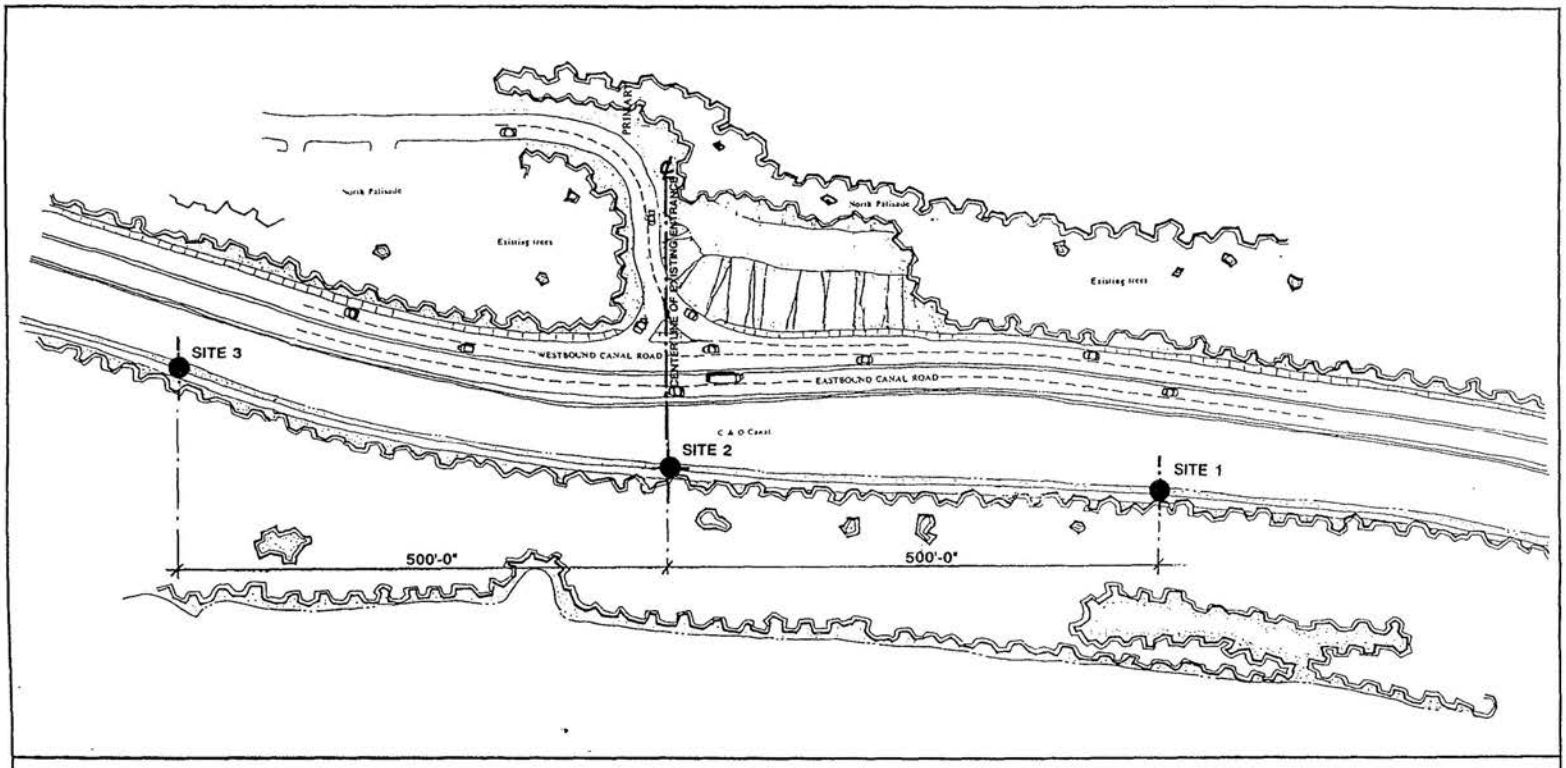
Receptor 2: Located in-line with the centerline of the existing Canal Road entrance, across the canal.

Receptor 3: Located 152.4 m (500 ft) west of the centerline of the existing Canal Road entrance.

A future Level of Service (LOS) "C", in conjunction with roadway design speeds, was assumed for noise prediction. **(Higher speeds render greater noise levels.)** The traffic noise prediction model, STAMINA 2.0, which is a FHWA approved version, was used. Predicted values are based upon such considerations as roadway configuration, traffic volumes, traffic speeds, traffic composition, and terrain. Both the No Build and Build Alternatives were analyzed. The calculated noise levels are summarized in **Table 4-9.** These predicted values were used to evaluate whether noise impacts would result from the project. Predicted noise levels for Alternative 2 represent the worst case scenario predicted noise levels for Alternative 2A **and Alternative 2A-Modified.**

4.3.2.c Noise Impact Analysis

Alternative 1, the No Build scenario, essentially would have no change in future noise levels from the current condition. Alternative 2, **2A and 2A-Modified**, the at-grade options, would have slightly lower noise levels at receivers 2 and 3 due to the LOS "C" being able to handle fewer vehicles with the at-grade geometric configuration. Alternative 3B, the westbound Canal Road elevated option, is the only alternative which violates NAC, because it exceeds 67 dBA.



Noise Sensitive Area/Receiver Site

Georgetown University Entrance Road ●

Figure 4-14

Due to traffic being elevated, a clear line of site is created to the sensitive receptors, removing the effectiveness of the parapet wall as a barrier. Alternative 3H, the Canal Road depressed option, has the lowest noise levels due to the fact that it is depressed below existing grades and, in effect, creates its own noise attenuation barriers.

TABLE 4-9

Predicted Noise Levels - dBA, L_{eq}

RECEIVER	EXISTING NOISE LEVELS	ALT. 1 NO BUILD	* ALT. 2 AT-GRADE	ALT. 3B ELEVATED	ALT. 3H DEPRESSED
1	65.2	65.4	64	67.1	58
2	64.1	64.7	61.4	67.1	54.4
3	65.2	65.4	61.5	66.4	56.9

* Predicted noise levels for Alternative 2 represent the worst case scenario predicted noise levels for Alternative 2A and **2A-Modified.**

Note: A comparison of field measured values with the STAMINA 2.0 model values can show an over prediction of the model by 2 to 4 dBA.

4.3.2.d Consideration of Abatement Measures

There are three possible ways to abate traffic noise at existing receptors: change the source, change the receptor, or change the path between the noise and the receptor.

Noise from vehicles is subject to control by regulatory authorities such as the US EPA for engine and tire noise and local law enforcement for horn and muffler noise. Traffic management measures **that have been proven** most effective in reducing noise levels include prohibition of heavy trucks and the use of lower speed limits to reduce traffic. The prohibition of heavy trucks along this route would not be practical. Since Canal Road is a primary arterial, it is not feasible nor practical to reduce traffic on this road. Geometric alterations of the roadway design would be limited due to site constraints. There is a retaining wall which separates the roadway from the C&O Canal on the south, and a steep slope and scenic palisade on the north. These adjacent land uses limit consideration of shifting Canal Road.

Alteration of the receptor (in this case the C&O Canal Towpath), moving or replacing it, is not an economically or aesthetically justifiable option for noise abatement.

The remaining options all deal with changing the noise path, essentially the line-of-sight, between the source and the receptor. This can be done by lengthening the noise path, interrupting it, or a combination of both.

Noise walls placed adjacent to the roadway would attenuate traffic related noise. These barriers are the most practical and commonly used measures. An effective barrier must break the line-of-sight and typically extends four times the perpendicular distance to the right-of-way.

The construction of noise attenuation barriers has been considered. In general, noise barriers would separate the roadway from the existing Canal and Towpath. In effect, the noise barriers would negatively impact the existing historic and scenic settings of the site. The visual quality of the historic district would be seriously compromised. Therefore, the construction of any barrier structure **has been determined** not feasible.

4.3.2.e Noise Abatement Measures to Minimize Impacts

No abatement measures are deemed reasonable or feasible to mitigate noise impacts. Future noise impacts do not warrant the implementation of noise barriers, especially in an area where the visual quality and historic setting of the site are of critical importance.

4.3.3 Energy

The construction of a new configuration of access to the University will affect energy consumption because it will cause changes in the levels of energy consumption by vehicles. The change in energy consumption is related to the change in travel distance and travel time to the university.

The difference among the Alternatives in operational energy consumption for non-University parking lot bound traffic is related to the potential congestion. There would be no change in travel distance for non-University traffic, and any changes in energy consumption resulting from roadway configuration and/or traffic signal changes would be insignificant. However, the additional congestion and queuing along Canal Road would add to the energy usage for non-University traffic. Alternatives 3B and 3H would be similar to the No Build with regard to non-University traffic energy usage.

For University traffic both travel distance and time would affect energy usage. Considering travel distance, operational energy consumption would be higher with the No Build than with the Build Alternatives. This is due to the longer routes traveled by a large number of vehicles to approach the Prospect Street entrance (to the campus) via M Street and Reservoir Road. The operational energy consumption would be reduced when new access was built because the access to the University would be easier and the route via Canal Road much shorter for most of the vehicles accessing the University. However, travel time would be different for each of the alternatives. As noted for the non-University traffic, the added congestion on Canal Road for Alternative 2 would increase the energy usage for this alternative over the No Build or other four Build Alternatives.

4.4 NATURAL RESOURCES

4.4.1 Land Form

Impacts to the land form in the Project area would vary for the different Alternatives associated with the upgrading of the Canal Road entrance. Replacement of portions of the existing rock exposures adjacent to Canal Road with retaining walls would be required as part of the Build Alternatives. This construction would alter the natural setting of the site. The level of impact would be related to the amount of construction activity required for each alternative. Based on the acreage of land disturbed, **and lengths and heights of retaining walls required**, impacts to the land form would range from greatest for Alternative 3H, Alternative 3B, Alternative 2 and 2A (both alternatives will impact the same physical area), to least for **Alternative 2A-Modified**. Alternative 1 (the No Build option) would result in no impacts.

Table 4-10 summarizes the relative impacts to land forms among the alternatives.

Table 4-10

Impacts to Land Forms

No Build	None
Alternatives 2/2A	Moderate
Alternative 3B	Moderate
Alternative 3H	Large
Preferred Alternative 2A-Modified	Minor

The *Technical Report on the Existing Retaining Wall Between Canal Road and the Chesapeake and Ohio Canal* presents information on the structural integrity and load capacity of the existing retaining wall. The technical report provides a general discussion on soil types in the Project area, however a detailed soils investigation would be required during the design phase of the Canal Road Entrance Project, if a Build Alternative is selected.

4.4.2 Water Quality Impacts

Construction of any of the Build Alternatives would not impact surface or groundwater in the Project area. Limited potential impacts to surface water quality would be controlled through use of Best Management Practices for sediment and erosion control during roadway construction. Groundwater in the vicinity of Georgetown University is not utilized for public supply, and would not be affected by roadway construction in any case.

4.4.3 Wetlands Impacts

The littoral zone of the C&O Canal is the only wetland found in the Project area. It is located on the other side of the canal from the construction site, and it would not be impacted by any of the project alternatives. There would be no displacement of wetlands required for the Project, and no impacts from runoff or sedimentation are anticipated. **In accordance with Executive Order 11990, *Protection of Wetlands* (May 24, 1977), no additional permitting or mitigation of wetlands is required for the Preferred Alternative.**

4.4.4 Wildlife and Habitat Impacts

Impacts are measured by the loss of trees and other vegetation that could alter the wildlife habitat of birds and small mammals that may occupy the site. Impacts to the Project area would include loss of escape cover and foraging habitat for a variety of birds and small mammals. The loss of habitat could result in an increase in roadkill for small mammals. However, this is already an urbanized area with heavy traffic along Canal Road. Estimates of habitat losses for the various alternatives are shown in **Table 4-11.**

TABLE 4-11

Estimated Habitat Loss
in Hectares (Acres)

ALTERNATIVE	WOODED	CLEAR
Alternative 1	0 (0)	0 (0)
Alternative 2	0.15 (0.37)	0.35 (0.88)
Alternative 2A	0.15 (0.37)	0.35 (0.88)
Alternative 3B	0.26 (0.64)	0.34 (0.83)
Alternative 3H	0.51 (1.26)	0.45 (1.18)
Alternative 2A-Modified	**0 (0)**	**0.31 (0.75)**

Note: Preferred Alternative added for FEIS.

There is an opportunity for native vegetation replacement and enhancement in the improved Canal Road entrance area. The landscaping would be both aesthetically pleasing and habitat enriching. The National Park Service has expressed a preference for native plant landscaping to increase wildlife habitat value and decrease the opportunity for exotic plant species invasion into adjacent parklands.

Overall, impacts to habitat and wildlife are considered minimal and do not vary substantially for any of the Build Alternatives. The at-grade signalized alternatives (Alternative 2, 2A **and 2A-Modified**) would minimize impacts to the natural features of the area as compared to the grade-separated alternatives (Alternative 3B and 3H) which disturb additional land further into the

northwest slope. All Build Alternatives have about the same loss of grassy area, but Alternative 3H has the greatest loss of wooded area.

To construct any of the Build Alternatives, the National Park Service would need to allow Georgetown University expanded access over parkland totaling approximately 0.20 hectares (0.5 acres). In return, the National Park Service would receive an equivalent interest in land from Georgetown University, and also would receive a scenic easement on 1.01 hectares (2.5 acres) of land provided as the local matching share. Both parcels would enhance and protect the natural beauty of the parks while serving as a buffer and benefit to natural areas.

4.4.5 Floodplains and Hydrology

An evaluation, as required under Executive Order 11988 *Floodplain Management* (May 24, 1977), was undertaken. Based on the floodplain limit of the Potomac River and the C&O Canal, none of the Project alternatives are located in a flood hazard area. Therefore, the proposed project would not impact any floodplains.

If a Build Alternative is the selected alternative, during design there will be an evaluation of need, number, and location of future catch basins and modifications to the storm sewer systems within the project limits. Alternatives may include discharge into the combined sewer underneath Canal Road, or, if separate outfalls are used, each outfall would be required to contain an oil/grit separator for water quality control (pursuant to District drainage criteria). In any case, since the hillside is very steep with an existing high runoff coefficient, none of the alternatives would cause a significant increase in runoff. Alternative 3H, which depresses Canal Road below the existing grade level, would require relocating the existing storm drains below Canal Road and may require pumps to properly drain the depressed section.

4.4.6.a Wild and Scenic Rivers

No rivers designated as wild and scenic are located in the area of the Proposed Action and thus there will be no impacts on such rivers. **No impact to the Potomac River occurs from this project.**

4.4.6.b American Heritage Rivers Initiative

None of the Alternatives, including the Preferred Alternative, would be in conflict with the Community Action Plan for the Potomac River.

4.4.7 Coastal Barriers and Coastal Zone Management

This Project does not require Coastal Zone Consistency review.

4.4.8 Threatened or Endangered Species

In accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), coordination with the United States (US) Fish and Wildlife Service indicated that no Federally-listed or Candidate threatened or endangered species are known to occur in the project area. A letter from the US Fish and Wildlife Service dated February 22, 1993 (see Appendix B) states that no Biological Assessment or further Section 7 Consultation is required. The National Park Service reported no known rare or endangered animal species occurring year-round in the area. (See Appendix B.0

4.5 HAZARDOUS WASTE SITES

Several of the FEIS alternatives **(Alternatives 2, 2A, 3B and 3H)** would result in excavations in the abandoned trolley right-of-way, in the area of the old foundations along the eastern end of Canal Road, and in the area of the university maintenance facility. Excavations in these areas could be in potentially contaminated soils. Therefore, an Initial Site Assessment (ISA) or some manner of environmental audit would be performed if these Alternatives were selected and required excavations in these areas. This audit would encompass the entire Project site. **Alternative 2A-Modified would not require excavations in the abandoned trolley right-of-way.**

4.6 CONSTRUCTION IMPACTS

4.6.1 Permits Required

The No Build Alternative will require no permits. Each of the other Build Alternatives, **including Preferred Alternative 2A-Modified** will require certain permits, generally described below.

Drainage and stormwater management design will require obtaining approval and a permit from the Stormwater Management Section/Soil Resources Branch - Environmental Control Division of the Washington, DC, Department of Consumer and Regulatory Affairs. The Department's Stormwater Management Guidelines (1988) outline the drainage criteria for the design of storm sewer systems and water quality control structures. The basic requirement of the Department is that there be no increase in peak discharge for the two-year and 15-year events and that water-quality treatment be provided to treat the first half-inch of runoff.

For discharge into an existing sewer system, the release rate of the Project's drainage structure must be designed to avoid adverse impact to the hydraulic grade line of the sewer system.

If on-site biological surveys of adjacent parklands are proposed, National Park Service permits may be required. Permits allowing for impacts to jurisdictional wetlands will be unnecessary for any of the Build Alternatives since none involve any wetland impacts.

4.6.2 Excavation and Blasting

Construction impacts to the site will vary depending on the alternative chosen. The No Build Alternative will have no construction-related impacts, while Alternative 3H will have the most. **Alternative 2A-Modified does not require blasting. The construction activities for the Preferred Alternative would occur closer to Canal Road, away from rock formations near the Potomac Palisades, and incur a smaller 'footprint'.** Based on the field examination of the geology and general environmental conditions at the Project site, impacts of the chosen alternative and construction activities will affect not only the natural conditions at the site, but will also affect the surrounding community in terms of traffic.

Several general impacts **would** be common to the other potential Build Alternatives **but are not expected under the Preferred Alternative. These conditions are** as follows::

- Creating relatively large, deep cuts in the crystalline rock exposures for construction of the proposed walls. Because of the extreme hardness of the local rock types, excavation would probably have to be accomplished by pre-splitting, which would require blasting. Where necessary, efforts to mitigate potential impacts from blasting operations will be performed for these alternatives. **(Alternative 2A- Modified involves no blasting nor deep cuts.)**

- Excavations into existing soil slopes, especially along the eastern length of Canal Road and along the existing access road, could create potential stability problems and have an impact on university facilities above. Some evidence of soil creep was noted in these slopes and could be aggravated by excavations at the toe of slope. Therefore, a site investigation of the soils should be performed to determine and minimize the potential construction impacts. **(Only minimal amount of slope investigation is needed with the Preferred Alternative because the retaining wall to the north of the new entrance will be no higher than 3 meters (10 feet).)**

- Although a design requirement for any Build Alternative is to effect no change in load on Canal Road, or specifically the C&O wall, it is recommended that further examination of the existing Canal wall be conducted to determine its potential for long-term stability. The *Technical Report* on the Canal wall cited earlier provides additional observations to the character and condition of the wall. **(This is a prudent measure to effect under any Alternative, including Alternative 2A-Modified.)**

- Excavations in the abandoned trolley right-of-way, in the area of the old foundations along the eastern end of Canal Road, and in the area of the University maintenance facility. Excavations in these areas could be in potentially contaminated soils. Therefore, an Initial Site Assessment (ISA) or some manner of environmental audit will be performed if the Selected Alternative requires excavations in these areas. This audit should encompass the entire Project site.

(Alternative 2A-Modified is designed to avoid construction in the abandoned trolley right-of-way.)

In addition to the potential impacts described above, several other construction impacts may be considered. **Table 4 -12** presents an impact matrix for each of the alternatives. Based on review of the matrix, it can be seen that **the No Build** Alternative would have no impact on the site. Of the five build options considered, Alternative **2A-Modified** would have the least impact while Alternative 3H would have the most impact.

TABLE 4 – 12

Construction Impacts By Alternative

ALTERNATIVE CONDITION	1 NO BUILD	2 and 2A AT-GRADE	3B WB ELEVATED	3H EB & WB DEPRESSED	2A-Modified AT-GRADE
Cut Walls/Excavation/Blasting	X	XXX	XXXXX	XXXXX	XX
Cut Slopes/Excavations	X	XXX	XXX	XXXX	XX
Fills (Embankments)	X	X	XX	XX	X
Existing Canal Wall	X	X	X	X	X
Drainage	X	XX	XXX	XXXXX	XX
Environmental	X	XX	XXX	XXXX	XX
Utility Relocation	X	XX	XXX	XXXXX	XX
Maintenance and Protection of Traffic	X	XX	XXX	XXXXX	XX

Rating:	
High Impact	XXXXX
Moderately High Impact	XXXX
Moderate Impact	XXX
Minor Impact	XX
No Impact	X

4.6.3 Maintenance of Traffic Impacts

Depending upon the Alternative **selected,** construction of a Build Alternative would involve closure of one or more lanes of Canal Road to vehicles at certain times during the day. A minimum of two lanes of traffic (one in each direction) would be maintained on Canal Road during construction of any of the Build Alternatives during off-peak periods. **During peak hours, maintaining two lanes in each direction is proposed under Alternative 2A-Modified.**

For Alternatives 2, 2A, **and 2A-Modified,** construction is expected to last between 7 and 10 months. Alternative 3B would require slightly more time for construction (10 months). Alternative 3H would last the longest, with approximately 18 months for construction. A description of preliminary maintenance of traffic during construction activities for each of the Build Alternatives is presented in **Appendix E.** There would be temporary impacts during construction of the Build Alternatives on public transportation, given some restrictions in reverse traffic flow during peak hours. There is also a potential for pedestrians and bicyclists to be temporarily prohibited during certain construction phases.

As with all construction projects under traffic conditions, there would also be slight risks to construction workers, pedestrians and bicyclists due to construction activities. **The Preferred Alternative offers the fewest risks because no heavy excavation is** needed near the Palisades nor the main utilities under Canal Road at the existing entrance. There is risk associated with vehicular traffic negotiating through construction and maintenance zones **for any Build Alternative**. The potential for accidents is also increased as vehicular traffic is diverted to local streets. Measures would be taken to minimize impact to vehicles traveling on Canal Road. Proper construction zone signing and controls will help minimize safety risks.

4.6.4 Air and Noise Impacts

The air quality impacts will be temporary and will primarily be in the form of emissions from construction equipment, dust from earthwork and utilization of unpaved roads, and smoke from burning of waste materials. Standard specifications for all contracts will require the contractor to comply with and observe all applicable laws, regulations, and orders. The specifications incorporate provisions for minimizing air quality impacts during construction.

Measures will be taken to reduce fugitive dust and other emissions generated during construction. Emissions from construction equipment will be controlled in accordance with emission standards prescribed under district and federal regulations. Air pollution associated with dust can be effectively controlled through the use of watering or other techniques in accordance with specifications.

Construction activities will comply with DCDPW restrictions regarding nighttime construction. In addition, contract requirements will include the stoppage of construction noise during passage of the mules along the C&O Canal.

As with any construction activity, noise and vibration impacts will result from heavy equipment movement and construction.

4.7 LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY RELATIONSHIP

The relationship of the Georgetown University Canal Road Entrance Project's local short-term impacts and use of resources to the maintenance and enhancement of long-term productivity is generally positive. Construction of the Georgetown University Canal Road Entrance Project will involve the short-term use of resources such as labor and construction materials. The Project will also contribute to the maintenance and enhancement of long-term productivity for the communities in the project area and for the local transportation network by being consistent with local planning. Georgetown University's 1989 *Bicentennial Master Plan* included improvements for the Canal Road entrance to the Main Academic Campus. The DC Board of Zoning Adjustment approved the University's Plan in 1990.

Transportation improvements are based on regional and local planning which consider the need for present and future traffic requirements within the context of present and future land use development.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Implementation of the proposed action involves a commitment of a range of natural, physical, human, and fiscal resources. Land used for the construction of the Canal Road entrance improvements is considered an irreversible commitment during the time period that the land is used for a roadway facility. However, if a greater need arises for use of the land or if the roadway improvements are no longer needed, the land can be converted to another use. At present, there is no reason to believe such a conversion will ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and roadway construction materials such as cement, aggregate, and bituminous material would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable; however, they are not in short supply and their use would not have an adverse effect upon continued availability of these resources. Any construction would also require a one-time expenditure of Federal and local funds that are not retrievable.

The commitment of these resources is based on the concept that residents in the Georgetown area and the surrounding District of Columbia would benefit by the improved quality of the transportation system. These benefits would consist of improved accessibility and safety, savings in time, and greater availability of quality services that are anticipated to outweigh the commitment of these resources.

CHAPTER 5.

ADDITIONAL TRAFFIC ANALYSIS OF THE PREFERRED ALTERNATIVE

This chapter is new for the FEIS, and presents the summary findings of NETSIM analysis.

5.1 INTRODUCTION

The analysis of the DEIS, which was supplemented by public and agency comment, indicated that Alternatives 3B and 3H appeared to incur too many high costs with insufficient benefit. From a traffic perspective, they offered no substantial advantage from the more modest intersection alternatives of Alternative 2 or 2A (see Section 4.2.3, "Traffic Operations by Alternative"). Furthermore, numerous other options suggested by Agencies and the public since publication of the DEIS have been evaluated. The results of these evaluations have been documented. (See *Briefing Paper on DEIS Mitigation Alternatives,* April 1996, *Briefing Paper on Signalized Intersection Alternatives*, January 1997. See also correspondence with the National Capital Planning Commission (NCPC) and the District of Columbia Department of Public Works (DCDPW) in Appendix F.) The results of the subsequent evaluations of various alternatives suggested more attention to variations of Alternative 2A.

Therefore, it was decided to perform traffic analysis on the No Build, Alternative 2, and numerous variations of Alternative 2A, including the selected Alternative 2A-Modified. These efforts were conducted in response to requests from DCDPW and the public. DCDPW requested that a more system-wide approach be applied to determining the impacts of the potential intersection improvements at the entrance to the Georgetown University Main Academic Lot from Canal Road.

It was decided to use the Network Simulation Traffic Operations Model (NETSIM). The NETSIM model is a corridor-level, microscopic simulation program that applies interval-based simulation to describe traffic operations. The model provides more accurate intersection Level of Service (LOS) determinations than the Highway Capacity Manual's Highway Capacity Software (HCS). It considers average stopped traffic delay per vehicle, as well as total elapsed time from when a vehicle slows at the end of a queue until the vehicle departs from the stop line. An additional advantage of the NETSIM is its ability to track each vehicle for each second of model simulation. This allows simulation of each driver's behavior, as well as lane choices and total travel time.

Although intersection LOS is a useful comparative tool, NETSIM allows more comprehensive Measures of Effectiveness (MOE) for comparison of various alternatives. Specifically, NETSIM's comprehensive individual vehicle tracking identifies two other important operational characteristics: travel speed for traffic through a given corridor, and vehicle stops per corridor trip. These latter MOE's are generally better indicators of the

overall traffic patterns than a snapshot of a specific intersection contained within the modeled corridor.

Initial runs of the NETSIM considered the No Build and Alternatives 2 and 2A. Subsequent refinements included:

- **adding the DCDPW construction improvements to the Whitehurst Freeway,**
- **adjusting the reported ouput of the model to account for queue lengths (i.e., allowing the spill-over effect on the next intersection),**
- **revising the signal timings to optimize synchronization and achieve better through traffic flow,**
- **introducing comparisons of one-signal or two-signals at the proposed new and existing entrance as additional mitigation options evolved, and**
- **evaluating mitigation improvements on Canal Road at the Whitehurst Freeway intersection (beyond that work already undertaken by DCDPW).**

Three interim Technical Memoranda on the network simulation studies of the No Build Alternative and variations of the NCPC's variation to Alternative 2A were prepared. This analysis successively led to further refinement of the proposed Build Alternative. The *Final Network Simulation Traffic Operations Report,* dated November 1998, summarizes the results of the studies.

In this FEIS, only the results for the No Build and the Preferred Alternative 2A-Modified appear. The No Build and Build scenarios used for the model include the lane configurations at the Whitehurst Freeway with Canal Road/ M Street and at Key Bridge with M Street that are currently nearing completion by DCDPW. (A scenario is one year, either AM or PM peak hour, and one alternative. In other words, 1998 AM No Build is one scenario.) The Build scenarios add the improvements called for with Alternative 2A-Modified at the entrance along Canal Road, as well as the improvements eastbound at Whitehurst Freeway and Canal Road. These improvements include adding a third eastbound lane for through traffic on Canal Road at Whitehurst Freeway intersection.

The following sections describe the MOE's resulting from the NETSIM findings.

5.2 LEVEL OF SERVICE AT INTERSECTIONS

In order to model the complexities of the study area as precisely as possible, after evaluations among the DEIS alternatives noted above became apparent, the NETSIM program was utilized to analyze Level of Service (LOS). As listed in Section 4.2.3a, the Highway Capacity Manual's *Highway Capacity Software* (HCS) was used to evaluate DEIS Alternatives. The HCS has several limitations that include:

- **Delay measures are indeterminable under heavily congested conditions (when the volume-to-capacity ratio exceeds 1.2). Thus, in the DEIS, the LOS and delay for**

several intersections were noted by an asterisk (*) indicating the intersection volume to capacity ratio is greater than 1.2.

- **The HCS methodology does not directly measure the affects on delay created by the interaction between adjacent signals.**

- **The HCS methodology can not account for situations whereby the volume of traffic entering a particular intersection is constrained by other adjacent intersections or geometric conditions.**

Using NETSIM, however, the LOS was re-calculated and compared for two years--1998, and 2016. The projected LOS at intersections along the Foxhall Road/Canal Road corridor from Reservoir Road to Key Bridge for the years 1998 and 2016 is presented in *Table 5-1.*

TABLE 5-1

NETSIM Summary of Intersection Levels of Service/Delay (Seconds)

		1998		2016	
INTERSECTION		**NO BUILD**	**2A-MOD.**	**NO BUILD**	**2A-MOD.**
Reservoir Road & Foxhall Road	AM	E / 45.3	D / 38.0	D / 39.8	E+ / 40.0
	PM	F / 76.3	F / 86.0	F / #	F / #
MacArthur Road & Foxhall Road	AM	C / 20.1	C / 18.8	E+ / 42.8	E / 48.5
	PM	C+ / 15.7	B / 14.8	C / 19.7	C / 19.9
Canal Road & Foxhall Road	AM	C / 21.5	C / 20.9	E / 45.5	E+ / 42.0
	PM	C / 24.4	C / 24.5	B / 13.6	B / 13.7
Canal Road & G.U. Entrance	AM	N/A	A / 0.1	N/A	A / 0.4
	PM	N/A	A / 2.1	N/A	A / 1.7
Canal Road & Whitehurst Fwy.	AM	B+ / 7.2	B+ / 5.5	B / 8.4	B+ / 6.7
	PM	C / 23.2	C / 20.4	F / 66.9	F / 67.0
Canal Road & Key Bridge	AM	C / 20.1	C / 18.9	D / 34.6	D / 35.4
	PM	B / 15.0	B / 11.4	F / 80.2	F / 86.4

Note: Entire table is new to FEIS.
Note: # - Indicates Extreme Delays

The results of the NETSIM modeling show that the LOS for the intersections for both the 1998 AM and PM scenarios does not degrade when comparing the No Build to the Build scenarios. In fact, all intersections, except the intersection of Foxhall Road at Reservoir Road, operate at LOS C or better. For the 1998 AM peak hour, that intersection operates at LOS E for No Build and LOS D for Build. For the 1998 PM peak hour, that intersection operates at LOS F for both the No Build and Build scenarios.

The 2016 AM and PM total intersection LOS does not significantly degrade when comparing the No Build to the Build scenarios. The Reservoir Road and Foxhall Road intersection is the only intersection that shows a LOS decrease. This decrease is from LOS D to LOS E+ and is caused by an increase in intersection delay of 0.2 seconds. The total intersection delay at any intersection does not increase by more than about six seconds for any location.

These impacts are not considered significant. The appearance of improvement in the numbers from the No Build to the Build scenarios in 1998 may reflect the impact of the proposed improvements –such as the additional lane added at the intersection with the Whitehurst Freeway-- which were included in the modeling parameters, or they may be simply be a factor of the standard variation that occurs in this system process. NETSIM is a deterministic simulation model that is affected by random processes within the model. Due to these random processes, the results of a model with identical parameters will change from run to run. To account for this randomness, each model was run multiple times to assert that the true expected result lies within an interval between x and y with a z percent confidence level. For this study, six runs of each model were run to achieve a 90% confidence level for the total model delay measure.

It is important to consider that even within this 90% confidence level, there is variance within the results. After six runs, the average is still bracketed by a maximum, minimum and standard deviation. For example, the numbers generated for the intersection of Foxhall at Reservoir Road, although disparate from the numbers generated for the other intersections, also do not suggest a significant impact. The average vehicle delay during the 1998 AM peak No Build is 45.3 seconds per vehicle and is 38.0 seconds per vehicle for the Build scenario, which represents a difference of 7.3 seconds per vehicle. The sample variance, however, is 22.4 seconds per vehicle for the No Build and is 6.3 seconds per vehicle for the Build.

The NETSIM model is intended to apply to the specific proposed action (intersection being improved), and to no more than one to two intersections on either side as part of its modeled "network". Specifically, Key Bridge and Reservoir Road, although shown in the tables in this FEIS, represent "external nodes". Vehicles enter the model at these intersections at extremely random intervals, unlike the immediate area of the Canal Road entrance where platooning, other efficiencies, and other input characteristics can occur. The randomness for these external nodes is so great that the modeled results should <u>not</u> be assumed to have the same 90% confidence level as interior to the corridor. Hence, the "impact" of a Build versus No Build at these two extreme locations cannot necessarily be derived. However, because agencies requested that the model extend to these outer intersections, the FEIS presents the findings, recognizing the limitations at these two locations.

5.3 TRAVEL TIME

Another comparison measure of effectiveness is the average travel time to traverse the corridor. *Table 5-2* gives a summary of the average corridor travel time for traffic along the Federal-aid primary route of Canal Road, between the Key Bridge and the Canal Road/Foxhall Road intersection.

TABLE 5-2

NETSIM Summary of Average Corridor Travel Time and Speed
Federal-aid Primary Route

		1998		2016	
		NO BUILD	2A-MODIFIED	NO BUILD	2A-MODIFIED
EASTBOUND	AM	152.1 sec	141.9 sec	296.4 sec	238.7 sec
	PM	145.6 sec	127.0 sec	128.7 sec	116.6 sec
WESTBOUND	AM	82.9 sec	82.4 sec	171.9 sec	183.4 sec
	PM	210.3 sec	210.8 sec	362.9 sec	360.5 sec
EASTBOUND	AM	19.7 MPH	21.0 MPH	10.1 MPH	12.5 MPH
	PM	17.2 MPH	19.7 MPH	19.5 MPH	21.5 MPH
WESTBOUND	AM	37.9 MPH	38.2 MPH	19.0 MPH	17.3 MPH
	PM	17.2 MPH	17.2 MPH	10.0 MPH	10.1 MPH

Notes:

- ***Entire table is new to FEIS. Time is in seconds. Speed is in miles per hour.***
- ***Eastbound AM extends from 700' west of Foxhall Road on Canal Road to just south of the Key Bridge***
- ***Eastbound PM extends from the stopbar on Foxhall Road at Canal Road to just south of the Key Bridge***
- ***Westbound AM extends from just west of the Key Bridge to the stopbar on Foxhall Road at Canal Road***
- ***Westbound PM extends from just west of the Key Bridge to 700' west of Foxhall Road on Canal Road***

There are no substantial changes to the through traffic measures between the Build and No Build scenarios for eastbound or westbound traffic during the AM and PM peak hours in the years 1998 and 2016.

From a local traffic perspective, namely traffic on non-primary routes, the issue of corridor travel time has been considered. *Table 5-3* gives a summary of the average corridor travel time and speed for through traffic travelling between Reservoir Road and Key Bridge.

(Again, the note of caution exists for including the external nodes of Reservoir Road and Key Bridge in the results.)

TABLE 5-3

NETSIM Summary of Average Corridor Travel Time and Speed
Local Routing

		1998		2016	
		NO BUILD	2A-MODIFIED	NO BUILD	2A-MODIFIED
EASTBOUND	AM	9:09	8:07	10:48	9:42
	PM	14:04	14:52	*	*
WESTBOUND	AM	4:16	4:10	10:51	11:20
	PM	5:39	5:33	8:42	8:34
EASTBOUND	AM	10.7 MPH	12.0 MPH	9.0 MPH	10.1 MPH
	PM	7.0 MPH	6.7 MPH	*	*
WESTBOUND	AM	21.0 MPH	21.6 MPH	8.4 MPH	8.0 MPH
	PM	15.9 MPH	16.2 MPH	10.3 MPH	10.5 MPH

Notes:
- *Entire table is new to FEIS. Travel time is in minutes. Speed is in miles per hour.*
- *The local route corridor is between Reservoir Road and Key Bridge.*
- *An asterisk * indicates extreme delays.*

As with the primary route travel time analysis, there are no substantial changes to the local through traffic measures between the Build and No Build scenarios for eastbound or westbound traffic during the AM and PM peak hours in the years 1998 and 2016. The only conditions where travel time declines when comparing the No Build and Build scenarios occur for eastbound traffic during the PM peak hour in 1998 (five percent decline) and during the AM peak hour in 2016 (four percent decline). All other travel times remain the same or improve.

These impacts are not considered significant.

5.4 QUEUING ANALYSIS

Queuing analysis was considered for the new signalized intersection, proposed under Alternative 2A - Modified. Because of the current congestion and backups along Canal Road, typical analysis methods cannot be used to develop reliable estimates of queues without a network-type analysis that includes timing optimization and simulation. With the use of the NETSIM model, queue lengths can be accurately estimated.

During the model calibration process (basically replicating existing conditions), the extent of existing queue lengths was included. The model reports queue lengths for each link. However, the model output does not distinguish between queues that are caused by a particular signalized intersection (or node) and queues that are caused by an adjacent signalized intersection.

In other words, a queue at one intersection may have no relevance to that intersection and may be caused by the back-up from another intersection. For example, the No Build Alternative is shown to have queue lengths of 60 vehicles (1490') at the existing entrance (westbound PM peak in 2016). An identical queue is shown for the Preferred Alternative. This would back-up traffic well beyond the proposed new entrance. Obviously, under the No Build circumstances, there is no new entrance, nor any traffic signal at that location to cause a queue. Obviously, too, with no signal control at the existing entrance, this queue is attributed to the next intersection of Canal/Foxhall Roads. Thus it was determined that the relative value of the queue lengths was limited, and any changes in queue lengths under the Preferred Alternative would not be a significant impact.

Under the Preferred Alternative, there will be no queue created at the proposed new entrance signal for eastbound through traffic during the AM or PM peak for 1998 or 2016. This is because in the mornings, left turns out of Georgetown University will be prohibited and thus eastbound traffic will not be stopped by the introduced signal. During the PM peak, the proposed signal timings and coordination with adjacent signals will minimize the number of eastbound vehicles that would be stopped by the new entrance.

For the Preferred Alternative, westbound traffic on Canal Road will be stopped occasionally during both the AM and PM peak hours at the proposed new entrance because of the traffic signal to allow left turn departures from the University parking lot. Because the simulation model provides maximum "green" time to Canal Road travelers, and takes advantage of "platooning" vehicles, an estimated average of two cars in the morning and five cars in the afternoon would be queued due to the new signal.

CHAPTER 6. LIST OF PREPARERS

This document and the supporting technical reports were prepared by the Eastern Federal Lands Highway Division of the Federal Highway Administration, the District of Columbia Division of the Federal Highway Administration, the District of Columbia Department of Public Works, and the National Park Service. Assistance was provided by HDR Engineering, Inc.; Land Planning and Design Associates, Inc.; Athavale Lystad & Associates, Inc.; and Elizabeth Anderson Comer/Archaeology.

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The following persons performed the technical analysis and preparation of the DEIS and/or FEIS.

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David Cheeney, AICP	Technical Support, Document Preparation	BA, MPA Urban Planning; 18 years.
Linda Amato, AICP	Section 4(f) Documentation, General Content Review, Document Preparation	BA, MURP; 17 years.
Richard Hartman, AICP	Community Impacts	BSEE, MA, MCP Planning; 22 years.
Sophie Ali, PE	Traffic Survey	BS Civil Engineering; 13 years.
Paul Mok, AIA, AICP	Project Planning and Coordination	BArch, MRP Architecture and Planning; 20 years.

Person	Responsibilities	Degree and Experience
Douglas Butler, PE	Traffic Impacts	BS Civil Engineering, MS Civil Engineering; 22 years.
David Patrick	Natural Environment	BS Biology, MA Wildlife Ecology; 12 years.
Larry Artman, PG	Geology	BS Geology; 12 years.
Peter Dahman	Hydrology	BS Civil Engineering, MS Agricultural Engineering; 16 years.
James Sheenan, PE	Geotechnical Analysis	BS, MS Civil Engineering, MBA; 25 years.
William Gross, PE	Cost Analysis, Maintenance of Traffic Analysis	BS Civil Engineering; 12 years.
Louis Arrigoni, PE	Air Quality and Noise Analysis	BS Civil Engineering; 11 years.
Katherine Biesmann, PE	Document Preparation	BS Civil Engineering; 10 years.
John Lazzara, PE	General Content Review, Document Preparation	BS Civil Engineering; 10 years.
John Albeck	Traffic Impacts	BS, MS Civil Engineering 9 years.
Robert Minsch, PE	Highway Planning & Design	Registered Professional Engineer, 40 years.
Ryan Birdseye	Air Quality Analysis	BS Geography, Masters of Urban Planning, 7 years.
Susan Anderson	Document Preparation	BS Geography, 4 years

Person	Responsibilities	Degree and Experience
Land Planning and Design Associates		
Stanley Tatum	Landscape Design and Aesthetics	BS Landscape Architecture, MLA; 30 years.
Athavale Lystad and Associates		
Frederick Heider	Public Participation	BES Chemical Engineering; 26 years.
Elizabeth Anderson Comer/Archaeology		
Elizabeth Comer	Historic and Archaeologic Impacts	BA History, MA Anthro./ Archaeology; 21 years.

CHAPTER 7.

LIST OF AGENCIES AND ORGANIZATIONS SENT COPIES OF THE DEIS, AND COMMENTORS ON THE DEIS

7.1 RECIPIENTS OF DEIS

Copies of the Draft Environmental Impact Statement were distributed to the agencies and organizations listed below. The document was also made available for public review at the M.L. King Memorial Library, 901 G Street, NW; the Georgetown Regional Library, Wisconsin Ave. and R Street, NW; and the Palisades Branch Library, 49th and V Streets, NW.

Federal Agencies

Advisory Council on Historic Preservation
U.S. Army Corps of Engineers
U.S. Department of the Interior
- National Park Service
  - C&O Canal National Historic Park
  - National Capital Region
  - Rock Creek Park
- Office of Environmental Project Review

U.S. Department of Transportation
- Federal Aviation Administration

U.S. Environmental Protection Agency
- Office of Federal Activities (2252)
- Region III (3E-S43), Environmental Planning Section

Regional Agencies

Commission of Fine Arts
Metropolitan Washington Council of Governments
- Transportation Planning Board

National Capital Planning Commission

District of Columbia

Council of the District of Columbia
D.C. Bureau of Air and Water Quality

District of Columbia (continued)

D.C. Department of Public Works
- Office of Policy & Planning
- Tree Division
- Utility Coordination and Control Division

D.C. Department of Consumer and Regulatory Affairs
D.C. Historic Preservation Review Board
D.C. Office of Planning
D.C. Surveyor
D.C. Water & Sewer Utilities Administration
- Project Development Section

Executive Office of the Mayor
Mayor's Agent on Historic Preservation

Organizations

Advisory Neighborhood Commission 2A
Advisory Neighborhood Commission 2E
Advisory Neighborhood Commission 3B
Advisory Neighborhood Commission 3D
Burleith Citizens Association
Business & Professional Association of Georgetown
Citizens Association of Georgetown
Citizens Coalition
Cloisters East Association
Cloisters West Homeowners Association
Foxhall Citizens Association
Georgetown University
Glover Park Citizens Association
Palisades Citizens Association
Potomac Electric Power Company
- Environmental & General Services

Libraries

Georgetown Regional Library
M.L. King Memorial Library
Palisades Branch Library
Georgetown University Library

7.2 COMMENTORS ON DEIS

Note: This section is new to the FEIS.

Appendix F contains correspondence from agencies and members of the public who commented in writing on the DEIS. All have been added to the Project Mailing List. All listed will receive a Notice of the Availability of the FEIS.

The agencies and organizations listed in 7.1 above will all receive copies of the FEIS.

CHAPTER 8. COMMENTS AND COORDINATION

Note: Highlighted text indicates substantive information different from the Draft Environmental Impact Statement (DEIS) or new to this Final Environmental Impact Statement.

For the Georgetown University Canal Road Entrance project, an on-going program consisting of newsletters, presentations to community groups, and public meetings, provided a forum for community residents to voice their concern and share their ideas.

Coordination with affected and resource agencies occurred throughout this environmental process. Agencies provided input for technical information as well as alternatives development. The purpose of this chapter is to present the public and agency coordination efforts for this project and highlight critical elements from that part of the environmental review process. A **Notice of Availability for the DEIS was published in the Federal Register, Vol. 60, No. 155, on August 11, 1995 on pages 41071/41072.**

8.1 EARLY AGENCY COORDINATION

As indicated in Chapter 1 - Purpose and Need, efforts concerning improvements for access to the main academic campus of Georgetown University have been underway for several years. In 1987, a Congressional mandate specifically identified such a transportation improvement; in 1991, a Memorandum of Agreement (MOA) was executed among:

- U.S. Department of Transportation, Federal Highway Administration, Eastern Federal Lands Highway Division,
- U.S. Department of Transportation, Federal Highway Administration, District of Columbia Division,
- U.S. Department of the Interior, National Park Service, National Capital Region,
- Government of the District of Columbia, Department of Public Works, and
- Georgetown University

This MOA identified responsibilities for carrying out elements of the Congressional demonstration project, and also general concepts for suitable scenic easements and property transfers among the parties. In order to accomplish the MOA, conceptual engineering build alternatives were developed, and generally reviewed with the signatories. The alternatives subsequently have been revised through the process noted in Chapter 2 - Alternatives.

On October 1, 1992, a coordination meeting was held to initiate the National Environmental Policy Act (NEPA) process and the preparation of appropriate environmental documentation and coordination. Participating in that meeting were the parties to the MOA and the FHWA's

engineering consultant for the project. This meeting helped to identify areas of concern and topics that should be emphasized in the project design and analysis.

As a result of the meeting, the FHWA determined that the appropriate documentation should be an Environmental Impact Statement, given the high level of agency and public interest over the years.

8.2 PUBLIC PARTICIPATION EFFORTS

Throughout the environmental documentation process associated with this Project, several meetings were held with local citizens to discuss the Project and its Alternatives. FHWA and the project team sponsored two public meetings as well as formal presentations to local neighborhood groups. Among the local groups were the District of Columbia Government Advisory Neighborhood Commissions. The following is a chronology of these meetings:

Presentations to Local Neighborhood Groups

On January 5, 1993, a presentation on the project was made at the regular monthly meeting of Advisory Neighborhood Commission (ANC) 2E. Approximately 100 people attended that meeting.

A follow-up to that meeting was held on January 25, 1993, where a presentation was made and the project discussed with the ANC 2E councilwoman and several officers of the Foxhall Citizens Association.

On April 4, 1993, the project was discussed at a meeting of the C&O Canal National Park Advisory Commission. About 30 people were present at that meeting, held in Sheperdstown, West Virginia.

On April 4, 1993, a presentation was made at the monthly meeting of Advisory Neighborhood Commission 3D. The meeting was attended by approximately 20 people. The primary concerns expressed at the meeting were potential traffic impacts on MacArthur Boulevard and Foxhall Road and potential visual impacts.

On December 7, 1994, a presentation was made to the Citizens' Association of Georgetown.

On September 5, 1995, a presentation on the project was made at the regular monthly meeting of ANC 2E. Approximately 150 people attended the meeting. A key concern of the ANC community was the potential for secondary development.

On September 13, 1995, a presentation on the project was made to ANC 3D. Approximately 30 people attended. The main concerns included secondary development,

GU campus development, and the need for more alternatives. The ANC adopted a resolution supporting the No-Build Alternative.

On September 26, 1995, FHWA attended a special meeting of ANC 2E held to consider, discuss and vote on the project. All commissioners were present and eleven citizens spoke. FHWA responded to many questions. Agreement on a resolution was reached and proposals were withdrawn.

On October 1, 1996, FHWA briefed ANC 2E on the Project status. Main concerns were traffic related (during construction and afterwards), secondary development, and a perceived need for a Supplemental DEIS.

On November 4, 1997, FHWA presented a status update on the project to ANC 2E at its regular monthly meeting. Approximately 150 people attended that meeting. The additional alternatives, mitigation options, and detailed additional traffic analysis that had been studied since the public hearing were explained. The Modified 2/2A alternative was presented, including the traffic mitigation measure at the Whitehurst Freeway. FHWA indicated that the FEIS was in preparation.

On November 19, 1997, FHWA presented a status update on the project to ANC 2A at its regular monthly meeting. Approximately 20 people attended that meeting. The additional alternatives, mitigation options, and detailed additional traffic analysis which had been studied since the public hearing were explained. The Modified 2/2A alternative was presented, including the traffic mitigation measure at the Whitehurst Freeway. FHWA indicated that the FEIS was in preparation. ANC 2A Commissioners adopted a resolution in support of the No Build Alternative and additional studies.

On September 12, 1998, the project was discussed at a meeting of the C&O Canal National Park Advisory Commission. About 20 people were present at that meeting, held in Williamsport, Maryland. FHWA presented the Modified 2/2A Alternative, including the traffic mitigation measure at the Whitehurst Freeway, which requires land from the C&O Canal Historic Park. FHWA indicated that the FEIS was in preparation, and a Memorandum of Agreement for Section 106 was being circulated for signature.

On November 10, 1998, FHWA presented a status update on the project to the Palisades Citizens Association at its regular monthly meeting. Approximately 35 people attended that meeting. Alternative 2A-Modified was presented, including the results of the detailed additional traffic analysis with the traffic mitigation measure at the Whitehurst Freeway. FHWA indicated that the FEIS was expected to be available in November.

Public Meetings

On February 11, 1993, a Public Meeting/Open House on the project was held near the Project site at Mount Vernon College. Notice was given to the Public in newspaper advertisements and

in letters to citizen groups. Interested citizens were invited to view the preliminary alternatives and discuss the project and their concerns with representatives from the Federal Highway Administration and other agencies and with the Project Consultants.

Comment sheets were provided at the meeting, and members of the Public were invited to submit written comments, either at the meeting or at a later date. A summary of the comments received is presented in Appendix D.

On September 9, 1994, a Public Meeting/Open House was held, again at Mount Vernon College. The purpose of this meeting was to present to the public information regarding existing and projected traffic in the study area. Issues related to each of the alternatives were also addressed. A copy of the handout is included in Appendix D.

On October 12, 1994, a Public Meeting/Open House was held, again at Mt. Vernon College. The purpose of the meeting was to present the environmental issues other than traffic for the alternatives that would be carried into the DEIS process.

On September 19, 1995, a Public Hearing was held at Mt. Vernon College. The purpose of the meeting was to solicit written and oral comments about the DEIS and the Project. The format of the meeting consisted of an "open house" forum followed by formal oral testimony. Seventy-five citizens attended; thirty-three provided oral testimony. Written comments were subsequently received from about two hundred citizens. Appendix F contains the submitted written comments.

The main topics related to traffic impacts, secondary development, GU growth, environmental impacts (air quality, noise and visual resources), project alternatives and the administrative review process. The brochure, comment sheet, and a summary of the Public Hearing is included in Appendix D-2.

Newsletters

A Project Mailing List was developed early in the Project process and updated regularly. In addition to the public meetings, six project newsletters were distributed to civic organizations and interested citizens.

February 1994 Newsletter. The focus of this Newsletter was to present the purpose of the Project, the roles of the agencies involved, and the history of the Project. Names and addresses were given for interested citizens and groups to send questions and comments.

August 1994 Newsletter. The second Newsletter presented the initial alternatives that were developed through the scoping process, existing travel patterns and traffic issues.

September 1994 Newsletter. The initial alternatives previously presented to the public were expanded in this edition. In addition, the historical and archeological resources were identified and potential impacts were discussed. Aesthetic concerns were also addressed.

March 1995 Newsletter. This fourth Newsletter presented the final alternatives that are to be carried through further analysis in the environmental process. In addition, a tentative schedule for the DEIS and official public comment period were also presented.

September 1995 Newsletter. The fifth Newsletter announced the availability of the DEIS and explains the format and schedule of the Public Hearing. The alternatives were briefly discussed.

August 1996 Newsletter. The sixth Newsletter announced a meeting of the National Capital Planning Commission, and presented the summary analysis of the three proposed NCPC alternatives.

*Additional Comments – **Prior to Draft Environmental Impact Statement***

In each of the newsletters, a formal line of communication was described so that individuals and groups could express their concerns. In addition, during the community presentations and public meetings, comments (oral and written) were also solicited. Written comments were received by a number of the local community groups. Copies of these letters and their responses are located in Appendix D.

*Additional Comments – **Since Draft Environmental Impact Statement***

The formal public comment period on the Draft Environmental Impact Statement extended to September 30, 1998. All comments from concerned citizens received by that date were carefully considered. Many included opinions regarding various alternatives. Many commentors called for additional studies on a variety of options. Copies of these letters and their responses are located in Appendix F. Also in the Appendix is a summary table of the comments and responses.

Correspondence and coordination with several members of the Public and the local Advisory Neighborhood Commissions occurred throughout the comment period.

8.3 AGENCY COORDINATION

As noted in Section 7.1, agency coordination began prior to the environmental impact review process for this project. Throughout the preparation of the DEIS, the public agencies involved in the project continued to meet periodically to review and coordinate the work. In addition, a number of resource agencies participated in the efforts for data. These agencies included the Government of the District of Columbia Office of Planning, Department of Public Works, Surveyor's Office, and Historic Preservation Office; U.S. Department of Interior Fish and

Wildlife Service; Metropolitan Washington Council of Governments; U.S. Department of Interior National Park Service, National Capital Region; and the National Capital Planning Commission.

On November 2, 1995, the NCPC conducted a separate hearing on the proposed Project.

On October 3, 1996, the alternatives of the DEIS were presented to the NCPC. Comments from NCPC included requests for studies for numerous alternatives and mitigation concepts, including:

- **parallel frontage road from the existing entrance/exit;**
- **new entrance from 44th Street;**
- **a new traffic circle to replace the Canal/Foxhall Roads intersection;**
- **a "left-turn" "jughandle" penetrating into the Glover-Archbold Park at the Canal/Foxhall Road intersection;**
- **shifting the new entrance/exit further west; and,**
- **a short break in the median at the existing entrance/exit to allow left turns in and out.**

Aesthetic mitigation issues included concerns for minimizing visual impacts to the Palisades, eliminating the need for blasting during construction, and avoiding the potential for secondary development.

Evaluations of these concepts were made. (See Section 2.3 "Alternatives Considered After DEIS and Public Hearing.") NCPC provided letters to FHWA dated November 9, 1995 and October 10, 1996. FHWA responded in a letter July 26, 1996 and in presentation before the Commission. (See Appendix F for this correspondence.)

Coordination letters were received from several other agencies, particularly DCDPW. Copies of these letters are presented in Appendices B and F. Additional telephone contacts and meetings were used to develop in the data collection suitable for impact analysis **and mitigation considerations.**

Several meetings were held with agencies during the period between publication of the DEIS (September 1995) and preparation of the FEIS (September 1998). Most notable among these, a meeting on the Project site occurred July 16, 1998 among representatives of the National Park Service, the State Historic Preservation Office and the Federal Highway Administration. The specific purpose was to obtain understanding and consensus of the extent of impacts by Alternative 2A-Modified to parklands, historic and cultural resources. The result of the meeting was initiation of a Memorandum of Agreement among the above agencies, and also with the District of Columbia Department of Public Works and the Advisory Council on Historic Preservation. A copy of this MOA appears in Appendix G.

CHAPTER 9. SECTION 4(F) EVALUATION

Note: Highlighted text indicates substantive information different from the Draft Environmental Impact Statement (DEIS) or new to this Final Environmental Impact Statement. The Draft Section 4(f) Statement had been Chapter 8 in the DEIS.

9.1 PROPOSED ACTION

9.1.1 Purpose of Proposed Action

For almost two decades, it has been proposed to upgrade the Canal Road entrance to Georgetown University in order to reduce impacts on Georgetown residential streets and to provide better control of traffic circulation to the University's Main Academic Campus.

The Proposed Action involves the reconstruction of the Canal Road entrance to Georgetown University to provide **for substantially improved access** for traffic entering and leaving the campus. **Six** alternatives were evaluated as part of the **Final** Environmental Impact Statement (FEIS). Canal Road is a four-lane east-west roadway, with two lanes in each direction separated by a low concrete median. Current access at this entrance is limited to right turns to and from the westbound lanes of Canal Road to the University's Main Campus. Access to and from the eastbound lanes of Canal Road is not provided. A more detailed description of the purpose and need is presented in Chapter 1 of the FEIS.

9.1.2 Need for Section 4(f) Evaluation

As set forth in Section 4(f) of the United States Department of Transportation Act of 1966, an evaluation must be prepared for each location within a proposed action which would use Section 4(f) lands. In particular, Section 4(f) of the USDOT Act of 1966 (**Pub.L. 89-670) as amended and revised**, and as codified at Title 49 USC 303, states:

> "The Secretary [of Transportation] may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State or local significance, or land of an historic site of national, State or local significance (as determined by the Federal, State or local officials having jurisdiction over the park, area, refuge or site) only if –
>
> (1) there is no feasible or prudent alternative to using that land; and
>
> (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge or historic site resulting from such use."

Several Section 4(f) resources were initially identified within the immediate project vicinity which may be impacted by the Proposed Action. These include the Georgetown Historic District,

National Park Service (NPS) park property (the Potomac Palisades), the Chesapeake and Ohio Canal Historic District (which includes the C&O Canal), the Glover Archbold Park, the Potomac Gorge, the George Washington Memorial Parkway, and several individual buildings, some of which are located on the campus of the Georgetown University. These resources are shown in **Figures 9-1** and **9-2.**

9.1.3 Project Alternatives

For this FEIS and Section 4(f) Evaluation, the six Alternatives being evaluated include a No Build Alternative and five Build Alternatives. These alternatives are depicted in Figures 2-2, 2-3, 2-4, 2-5 **and 2-6.**

The No Build Alternative would involve no change to the existing conditions. The existing Canal Road entrance to Georgetown University would be maintained in its present configuration. This Alternative would not impact any of the Section 4(f) resources and therefore is not discussed further in the following sections.

The Build Alternatives include **three** At-Grade Intersection configurations and two Interchange configurations. Alternative 2, 2A, **and 2A-Modified all** of which are At-Grade Intersection alternatives, include a signalized intersection on Canal Road at the entrance to Georgetown University. The existing westbound Canal Road lanes would be shifted to the north to provide room for turning lanes to and from the eastbound lanes.

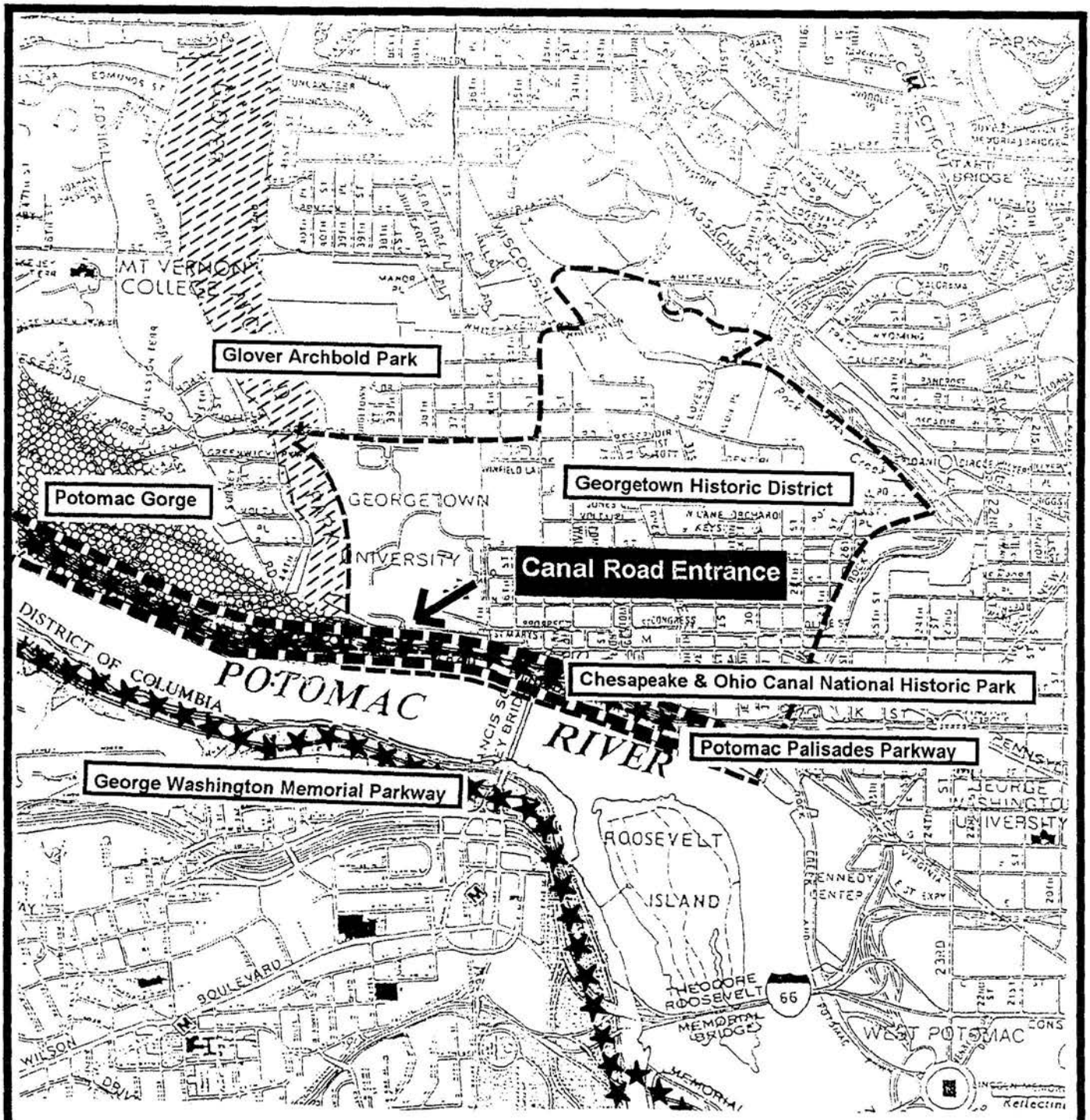
Alternatives 2A **and 2A-Modified** would not permit eastbound turning movements onto Canal Road during the morning peak periods. Vehicles wishing to make this movement would be required to use the Prospect Street entrance, which would remain open for these Alternatives.

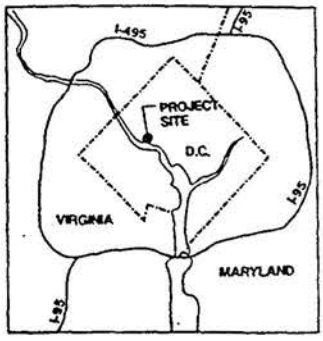
Alternative 3B is a grade-separated interchange, and would shift the westbound lanes of Canal Road to the north and would elevate them above the entrance and exit lanes serving the eastbound lanes of Canal Road.

Alternative 3H, also a grade-separated interchange, would depress all eastbound and westbound lanes of Canal Road below the entrance and exit lanes serving eastbound Canal Road. Chapter 2 of the FEIS provides detailed descriptions of the project alternatives.

All alternatives suggested since the DEIS by numerous agencies, including the NPS and the National Capital Planning Commission (NCPC), have been considered. Among the evaluated options were:

- **frontage roads along the northern edge of Canal Road,**
- **a traffic circle at Glover-Archbold Park and Foxhall/Canal Roads,**
- **a "jug-handle" at Glover-Archbold Park and Foxhall/Canal Roads,**
- **two median breaks along Canal Road with no turning storage lanes, but with a new entrance,**



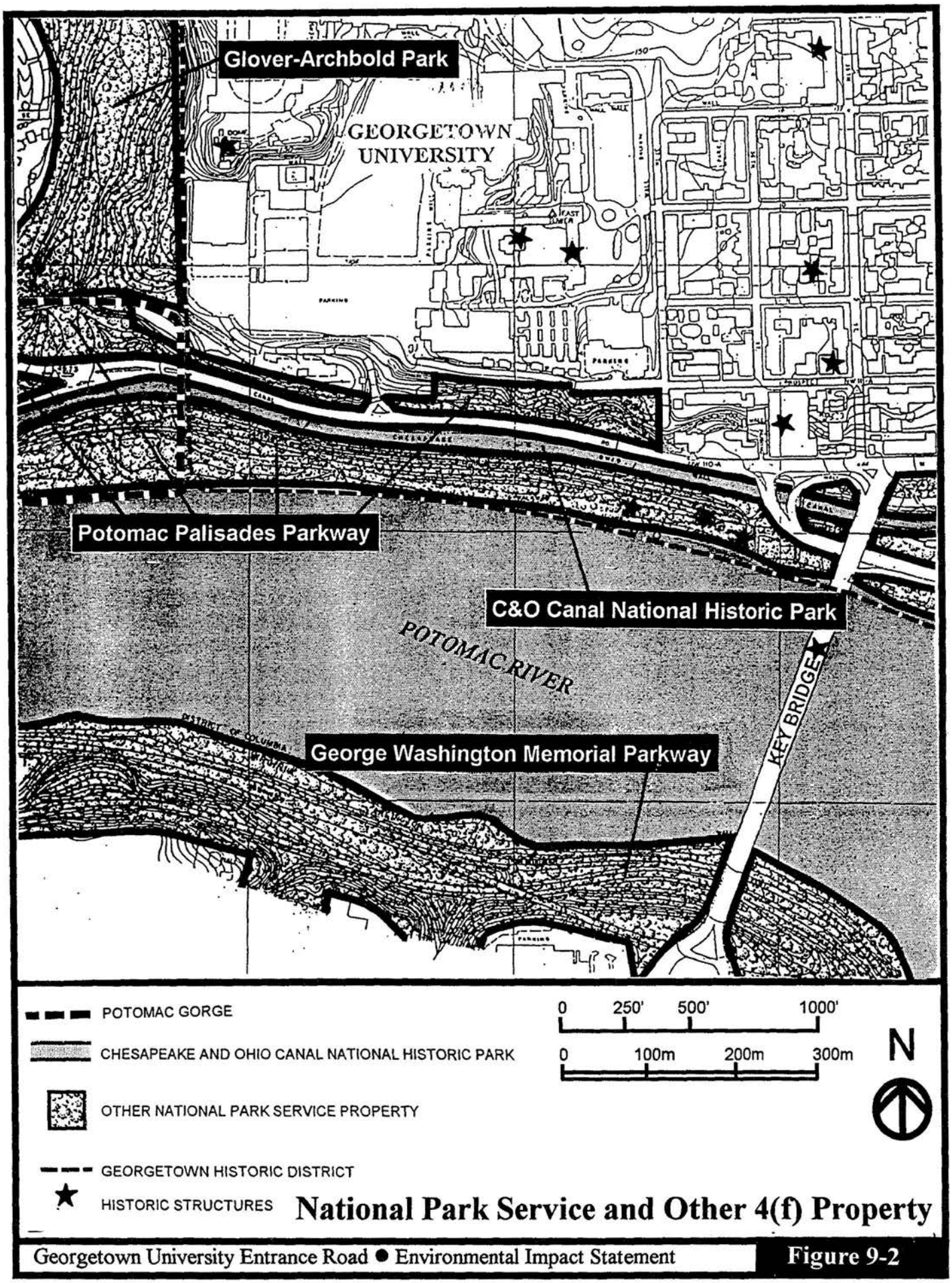


KEY MAP

N

General Area 4(f) Resources

Georgetown University Entrance Road ● Environmental Impact Statement | Figure 9-1



National Park Service and Other 4(f) Property

Georgetown University Entrance Road ● Environmental Impact Statement | **Figure 9-2**

Federal Highway Administration Project