

PART

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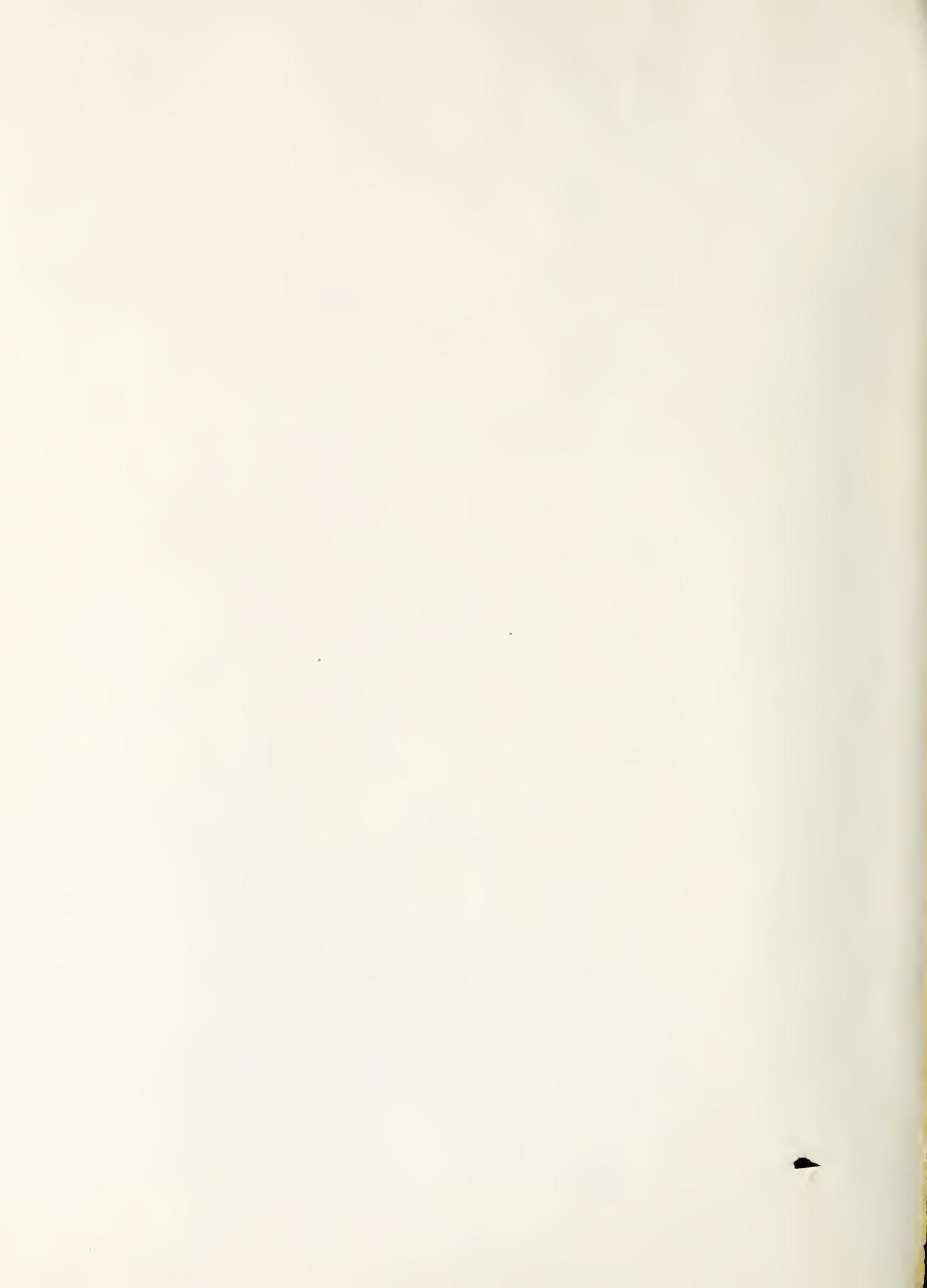
FINAL ENVIRONMENTAL IMPACT STATEMENT

METROPOLITAN WASHINGTON REGIONAL RAPID RAIL TRANSIT SYSTEM

PROJECT DC-23-9001

**U. S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
IN COOPERATION WITH THE
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY**

AUGUST 1975



THE U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

in cooperation with the

WASHINGTON METROPOLITAN AREA
TRANSIT AUTHORITY

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE REGIONAL SYSTEM

PART III APPENDICES

August 1975

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PART III

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Transportation and the Council on Environmental
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In order to facilitate comparison with the draft statement and to maintain consistency in page reference, the original pagination has been retained in Parts I and II of this Report. The Appendices in Part III are entirely new and are simply numbered sequentially, except for the original Appendices A and B.

APPENDIX A: COMMUNICATION BETWEEN THE DEPARTMENT OF
TRANSPORTATION AND THE COUNCIL ON ENVIRONMENTAL
QUALITY



OFFICE OF THE SECRETARY OF TRANSPORTATION

WASHINGTON, D.C. 20590

ASSISTANT SECRETARY

MAY 2 1972

MEMORANDUM FOR: Russell E. Train
Chairman
Council on Environmental Quality

SUBJECT: Transmittal of draft environmental statement for
the Regulatory Modernization Act of 1971

Attached are ten (10) copies of a draft environmental statement
for the Regulatory Modernization Act of 1971.

Since this Bill is presently being considered by Congress, we
would appreciate receiving any comments on the statement as soon
as possible, but in any case within forty-five (45) days of the
above date.

Original Signed by:
Herbert F. DeSiroe

Herbert F. DeSiroe
Assistant Secretary for
Environment and Urban Systems

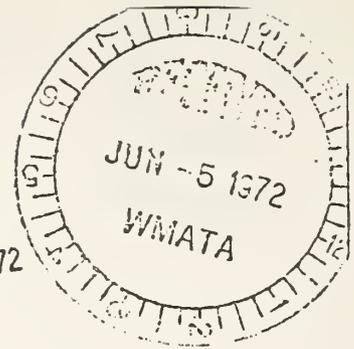
Attachment (10)

cc:

Department of Commerce (3)
Department of Housing and Urban
Development (3)
Department of Health, Education,
and Welfare (3)
Department of the Interior (3)
Environmental Protection Agency (3)

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N. W.
WASHINGTON, D. C. 20006

JUN 2 1972



Dear Mr. Hirten:

The attention of the Council has been drawn on a number of occasions to the question of the application of the National Environmental Policy Act to the Metro Rapid Rail Transit project in the Washington area. As you know, the Washington Metropolitan Area Transit Authority is not a Federal agency under NEPA. However, a number of Federal agencies, including the Coast Guard, are now involved in the necessary clearances for Metro crossings of the Anacostia and Potomac Rivers, and it is desirable that one lead agency be designated to do the impact statements involved. In addition, the annual Federal contribution to the project is a DOT appropriation item and we believe that members of the House Appropriations Committee may be expecting an overall impact statement in this connection.

The Council staff recently met with officials of the Washington Metropolitan Area Transit Authority, who expressed their desire to assist in full compliance with the spirit and letter of NEPA. However, submission by WMATA itself of environmental impact statements under the Act would appear to be inappropriate since WMATA is not a Federal agency for NEPA purposes. It also appears that the National Capital Planning Commission would not be submitting statements, since by statute its authority over Metro matters is purely advisory. Given these circumstances the Council is led to

the conclusion that the most appropriate Federal agency to prepare the impact statements required in connection with Metro is the Department of Transportation.

We suggest that a suitable approach to applying NEPA at this point to the Metro development would be to prepare and circulate draft environmental impact statements now on each of the two river crossings, and to undertake preparation of an overall environmental evaluation of the Metro system in time for the 1973 appropriation cycle. In this way, the immediate NEPA problems in granting Federal permits for crossing the rivers and adjacent parklands will be solved and interested parties will in due course receive a full-range environmental evaluation of Metro.

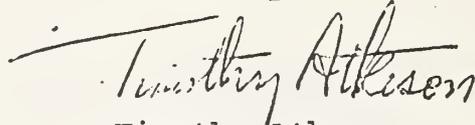
In regard to the river crossings, because of the need for DOT "4(f) statements" and bridge permits from the Coast Guard, DOT should serve as lead agency with WMATA providing the bulk of data and information related to the actual construction plans. The National Park Service and the U.S. Army Corps of Engineers should be consulted in the preparation of the river crossing statements.

We would like to see the overall draft environmental impact statement on the Metro system prepared to be put into circulation at the time of the next request for Federal funding, due in late January of 1973. Comments could be received and the final statement issued prior to hearings on the request, which it is estimated will occur in March 1973. The WMATA has already contracted for an overall environmental analysis of the system, and the preliminary report is due December 20. While prime responsibility for the statement, for the reasons cited above, will need to be with DOT, this preliminary study should simplify the task of preparing the draft statement.

In all these efforts, we will encourage maximum coordination and assistance from other Federal agencies and especially WMATA.

I hope these arrangements will be workable. Please feel free to call on the Council if clarification is needed.

Sincerely,


Timothy Atkeson
General Counsel

Mr. John Hirten
Acting Assistant Secretary for
Environment and Urban Systems
Department of Transportation
Washington, D.C. 20590

cc: Col. William L. Barnes, Corps
Mr. John Kennedy, WMATA
Mr. Bruce Blanchard, Interior

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Charles B. Tomlinson

Michael G. Clarke
Richard W. Huffman, RA, Assoc. AIP
Ross M. Sutherland, AIA
Jonathan S. Sutton, Assoc. AIA/AIP/ASLA

July 23, 1974

Mr. John Collins
Transportation Coordinator
Region III, Environmental
Protection Agency
6th & Walnut Streets
Philadelphia, Pa. 19106

Dear Mr. Collins:

In reference to our telephone conversation yesterday, this letter is to confirm our meeting Tuesday, July 30th, at 1:30 P.M. with representatives of Environmental Research and Technology, WMATA, and WMRT to discuss the air quality aspects of the environmental studies that we are preparing for the individual routes of the WMATA regional Metro system. The meeting will be held at the WMATA Building at 600 Fifth Street, N.W., in Washington, D.C. Mr. John Patteson at WMATA is our contact.

We look forward to meeting you. Thank you for your assistance.

Yours sincerely,



ANTOINETTE FARRAR SEYMOUR
Project Coordinator

AFS:et

cc: Ms. Colleen Leary
Environmental Research & Technology

Mr. Roy T. Dodge, WMATA

Mr. John Patteson, WMATA

WMATA

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*WMATA
Corrup.*

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Richard W. Hullman, RA, Assoc. AIP
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Jonathan S. Sutton, Assoc., AIA/AIP/ASLA

August 16, 1974

Mr. John Collins
Middle Atlantic Regional Office
Environmental Protection Agency
6th & Walnut Streets
Philadelphia, Penna.

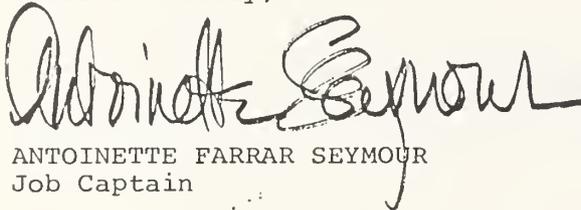
Dear Mr. Collins:

Enclosed please find a copy of my notes of our meeting
July 30, 1974 concerning air quality studies made as a
part of WMATA environmental studies.

At the time of the meeting you said that you would be
willing to initial this memo for our and WMATA's records.

If you find that the memo accurately reflects your state-
ments at the meeting, please initial it and return it to
me, and I will circulate the initialed copies. Thank you
very much.

Yours sincerely,



ANTOINETTE FARRAR SEYMOUR
Job Captain

AFS:et
Encl.



District of Columbia Redevelopment Land Agency

1325 G Street, N.W. Washington, D.C. 20005

John J. Gunther, Chairman
Stephen S. Davis, Vice Chairman
Willie L. Leftwich, Jr.
Alfred P. Love
Melvin A. Mister, Executive Director

May 23, 1974

Ms. Wendy Schermer Allen
Wallace, McHarg, Roberts and Todd
1737 Chestnut Street
Philadelphia, Pennsylvania 19103

Dear Ms. Allen:

This is in reply to your request of May 1 for relocation and other information in connection with the work your firm is doing for the Washington Metropolitan Area Transit Authority.

The relocation data is rather difficult to assemble and this has caused the delay in responding to your letter. You will receive a telephone call soon from Mr. Robert Archer of our Relocation Staff (Area code 202, 382-8425) who will discuss this with you.

As to the other information you requested, there are 9 active urban renewal areas in Washington. Construction of new facilities has started in seven:

1. Southwest Urban Renewal Area

- a. Area B
Construction started with the Southwest Expressway in July, 1957 and on the Capitol Park Apartments, the first private construction, in April, 1958.
- b. Area C-1
Construction started with the Fire Department Repair Facility in November, 1958.

c. Area C

Construction started with the Potomac Electric Power Co. station in December, 1958; on the first Federal Office Building in April, 1959 and on the first housing, Town Center Plaza East in January, 1960.

2. Columbia Plaza

ASLA

Construction started with the residential development in January, 1965 and on the highway in December, 1962.

3. Northeast One

Construction started with the Chesapeake and Potomac Telephone Co. in May, 1965.

4. Northwest One

Construction started with Sibley Plaza public housing in November, 1966.

5. Fort Lincoln New Town

Construction started with Fort Lincoln Dwellings, public housing, in January, 1969.

6. Shaw School Urban Renewal Area

Construction started with Lincoln-Westmoreland Apartments in December, 1969.

7. 14th Street, N.W.

Construction started with the Community Health Facility in December, 1972.

8. H Street, N.E.

Construction has not started.

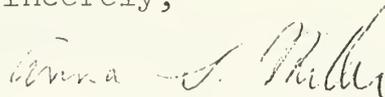
9. Downtown

Construction has not started.

Construction, both public and private, other than urban renewal has necessitated relocation. (The Civic Center, which you mention, has not been officially approved, and no relocation has taken place). Many public and private office buildings as well as apartment buildings have been built in the District in the past 15 years. We do not have data on this. However, since 1965, the Redevelopment Land Agency has handled relocation from all public programs.

Enclosed are copies of our Annual Reports of 1971 and 1972 which contain relocation information on pages 11 and 6.

Sincerely,

A handwritten signature in cursive script that reads "Anna S. Miller".

(Miss)Anna S. Miller
Special Assistant to the
Executive Director

Enclosures



Wallace McHarg Roberts and Todd

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Charles B. Tomlinson

Michael G. Clarke
Richard W. Huffman, RA, Assoc., AIP
Ross M. Sutherland, AIA
Jonathan S. Sutton, Assoc., AIA/AIP/ASLA

28 May 1974

National Capital Planning Commission
1325 G Street, N.W.
Washington, D.C. 20576

I would very much like to obtain copies of the
following, if possible:

NCPC's Environmental Policies and
Procedures (36 Federal Register 23706,
as amended)

Section 5 of the National Capital
Planning Act of 1952, as amended

If there is a charge, please let me know and I
will send payment immediately.

Thank you,

WENDY SCHERMER ALLEN

WSA/wsa

PROJECT: WMATA System
MEMO TO: JSS, RWII, DCH, WSA, WMATA System Files
FROM: AFS
DATE: May 22, 1974
SUBJECT: Route studies, comments of the following agencies
requiring additional data:
U.S. Dept. of the Interior--National Park Service
Fairfax County Board of Supervisors
Maryland-National Capital Parkland Planning Commission
North Virginia Planning District Commission
Virginia Department of Highways

This memo is a continuation of memos of May 13th and April 29th listing agency comments that call for specific information to be included in individual route studies.

U.S. Department of the Interior--National Park Service

"The National Park Service has negotiated a very detailed agreement governing requirements for the issuance of permits for the use of parklands on a temporary basis, for the replacement of park resources and facilities to be used on a permanent basis, and for the restoration of park resources and facilities disturbed or adversely affected as a result of any portion of the Metro system built on or adjacent to parkland. All details of the design for Metro facilities that will affect parkland are to be approved by the National Park Service.

Additionally, the Park Service approves all plans for restoration and/or reconstruction of parklands or facilities damaged as a result of Metro prior to the issuance of a permit for use of parkland. This cooperative agreement is quite comprehensive. It is hoped that local entities have similar prerogatives available to them to ensure that open space and recreational values are preserved and/or enhanced. Such agreements should adequately provide for meeting statutory requirements applicable to lands and facilities which have been acquired and/or developed through Federal assistance. The final environmental statement would be improved if these considerations were included."

Fairfax County Board of Supervisors

Description is needed of short-term construction impact problems, including erosion, sediment control, spoils disposal, control of dust, traffic control of construction vehicles, noise control, tree cover removal, wildlife habitat disturbance, soils engineering, and public utility system interruption or relocation.

Maryland-National Capital Parks and Planning Commission

Discussion is needed of:

- (1) Local air, water and noise pollution impacts
- (2) Specific variations in alignment and station location that might alleviate long-term negative impacts

Northern Virginia Planning District Commission

Detailed discussion is needed of:

- (1) natural and ecological impacts
- (2) social and economic impacts
- (3) visual and physical impacts

Virginia Department of Highways

Discussion is needed of areas in which existing traffic congestion suggests a potential conflict between Metro access traffic and other traffic.

PROJECT: WMATA System

MEMO TO: JSS, RWH, DCH, WSA, WMATA System Files

FROM: AFS

DATE: May 29, 1974

SUBJECT: Comments of the Following Agencies,
Applicable to Route Studies:

Environmental Protection Agency
Dept. of the Interior, Office of Environmental Review
Dept. of the Interior, Bureau of Sport Fisheries and Wildlife
Dept. of the Interior, Facilities and Government Lands
Dept. of Transportation
Falls Church City Council
Washington Ecology Center

This is the final in a series of memos listing comments by the agencies that reviewed the System EIS that apply to what must be presented in individual Route Environmental Statements (Earlier memos in this series are dated April 29th, May 13th, and May 22nd).

EPA

- 1) Alternative station locations should be discussed
- 2) Air quality impact of Metro stations should be discussed

Department of the Interior, Office of Environmental Review, Bureau of Sport Fisheries and Wildlife, Facilities and Government Lands

- 1) Discussion needed of condition of air discharged through vents.
- 2) Discussion needed of amounts of land now used as wildlife habitat that will be utilized for rights-of-way, parking areas and station sites.
- 3) Increased accessibility of cultural and recreational opportunities should be discussed.

- 4) "Metro will have significant impact on parklands at many locations and in several ways. For example, the alignment of the E Route on the surface through Fort Totten is one specific item of major concern because of its impact on parkland. (It is listed on page 99 under Sherman Circle, but is significant enough that it should have its own subtitle). The E Route would take approximately 9½ acres of parkland for right-of-way and the balance of the strip, containing approximately 15 acres, would be rendered useless as parkland. We have very strong objections to this proposal and believe that this portion of E Route should continue underground beyond the Maryland-D.C. line".

Dept. of Transportation

- 1) Description of coordination between railroads and WMATA is needed in areas where Metro construction will be undertaken parallel to existing railroads.

Falls Church City Council (K Route)

Two resolutions have been adopted by the Falls Church City Council "...both of which carry the implicit observation that the present station plans are environmentally inadequate..." The City of Falls Church states its opposition to any plan which encourages any type of motor vehicular access to or egress from the East Falls Church Metro Station through any residential section in Falls Church in the vicinity of the station '....' The City of Falls Church states its opposition to any plan which: 1) allows motor vehicular access to or egress from the West Falls Church Metro Station along Haycock Road between West Broad Street and the station; and 2) which encourages any type of motor vehicle access to or egress from either (of) the stations through any residential section in Falls Church in the vicinity of the station; 3) fails to use motor vehicle ingress and egress from I-66 instead of Route 7".

Washington Ecology Center

- 1) WMATA relocation provisions should be discussed; also the relationship of the route and any resulting dislocations to Urban Renewal, Model Cities, C.R.P., N.D.P. and any private renewal areas that have resulted in dislocation of residences and/or business in the recent past.
- 2) Potential disruption of neighborhoods or communities should be discussed.
- 3) Safety during Metro construction and Metro operation should be discussed.

RE: A & B Routes Impact Statements

SUBJECT: Coordination with National Capital Park and Planning
Commission

MEMO TO: Files, JS, GT, TS, CT, John Patteson

FROM: DCH *DCH*

DATE: 5/1/74

John Stewart, from National Capital Park and Planning Commission, Montgomery Regional Office, Environmental Planning Division, (301) 589-1480, ext. 351, informed me by phone that NCPPC has been doing environmental impact studies of the Montgomery County Metro Station areas for several months. He suggested that coordination with our "A" and "B" Route studies would be most productive.

There is a coordinating committee known as "The Transit Access Impact Technical Committee" which meets monthly. Metro has a representative on this committee.

Mr. Stewart suggested that a good start would be to exchange work programs. He offered to act as liaison with the NCPPC.

I agreed that this sounded like a good idea, but that it was premature since we were not yet under any contracts or authorizations to proceed for any of the work in Montgomery County except for the System-wide Revisions. This should be a very good source of information and an exchange would be useful if these studies get underway.

DCH/fmo

PROJECT: WMATA Systems

MEMO TO: JS, CBT, DCH, WSA, Files

FROM: AFS

DATE: 4/29/74

RE: Historic Preservation Requirements for WMATA Studies

Meeting with Ernest Holtz, Staff Planner for the Southeastern U.S. Advisory Council on Historic Preservation.

Holtz indicated that different levels of detail will be required from WMATA concerning historic structures affected by Metro in the regional study and in the individual route segment studies; more detail will be expected in route segment studies.

Specifically, on the route segment studies, the Council wants, in addition to an identification of the structures that would be adversely affected by Metro, the adverse affects anticipated and WMATA's plans to mitigate these affects, the following:

"a review of alternatives that would remove any adverse affects upon each National Register property; and

"a review of alternatives that would mitigate any adverse effects upon each National Register property."

The Council is aiming toward getting WMATA to agree to a memorandum of understanding requiring a review by the Advisory Council and the State Historic Preservation Officers of each route segment study. Attached is a copy of the Council's form letter applicable to such studies.

We also have in the WMATA library, a new publication from DOT, recommended by the Advisory Council, called Techniques for Incorporating Historic Preservation Objectives into the Highway Planning Process, April, 1974, that is also applicable to mass transit.

APPENDIX B: COOPERATIVE AGREEMENTS BETWEEN WMATA AND LOCAL
JURISDICTIONS AND THE NATIONAL PARK SERVICE

APPENDIX B: COOPERATIVE AGREEMENTS BETWEEN WMATA
AND LOCAL JURISDICTIONS AND THE NATIONAL
PARK SERVICE

MASTER AGREEMENTS WITH JURISDICTIONS

In order to clarify responsibilities during Metro's construction, WMATA has entered into cooperative agreements with the District of Columbia and the other local jurisdictions through which Metro will operate. Factors covered by these agreements include:

- Design and plan approval;
- Design requirements and criteria;
- Maintenance of traffic;
- Landscaping;
- Surface and street restoration;
- Fire and police alarm system;
- Parking meters;
- Projections in public space;
- Inspection and approval of construction;
- Design and construction by the jurisdiction to accommodate WMATA;
- Design and construction by WMATA to accommodate the jurisdiction;
- Coordination of freeway and transit system;
- Final inspection and acceptance;
- Disposition of salvaged materials;
- Land acquisition and right-of-way plots;
- As-built drawings;
- Reimbursements;
- Construction permits.

The length of the Master Agreements necessitates a summary of selected points relevant to assessing the environmental impact of Metro. For purposes of the following summary, the agreement with Prince George's County has been selected. For additional information, the agreements should be consulted.

Laws Ordinances and Regulations

WMATA shall comply with all laws, ordinances and regulations of the County and its political subdivision with respect to use of streets, highways, and all other vehicular facilities, traffic control and regulation, zoning, signs and buildings.

Public Facilities and Utilities

The Interstate Compact provides that any highway or other public facility or any facility of a public utility company which will be dislocated by Metro shall be relocated if such facilities are devoted to a public use, and the reasonable cost of relocation, if substitute facilities are necessary, shall be paid by WMATA.

Cooperation in Procuring County Land

The County agrees to cooperate with WMATA in procuring those sites approved by the County for construction sites and the location of WMATA's permanent and temporary facilities, utilizing land under the ownership of the County. If no suitable County-owned land is available, then WMATA has the responsibility of acquiring any privately owned sites.

Relocation of the County's Facilities

WMATA shall perform the relocation, modification or construction of the County's facilities unless it is mutually agreed that the County shall perform the design and construction. WMATA will submit plans for relocating, modification or construction of the County's facilities for approval by the County.

Maintenance of County Facilities

The County's facilities, affected by transit construction, which are required to be kept in service and in place shall be maintained by the Authority.

Replacement and Modifications to the County's Facilities

Replacement and modifications to the County's facilities, necessitated by Metro, without betterment shall be at WMATA's expense. Replacement and modifications which result in betterment to the County's facilities shall be paid for by the County on the basis of the additional costs arising from the betterments above the cost of replacements in kind. Any new facilities added by WMATA at the County's request for the general improvement to the County's facilities and not necessitated by the rapid transit project shall be the expense of the County.

Highway and Street Improvements in the Vicinity of Stations

WMATA, in coordination with the County, shall make such studies as may be required to determine the need for street and highway improvements in the immediate vicinity of its stations. Improvements shall be designed and constructed by the County at the County's expense. Provision of minimum roadway facilities to gain access to transit facility sites shall be planned, constructed and financed by WMATA.

Design Requirements and Criteria

Relocation, modification and construction of County's facilities shall conform to the design requirements of the respective County Department and shall be in accordance with the latest edition of the following:

- WMATA Guide Specifications as approved by the County;
- Latest edition of Design Criteria for Maryland State Highway Administration;
- Construction standards and specifications for materials, highways, bridges, and incidental structures, Maryland State Highway Administration latest edition;
- County standards and specifications;
- Washington Suburban Sanitary Commission current adopted Sanitary Sewer and Water Main Specifications and Standards;
- The American Association of State Highway Officials Design Specifications;
- The American Society for Testing and Material Standards;
- The Illuminating Engineering Society Manual;
- Prince George's County Soil Conservation District Standards for Soil Erosion and Sediment Control.

In addition to the design standards above, WMATA shall locate ventilation grating openings to cause the least effect on the surrounding environment.

Maintenance of Traffic

WMATA's construction on arterial, commercial and office streets, except in tunnels and under

decking or on portions of roadways closed by permit, shall be conducted to allow orderly movement of pedestrian and vehicular traffic. Special consideration shall be given to the necessity of providing access at all times to business establishments. WMATA shall request permission from the County for partial or complete temporary closings to vehicular traffic and provide adequate detour routes.

Landscaping

Trees and landscaped areas under the control of the County shall be preserved whenever practicable. Trees in the construction area which are to remain shall be protected in accordance with the County's requirements and standards. Trees which must be removed shall be replaced with trees of species in like kind unless otherwise designated by the County. Replacement trees shall have a minimum of 2 1/2 inch caliper and be guaranteed for a period of one year. Landscaped areas shall be restored to the original condition to the extent practicable.

Surface and Street Restoration

All pavement restoration in public streets shall be in strict conformance with the current specifications and practices of the County. Restoration shall be accomplished and financed by WMATA.

Land Acquisition and Right-of-Way Plots

WMATA shall assume full obligation of costs and responsibilities in acquiring any County owned property. WMATA will pay the County fair market value.

The County will endeavor to grant WMATA a right-of-way entry permit to any land or to any interest in real property owned by the County, when it has been mutually agreed by WMATA and the County that the subject land is required for rapid transit facilities. Whenever permanent subsurface rights are granted which do not impair full usage of the surface or temporary surface easements or other temporary use of County's land or public rights-of-way are agreed to as necessary for rapid transit facilities, the

County will grant such easements or use without cost.

WMATA agrees to restore the land and/or public rights of way disturbed by construction to its original condition.

As mentioned previously, this is a summary of points particularly relevant to the environmental impact of Metro. The Master Agreements cover a number of additional points as well as procedural factors.

COOPERATIVE AGREEMENT WITH THE NATIONAL PARK SERVICE

WMATA has entered into a cooperative agreement with the National Park Service in order to establish general guidelines to be used in the consideration of specific requests for the use of parklands in connection with the construction and operation of Metro. The guidelines particularly relevant to determining the environmental impact of Metro are summarized below. For more detail, consult the cooperative agreement.

Permits and Plans

1. WMATA may not construct or operate transit facilities in or under parklands without the consent of and except upon the terms and conditions required by the Secretary of the Interior.
2. No surveys, exploratory or construction work involving parklands shall be undertaken by WMATA except in accordance with a permit issued to WMATA by the Park Superintendent who has jurisdiction over the affected lands.
3. WMATA agrees to coordinate with the Service the preparation of its plans for transit facilities in, under or adjacent to parklands.
4. Upon the request of the Service, WMATA agrees to supply, prior to or upon submittal of the permit application, geological, horticultural, hydraulic and engineering studies of the specific location in order that a determination can be made as to whether vibration,

noise, pollution, change in water table or moisture content of soil will adversely affect the park area.

5. A permit for use of parklands may include such terms as are deemed necessary for the use and protection of parklands.

Restoration

1. WMATA will perform and finance all necessary redesign, reconstruction and relandscaping of the parklands used in such a manner that the character and use of the park area shall be reestablished to the fullest extent possible, consistent with such transit use. Plans for reconstruction must first be approved by the Service prior to the issuance of a permit for the facility. Restoration work shall be completed prior to public use of the station or other facility.
2. WMATA agrees to require performance bonds to assure proper completion of the work.
3. All excavations shall be compacted to the same degree as the adjacent area when back-filled. If any settlement of disturbed areas occurs after completion as a result of Metro construction, WMATA shall correct the settlement and restore the area.

Maintenance During Construction

1. WMATA agrees to make appropriate provision in all of its plans to insure that all temporary fences, roads and structures on parklands will be aesthetically agreeable and harmonious within the adjacent park area, and agrees to submit said plans to the Service for approval with the permit application.
2. All reasonable precautions shall be exercised by WMATA to protect park property, and all damage will be immediately repaired to the satisfaction of the Service, and at no cost to the Service.

Particular attention shall be given to drainage, both permanent and temporary. WMATA shall take all possible precautionary measures to avoid damage or loss that might result from accumulations, and concentrations of drainage waters and material carried

by such waters, and such drainage shall be diverted or dispersed when necessary to prevent damage.

WMATA agrees to take all measures to avoid pollution, including disposing of silt in any waterway or drainage facility, and to comply with standards promulgated pursuant to the Federal Water Pollution Control Act.

3. WMATA shall maintain all parklands covered by its permits, which are exterior to the enclosed work area, in park-like condition as work progresses pending completion of the reconstruction of the parklands and regardless of the remaining length of the construction contract.
4. All temporary fencing shall be relocated as work progresses in order to exclude from the work area any portion of the permit area not being used for construction purposes.
5. Each individual structure to be erected on the surface of parklands shall be completed in its entirety in one continuous operation as rapidly as possible.
6. No construction, operating or maintenance equipment may be stored on parklands unless necessary for work currently being performed and in accordance with a permit issued.
7. All necessary sanitary and litter facilities shall be provided and maintained by WMATA.
8. WMATA will require employees and contractors to exercise all normal and reasonable safety precautions.
9. WMATA agrees to be fully responsible for the management, protection, use and safety within the park areas covered by any permits until work is completed and approved by the Service.

Permanent Use of Parklands

1. When it has been determined, by WMATA and the Service, what parklands will be used for permanent transit facilities, the fair market value of the parklands shall be determined by agreement. Fee title will be transferred to WMATA in exchange for a simultaneous transfer by WMATA to the Service of fee title replacement lands of comparable value which are suitable for the provision of public services in character to those

provided by the replaced parklands, acceptable to the Service for development for park purposes, and located within the Washington Metropolitan Transit Zone. If a simultaneous exchange can not be effected at that time, funds shall be paid into an escrow account and held until replacement lands are acquired.

ESCROW AGREEMENT

This agreement made and entered into this 14th day of February, 1971 by and between the Secretary of the Interior, by and through the National Park Service (hereinafter referred to as "Service"), acting by and through its Director, the Washington Metropolitan Area Transit Authority (hereinafter referred to as "Authority") acting by and through its General Manager, and the National Park Foundation (hereinafter referred to as "Foundation") acting by and through one of its officers,

W I T N E S S E T H

WHEREAS, the Service and the Authority have entered into a Cooperative Agreement effective the 11th day of February, 1971, dealing with the construction and operation of transit or related facilities upon, over or across parkways or park lands; and

WHEREAS, that Agreement provides that, when it has been determined that certain park lands will be used for permanent transit facilities, fee title to the lands to be occupied by the facility will be transferred to the Authority in exchange for a simultaneous transfer by the Authority to the Service of fee title replacement lands of comparable value; and

WHEREAS, that Agreement further provides that if a simultaneous exchange cannot be effected at that time, funds covering such value shall be paid by the Authority into an escrow account, to be used for acquisition of replacement lands, and held therein at interest until replacement lands are acquired (with principal and interest) and transferred to the Service.

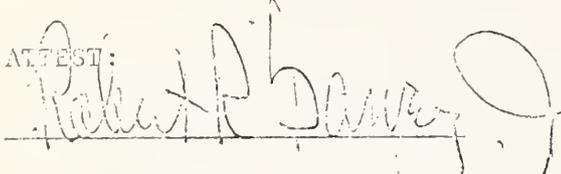
NOW, THEREFORE, in consideration of the aforesaid facts the parties hereby agree as follows:

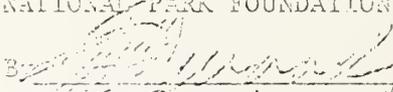
1. The Foundation shall act as escrow agent for receipt of any such funds.

2. The Foundation shall hold and invest such funds in a separate interest bearing account in a bank of the Foundation's choosing.

3. The Foundation shall make such funds, with all accrued interest, less reasonable compensation to the escrow agent, available to the Authority upon its written demand with the written consent of the Service.

WHEREFORE, the parties hereto have caused this agreement to be executed as of the day and year first above written.

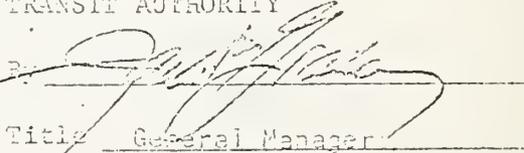
ATTEST:


NATIONAL PARK FOUNDATION
By 
_____ Title Assistant Treasurer

NATIONAL PARK SERVICE
By 
_____ Title Director

ATTEST:

_____ Secretary

WASHINGTON METROPOLITAN AREA
TRANSIT AUTHORITY
By 
_____ Title General Manager

(SEAL)

DAVID VOLKERT & ASSOCIATES

ENGINEERS
ARCHITECTS
PLANNERS

• 4701 Sangamore Road
Bethesda, Maryland 20016
301-320-3100

• 5185 MacArthur Boulevard
Washington, D. C. 20016
202-244-1516

June 11, 1975

De Leuw, Cather & Company
600 - 5th Street, N.W.
Washington, D.C. 20001

Attn: Mr. J. J. Salomon *#6/13/75*

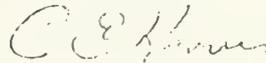
Re: Section K-4b: Change Order #750312-6

Gentlemen:

In accordance with the Manual of Design Criteria, Rev. 14.h, Page XII.10B, David Volkert & Associates (Section Designer) has investigated the area which will be affected by METRO construction within section K-4b to ensure that all appropriate requirements of the National Historical Preservation Act (P.L. 89-665 and amendments) and Executive Order 11593 have been implemented. This letter is intended to be a manifestation of compliance with para. 16a.

A visual inspection of the project site and a discussion with a contractor's representative indicated that there was nothing of historical significance in the project area. A check of the National Register of Historical Places, updated through February 4, 1975 (latest revision) in Federal Register, Volume 40, Number 24, reveals no historical landmarks within or near the project location. Correspondence with the Virginia Historic Landmarks Commission, the controlling agency, indicates that there are no landmarks or sites eligible for future inclusion in the Register as well.

Very truly yours,



C.E. Harris
Project Manager

bb

enc. Drawing showing limits of Section K-4b
DV&A letter dated May 6, 1975
Virginia Historic Landmarks' Commission
letter dated June 6, 1975

529, 527

RECEIVED

JUN 10 1975



COMMONWEALTH of VIRGINIA

VIRGINIA HISTORIC LANDMARKS COMMISSION

MEMBERS

Frederick Herman
Chairman

John M. Jennings
Vice Chairman

Stanley W. Abbott

A. Smith Bowman

Elbert Cox

Donald R. Haynes

Frederick D. Nichols

James R. Short

Marvin M. Sutherland

Junius R. Fishburne, Jr.
Executive Director

221 Governor Street
Richmond, Virginia 23219
Telephone (804) 770-3143

June 6, 1975

Mr. C. E. Harris
Project Manager
David Volkert & Associates
5185 MacArthur Blvd.
Washington, D. C. 20016

Re: K-4a and K-4b sections
Washington Metro subway
Arlington County

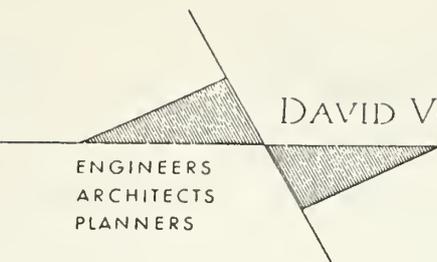
Dear Mr. Harris:

We know of no places, now listed on or which might be eligible for the National Register of Historic Places, which would be adversely affected by this project.

Yours truly,

Robert E. Swisher
Landmarks Specialist

RES/mmt



DAVID VOLKERT & ASSOCIATES

ENGINEERS
ARCHITECTS
PLANNERS

• 4701 Sangamore Road
Bethesda, Maryland 20016
301-320-3100

• 5185 MacArthur Boulevard
Washington, D. C. 20016
202-244-1516

May 6, 1975

Executive Director
Virginia Historic Landmarks Commission
221 Governor Street
Richmond, Virginia 23219

Dear Sir:

David Volkert and Associates is the section designer for the K-4a and K-4b sections of the Washington, D.C. METRO subway in Arlington County, Virginia. Project limits for the sections are shown in the enclosed drawing.

A check of the National Historical Register, updated through February 4, 1975 in Federal Register, Volume 40, Number 24, indicates that there are no historic landmarks within or near the project location.

We would appreciate verification of this fact, and more important, would like to know of any landmarks, possibly affected by the project, that are currently being considered for possible inclusion in the National Register.

Very truly yours,



C. E. Harris
Project Manager

bb
enc.



United States Department of the Interior

NATIONAL PARK SERVICE
NATIONAL CAPITAL PARKS
1100 OHIO DRIVE SW.
WASHINGTON, D.C. 20242

IN REPLY REFER TO: D24-NCP(CUCE)

JUN 17 1974

Mr. Roy T. Dodge
Washington Metropolitan Area
Transit Authority
600 5th Street, N.W.
Washington, D.C. 20001

Re: WMATA Contract 3L0011
L'Enfant Plaza-Pentagon Route
-Sections FL1 and L1

Dear Mr. Dodge:

This is in reference to the restoration drawings submitted to us by Praeger Kavanagh Waterbury on June 3 for East Potomac Park Sections L1 and FL1.

We have reviewed these plans and have assigned them our Map File No. NCP 805/80,000 sheets 1-5. These plans are hereby approved with the following understanding.

1. *Juniperus chinensis sargentii* will be changed to *Juniperus horizontalis plumosa* as originally agreed to.
2. Prior to final landscaping an onsite meeting will be conducted to ascertain any additional plantings required due to damage from construction activities.

Additional landscaping will then be incorporated into the landscape restoration contracts. Your concurrence is requested.

Sincerely yours,

(SGD) JOHN A. TOWNSLEY

Director, National Capital Parks

cc:
Mr. Butcher
Washington Metropolitan Area
Transit Authority
600 5th Street, N.W.
Washington, D.C. 20001

RECEIVED
JUL 10 1974

1. Mr. Roll OFFICIAL RECEIPT

2. Mr. [unclear]
3. H.T. File 2001

Bill No. ~~116~~ 116

Rec. # 230

Make Remittance Payable To: National Park Service, National Capital Parks
(Bureau or Office)

Date: 8/6/74

Mail Payment To: 1100 Ohio Drive, S. W., Washington, D. C. 20242
(Address)

PAYER:

Mr. Nicholas J. Roll
Washington Metropolitan Area
Transit Authority
600 5th Street, N. W.
Washington, D. C. 20001

To be issued as official receipt for all cash remittances and for all other remittances when required by applicable procedures.

Amount of Payment \$ _____

Date	DESCRIPTION	Quantity	Unit Price		Amount	
			Cost	Per		
	Reimbursement to the National Park Service for the construction of three tennis courts, in lieu of the Authority construction three required temporary tennis courts. (See attached letters 6/24/74 and 7/19/74)				58,000	00
AMOUNT DUE THIS BILL,					\$ 58,000	00

RECEIVED as payment on above bill,

\$58,000.00

Date 8/6/74

Signature *Rose P. [unclear]*

Title Cashier



United States Department of the Interior

NATIONAL PARK SERVICE
NATIONAL CAPITAL PARKS
1100 OHIO DRIVE SW.
WASHINGTON, D.C. 20242

PLEASE REFER TO:

L3027-NCP(CUCE)

MAY 14 1974

Bank

Mr. Nicholas J. Roll
Washington Metropolitan Area
Transit Authority
600 5th Street, N.W.
Washington, D.C. 20001

Dear Mr. Roll:

Pursuant to past discussions and correspondence regarding the tennis court replacement in East Potomac Park which results from your L-2 route, we propose the following solution.

We have recently constructed eight new courts, the location of which was agreed to by the Authority so as not to interfere with your construction activities. You will be removing three of our older courts for a 3-year period. The original understanding was that you would replace these three courts with temporary courts and, in turn, rebuild those three courts upon completion of your construction. To avoid a complicated and cumbersome arrangement, we suggest that you reimburse us for three of the eight courts which we recently constructed. This cost amounts to \$58,000. Payment of this \$58,000 to the National Park Service would, in our opinion, be equitable reimbursement for the required temporary courts. We would like to conclude the matter of the temporary courts in this way. Washington Metropolitan Area Transit Authority would then proceed to replace the original tennis courts on completion of the construction program.

As agreed to before, temporary fencing should be placed around the courts which will remain adjacent to the work area and safe pedestrian access across the tunnel excavation be provided at all times in the vicinity of the southeast corner of the bubble-covered courts.

Sincerely yours,

Walter J. Felt

Director, National Capital Parks



Save Energy and You Serve America!

REC'D
JUN 10 1974

*Parsons
Knoedler
JK 4-10-74*

April 10, 1974

TO: File 7254

FROM: J. Iffland

RE: WMATA Contract 3L0011
L'Enfant Plaza - Pentagon Route
Section L1

A field survey of the existing landscaping in East Potomac Park was conducted on April 8, 1974 for the purpose of establishing the existing conditions to use as a basis for the landscaping restoration drawings to be included in the Section FL1 Contract Drawings. The following were present for all or part of the time the survey was being made.

Jeff Knoedler	- NPS, NCP
Donald K. Mace	- NPS, NCP
Edward G. Underhill	- DCCO
Craig Rankin	- PKW
Leonard Puglia	- PKW
Jerome Iffland	- PKW

In addition, the following items were discussed:

1. PKW will include preliminary landscaping drawings for East Potomac Park in their Final Review Submission of Section FL1 for NPS, NCP review and comments. Once comments have been received, PKW will complete these drawings and make another submission for NPS comments.

2. PKW agreed that they will add some requirement to Section L1 specifying that tree roots, etc., will be protected by a system of ~~planting~~ *planting* where the access road traverses the area of large trees..

3. PKW will add to the Section L1 contract a requirement that the contractor shall consult with NPS and WMATA on the actual location of the access road between the I-95 and the I-95 Ramp.

JI/ag

cc: General Roy T. Dodge - WMATA
Thomas A. Sligh - WMATA
Edward G. Underhill - DCCO
Jeff Knoedler - NPS, NCP

April 8, 1974

TO: File 7254

FROM: J. Iffland

RE: WMATA Contract 3L0011
L'Enfant Plaza - Pentagon Route
Sections L1 and FL1

A meeting was held in the Washington, D. C. office of the National Park Service, National Capitol Parks on April 5, 1974 to discuss landscaping and FL1 construction staging areas for the referenced sections of subway. The following were in attendance:

Thomas A. Sligh	- WMATA
Jeff Knoedler	- NPS, NCP
Thomas DeHaven	- NPS, NCP
Leonard Puglia	- PKW
Jerome Iffland	- PKW

The following items summarize the discussion with respect to review of PKW's drawing L-1-L-1.

1. We will change the black Pine to Japanese Black Pine.

2. We will change the Sumac to Cytisus Scoparius (Scotch Bloom) and Budlleia Alternifolia (Butterfly Bush) holding about a 2:1 or 3:1 ration respectively.

3. The use of English Ivy is alright for now.

4. The drainage was discussed and explained by L. P. and it was agreed that it was being handled satisfactorily. It was noted that a catch basin had been added at the low point on the north side of the subway (which is now above grade cutting off the natural flow). In addition, there is also a catch basin on the south side of the transit structure - here the existing C. B. has been relocated but it is still at the low point of the drainage area.

5. There was no objection to dogwood and flowering crab.

6. J.I. transmitted the correspondence file noted in item 2 of PKW Memo. No 158 to Mr. Knoedler and also returned the borrowed District Plans to Mr. Slight as noted in Item 4 of the same Memo.

7. Jeff Knoedler will respond to minutes of meetings with PKW if he has any corrections or additions.

8. Mr. Knoedler expressed concern over possible damage to planting outside of the construction limits but adjacent to it. Areas explicitly noted were the strip of planting along Ohio Drive between access roads and the Elms adjacent to one of the access roads from Ohio Drive. It was agreed that WMATA would be responsible for this damage. It was suggested by J.I., that prior to updating the FL1 contract which is done just before letting and well after Section L1 construction is underway, a survey of the Park areas adjacent to construction would be made and that any restoration of damaged landscaping would then be included in the Section FL1 landscaping restoration drawings. For the time being, this approach will be used.

9. PKW will meet with Mr. Knoedler (in Rm. 202 NPS, NCP) at 8:30 Tuesday (April 9) to make the corrected survey discussed in Item 1 of PKW Memo. 158.

10. It was agreed that large trees would be replaced in kind by 6" diameter ones. Additional trees would be provided to be placed where directed by NPS, NCP to provide for an equivalency of the large trees.

11. PKW will add a note on the Section L1 landscaping drawing to the effect that the contractor shall notify NPS, NCP in sufficient time of any planting the Contractor intends to destroy so that NPS, NCP can salvage these items if they desire. The note should also cover the condition that the Contractor will notify NPS, NCP in sufficient time so that the NPS, NCP salvage operations will not delay the Contractor's work.

12. It was agreed again that any transplanting of shrubs and small trees in the construction area done by NPS, NCP prior to construction will not be a betterment item.

The following items relate to construction easement areas for Section FL1.

13. There was no problem with use of Square 390 for a construction easement area.

14. There was no problem with the construction easement area adjacent to the L2a Traction Power Substation adjacent to Ohio Drive in East Potomac Park.

15. The construction easement area on the other side of the Potomac next to the Washington Memorial Parkway is satisfactory for now. However, if it should be decided to keep the existing detour road, then PKW will change their drawing to provide access to this area from the detour road rather than from the Parkway. The area on the other side of the parkway was discussed and PKW felt that its use would result in traffic problems. Mr. Knoedler agreed to the designated area for now although this is still subject to further study on his part.

Jl/ag

cc: General Roy T. Dodge - WMATA
Thomas A. Sligh - WMATA
Edward G. Underhill - DCCO
Jeff Knoedler - NPS, NCP

April 8, 1974

TO: File 7254

FROM: J. Iffland

RE: WMATA Contract 3L0011
L'Enfant Plaza - Pentagon Route
Sections L1 and FL1

A meeting was held in the Washington Metropolitan Area Transit Authority's office in Washington, D. C. on April 3, 1974 to discuss Landscaping comments by National Park Service, National Capitol Parks for Sections L1, FL1 and L2a. The following items pertain to the discussion with respect to Sections L1 and FL1.

In attendance were:

Thomas A. Sligh	-- WMATA
Harold Butcher	- WMATA
Melvin Siegel	- WMATA
Robert Lee	- WMATA
Lou Lantz	- D. C. Dept. of H&T
Jeff Knoedler	- NPS, NCP
Jerome Schwartz	- PKW
Jerome Iffland	- PKW

The following items summarize the discussion:

1. It was noted by Mr. Knoedler that the survey drawings in Section L1 did not indicate all of the tree sizes and types. It was agreed that PKW and NPS, NCP personnel would re-survey the area together and obtain the missing information to both parties in agreement. This information would not be added to the Section L1 survey sheets. Rather, it would be included in the landscaping restoration drawings for Section FL-1 which would be developed on the premise that existing conditions would be replaced. (See also items 3, 4 and 9 below.) It was agreed that we did not have to differentiate the brush along the railroad.

2. PKW will provide Mr. Knoedler with a complete package of all correspondence and memorandums in their files relating to NPS, NCP.

3. It was agreed that WMATA would restore all landscaping in the area of the subway construction. Part of this restoration work would be in Section L1 and would cover the area around the portal as shown on Dwg. L-1-L-1. The remainder would be in Section FL-1.

4. NPS, NCP will transplant some of the plants and shrubs and maybe small trees within the construction area to other areas before construction starts. These items in general would be ones which the Contractor would not attempt to salvage and it was agreed that this transplanting would not result in a betterment item. Most of the shrubs set out in the triangle of land by the D. C. Highway and Traffic Department near the I-95 ramps will be transplanted before construction. However, all WMATA plans will restore planting to the condition before this transplanting takes place.

5. PKW borrowed the District Plans for I-95 showing the planting that they did. These will be returned to Tom Sligh.

6. Mr. Knoedler requested WMATA's construction sequence so they can plan maintenance and also road access for events such as the President's Cup and the Cherry Blossom Festival. It was noted that construction dates are still somewhat up in the air but Mr. Sligh will make this information available as soon as the construction dates and sequences have been firmed up. The contractor is required to submit a construction sequence for approval prior to starting work. This will be available for NPS, NCP's information and use.

7. Mr. Knoedler noted that the interface between L1 and L2a did not agree. The species were different and he thought there was a drainage problem. It was agreed to iron these problems out in a separate meeting with Mr. Thomas DeHaven as soon as possible.

8. It was agreed that PKW would include partially completed plans for the landscaping restoration not included in Section L1 in their next submission (Pre-Final) for Section FL-1. NPS, NCP would get these plans for review.

9. It was agreed that the large oaks along Ohio Drive and other large trees would be replaced with smaller (6" to 7" diameter) trees and in addition, some equivalent number of additional trees would be provided to make up for the impossibility of replacing the full diameter trees. These additional trees would not be a betterment item and would be placed as directed by NPS, NCP - probably along the railroad. These additional trees would then be shown on the Section FL-1 plans.

10. NPS, NCP objected to replacing the Sumac along the railroad with Sumac. This will be discussed in more detail in the meeting with Mr. DeHaven.

11. PKW will change the access road along the railroad in Section L1 to maintain the access to the Police impounding area. The existing road will be used. It was noted that PKW will have to have their surveyor come out to locate this road and we may not get it on the drawings until the amendment stage.

12. NPS, NCP does not want WMATA to replace the existing construction storage facilities along the railroad adjacent to the access road referred to in Item 11.

13. PKW will discuss the FL-1 construction easements with NPS, NCP at the meeting with Mr. DeHaven.

14. Mr. Sligh stated that maintenance of the ivy around the Portal Area would be by NPS, NCP.

JI/ag

cc: General Roy T. Dodge - WMATA
Thomas A. Sligh - WMATA
Edward G. Underhill - DCCO
Jeff Knoedler - NPS, NCP



MASTER AGREEMENT

BETWEEN

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

AND

ARLINGTON COUNTY, VIRGINIA

COOPERATIVE AGREEMENT
BETWEEN
ARLINGTON COUNTY, VIRGINIA
AND
THE WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

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COOPERATIVE AGREEMENT
BETWEEN
ARLINGTON COUNTY, VIRGINIA
AND
THE WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

This cooperative agreement, made and entered into this 25th day of May 1971, by and between ARLINGTON COUNTY, VIRGINIA (hereinafter referred to as "County"), acting by and through its County Manager, and the WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY (hereinafter referred to as "Authority"), acting by and through its General Manager.

W I T N E S S E T H :

WHEREAS, the Authority was created effective February 20, 1967, by Interstate Compact by and between Maryland, Virginia, and the District of Columbia, pursuant to Public Law 89-774, approved November 6, 1966; and

WHEREAS, the Authority is an instrumentality of the District of Columbia, the Commonwealth of Virginia and the State of Maryland; and

WHEREAS, the Authority's primary function is to plan, develop, finance and provide for the operation of a rapid transit system serving the Washington Metropolitan Area Transit Zone; and

WHEREAS, the Authority is authorized to locate, construct and maintain any of its transit and related facilities in, upon, over, under or across any streets, highways, freeways, bridges and any other vehicular facilities, subject to the applicable laws governing such use of such facilities by public agencies; and

WHEREAS, the Authority shall comply with all laws, ordinances and regulations of the signatories and political subdivisions and agencies thereof with respect to use of streets, highways and all other vehicular facilities, traffic control and regulation, zoning, signs and buildings; and in the absence of such laws, the use of such facilities by the Authority shall be subject to such reasonable conditions as the highway department or other affected agency of a signatory party may require; and

WHEREAS, paragraph 68 of the Interstate Compact provides that any highway or other public facility or any facilities of a public utility company which will be dislocated by reason of a project deemed necessary by the Authority to effectuate the authorized purposes of the Compact, shall be relocated if such facilities are devoted to a public use, and the reasonable cost of relocation, if substitute facilities are necessary, shall be paid by the Authority from any of its monies; and

WHEREAS, it is the intent of this agreement to establish herein the general guidelines and working relationship details between the Authority and the County pursuant to Arlington County laws and the enabling legislation previously mentioned in order that the Authority's rail rapid transit facilities may be accommodated in Arlington County.

NOW, THEREFORE, in consideration of the mutual covenants herein contained, the parties agree as follows:

ARTICLE I - DEFINITIONS

1. It is agreed that for the purpose of this agreement words and phrases shall be defined as follows:

a. Authority shall mean the Washington Metropolitan Area Transit Authority.

b. County shall mean the County Board of Arlington County, Virginia.

c. County Manager shall mean the County Manager of Arlington County, Virginia.

d. Department of Transportation shall mean the Department of Transportation of Arlington County, Virginia.

e. Department of Building Inspection shall mean the Department of Building Inspection of Arlington County, Virginia.

f. Department of Utilities shall mean the Department of Utilities of Arlington County, Virginia.

g. Authority's Engineer or Inspector shall mean the authorized representative of the Authority with such power as may be delegated to him.

h. Department's Engineer or Inspector shall mean the authorized representatives of the respective Department with such power as may be delegated to him.

i. Department of Transportation Facilities shall mean all structures, improvements, services, and other properties under the jurisdiction of the Department and shall include roadways, pavements, alleys, curbs, parking meters, traffic signs, surface markings, sidewalks, trees, landscaping, police and fire alarm systems and street and traffic lighting systems and storm sewer systems including drainage structures.

j. Department of Utilities Facilities shall mean all structures forming a part of the sanitary sewerage system and the water system including street fixtures such as manhole covers, fire hydrants and water valve covers.

k. Public Space shall mean the area between private property lines and consisting of alley, roadway, medians, sidewalk, grass and utility strip, automobile parking areas or any combination thereof. The term includes real property interests and easements for street, sidewalk, highway, public parking lots, public parks, storm sewer, water mains, sanitary sewers and other public purposes under the control and jurisdiction of Arlington County.

l. Authority's Contractor shall mean the individual, partnership, or corporation that agrees to provide all labor, material services, and perform all work required under a contract with the Authority.

m. Department's Contractor shall mean the individual, partnership, or corporation that agrees to provide all labor, material services, and perform all work required under a contract with the respective Department.

n. Section shall mean a physical portion of the Authority's rapid transit system to be constructed under one or more construction contracts.

o. Section Designer shall mean an individual engineering or architectural-engineering firm selected by the Authority to prepare contract plans, specifications and cost estimates for a section of the Authority's rail rapid transit system.

p. General Engineering Consultant (GEC) shall mean an engineering firm retained by the Authority to prepare engineering design criteria, general plans, directive drawings, standard drawings and guide specifications for the rapid transit system; to review the work of the various Section Designers; and to coordinate the review of the Section Designer's plans by the public agencies affected by the work.

q. General Architectural Consultant (GAC) shall mean an architectural firm retained by the Authority to prepare the architectural conceptual design, general plans, directive drawings, standard drawings, and to coordinate and review the architectural work during the final design phase.

r. General Soils Consultant (GSC) shall mean a firm retained by the Authority to perform soils and geologic investigations for the rapid transit system, and to review foundation and underpinning designs prepared by the Section Designers or the Authority's Contractors.

s. Betterments shall mean and include any upgrading of County's facilities in terms of function, capacity, durability, or efficiency, made for the benefit of and at the election of the respective Department, not attributable to the rapid transit construction. Replacement in kind

or to meet current design criteria standards shall not be considered to be a betterment. Betterments include, but are not limited to the following examples:

(1) An increase in the gutter-to-gutter width to increase the number of lanes in the traveled way.

(2) An increase in the gutter-to-gutter width to provide for a median, with no increase in the capacity of the traveled way.

(3) Improvement in the landscaping of an area above existing conditions.

(4) Increase in thickness of pavement above existing construction standards of the Department of Transportation.

(5) Increase in existing size greater than the minimum size specified in the current adopted County Design Criteria Standards for storm sewer, sanitary sewer, or water mains.

t. Authorization shall mean approval by the County for the Authority to proceed with the construction of any phase of a Section, or approval by the Authority for the County to proceed with the design and/or construction of a transit related project.

u. Relocation shall mean the adjustment of County's facilities required by the rapid transit system, such as removing and reinstalling the facility including necessary rights-of-way at a new location; moving; rearranging; construction; or reconstruction.

v. Dislocate shall mean to displace, disrupt, disarrange, abandon, or put out of proper place.

w. Maintain shall mean supporting complete in place, protecting, constructing temporary replacement facility or continuing facility in service.

x. Salvage Value shall mean the amount received for County property removed, if sold; or if retained for reuse, the amount at which the material recovered is charged to the County's accounts.

y. Arterial Streets shall mean through streets as defined by the major thoroughfare Plan of Arlington County, Virginia and subsequent amendments or revisions thereto.

z. Peak Traffic Hours shall mean the normal workday hours (normally five (5) hours per day) during which parking or standing is prohibited on the designated streets.

aa. Non-peak Traffic Hours shall mean the daylight hours between the morning and evening peak traffic hours, and weekend hours.

bb. Overnight Traffic Hours shall mean the hours during the night between the evening peak traffic hours and the peak traffic hours the following morning.

cc. Commercial and Office Streets shall mean those streets subject to special work restrictions in that the orderly movement of pedestrian traffic shall be maintained during business hours. Street space interruptions shall be kept to a minimum during peak traffic hours except by special permit. For this purpose, these streets are designated as follows:

- (1) North Lynn Street - from Arlington Boulevard to Lee Highway
- (2) North Moore Street - from Wilson Boulevard to 20th Street North
- (3) Fort Myer Drive - from Lee Highway to Arlington Boulevard
- (4) Wilson Boulevard - from North Lynn Street to North Glebe Road
- (5) 19th Street North - from North Nash Street to Arlington Ridge Road
- (6) Fairfax Drive - from Fort Myer Drive to North Rhodes Street
- (7) 16th Street North - from North Uhle Street to North Rhodes Street
- (8) Court House Road - from Arlington Boulevard to Wilson Boulevard
- (9) 15th Street North - from North Taft Street to North Veitch Street
- (10) North Veitch Street - from 14th Street North to 16th Street North
- (11) North Garfield Street - from Washington Boulevard to North of
Wilson Boulevard
- (12) North Highland Street - from Washington Boulevard to 13th Street North
- (13) Washington Boulevard - from North Highland Street to Kirkwood Road
- (14) Fairfax Drive - from Wilson Boulevard to Glebe Road
- (15) Kirkwood Road - from Washington Boulevard to Fairfax Drive
- (16) Lee Highway - from Washington Boulevard to Fairfax Drive
- (17) Glebe Road - from Wilson Boulevard to Washington Boulevard
- (18) North Quincy Street - from Wilson Boulevard to Washington Boulevard

- (19) Fairfax Drive - from Lee Highway to Falls Church Line
- (20) Washington Boulevard - from Lee Highway to North Westmoreland Street
- (21) 18th Street South - from South Fern Street to South Ball Street
- (22) South Eads Street - from 15th Street South to 20th Street South
- (23) South Clark Street (Jefferson Davis Highway Service Road) - from 15th Street South to 20th Street South
- (24) South Ball Street - from 15th Street South to 20th Street South
- (25) Clark Place - from 18th Street South to 20th Street South

dd. Central Business District shall mean all streets in Clarendon, Virginia Square and Parkington area which are primarily commercial in nature and shall be subject to special work restrictions during the Christmas shopping period which will prohibit excavation and the placement of decking on the street surface but will not preclude activity below ground. These streets are designated as follows:

- (1) Wilson Boulevard - from North Court House Road to North Glebe Road
- (2) Fairfax Drive - from North Danville Street to North Nelson Street
- (3) Washington Boulevard - from North Fillmore Street to North Monroe Street
- (4) North Danville Street - from Fairfax Drive to Franklin Road
- (5) North Edgewood Street - from 11th Street North to Franklin Road
- (6) North Fillmore Street - from 11th Street North to Franklin Road
- (7) North Garfield Street - from Washington Boulevard to Franklin Road
- (8) North Highland Street - from Washington Boulevard to 13th Street North
- (9) North Hartford Street - from Wilson Boulevard to 13th Street North
- (10) North Herndon Street - from Wilson Boulevard to 13th Street North
- (11) North Irving Street - from Wilson Boulevard to 13th Street North
- (12) North Monroe Street - from Fairfax Drive to Washington Boulevard
- (13) North Randolph Street - from North Glebe Road to Fairfax Drive
- (14) North Stafford Street - from Wilson Boulevard to 9th Street North
- (15) North Stuart Street - from Wilson Boulevard to 9th Street North

ee. Public Setback shall mean the portion of the street between the property side of the sidewalk and the building or property lines.

ff. Sidewalk Space shall mean that portion of the street between the curb lines or the lateral lines of a roadway and the adjacent property lines intended for the use of pedestrians. It encompasses the area normally designated for grass and utility strips.

ARTICLE II - GENERAL

2. The County agrees to assist the Authority in procuring consistent with the authorities and responsibilities of the County those areas suitable for construction sites and for location of the Authority's permanent and temporary facilities, utilizing land under the control of the County.

3. The Authority shall perform the relocation, modification or construction of the County's facilities, in accordance with the plans prepared by the Authority's Section Designers and approved by the County unless it is mutually agreed that the County shall perform the design and construction as provided in ARTICLE XII - "Design and Construction by County" to accommodate the Authority.

4. The County agrees and consents to the relocation, modification or construction of the County's facilities by the Authority, subject to the restrictions hereinafter set forth.

5. Maintenance of County facilities complete in place during the course of the construction shall be at the Authority's expense.

6. Replacement and modifications to the County's facilities necessitated by reason of the Authority's rapid transit project, without betterment, shall be at the Authority's expense.

7. Replacement and modifications to the County's facilities which results in betterments to the County's facilities shall be paid by the County on the basis of the additional costs arising from the betterments above the cost of a replacement in kind. The value of the betterments may be determined by use of special bid items or by mutual agreement.

8. Any new facilities added by the Authority at the County's request for the general improvement of the County's facilities and not as replacements or modifications necessitated by the rapid transit project shall be at the expense of the County. The costs of design and construction to be paid by the County shall be determined by use of special bid items or by mutual agreement.

9. The Authority, in coordination with the County, shall make such studies as necessary to determine the need for street and highway improvements in the immediate vicinity of its stations.

10. Improvements to the County's streets made necessary by increased traffic at the Authority's rail rapid transit stations shall be designed and constructed by the County at the County's expense.

11. Provision of minimum roadway facilities, in the nature of driveways, necessary solely to gain access to transit facility sites from the nearest or most appropriate existing or programmed public street or highway, as determined by the Authority, shall be planned, constructed and financed by the Authority.

12. The Authority shall receive a credit for the salvage value of replaced materials, as provided in Article IV, Disposition of Salvaged Materials.

13. The County has designated the Department of Transportation as the Department to receive, expedite, distribute and coordinate the plans and specifications of the Rapid Transit System for review and comments with the various County Departments affected as required by County ordinances. The Department of Transportation will return two copies of plans and specifications with all the comments from various County Departments to the Authority's General Engineering Consultant.

ARTICLE III - DESIGN AND PLAN APPROVAL

14. The design of replacements and modifications to the County's facilities for the Authority's project shall be included in the overall design of the transit project.

15. Coordination of design and development of the final plans and specifications shall be accomplished by the Authority's Section Designer by conferring from time to time with the respective Department's point of contact to insure that the plans conform to the respective Department's current standards. Department representatives shall endeavor to furnish the Section Designer an approval or comments on any proposed design within ten (10) working days, after submission thereof.

16. The General Engineering Consultant shall transmit three (3) sets of plans and specifications to the Department of Transportation for review and comments at various review stages of 30% and 65%. Two (2) sets of each submission shall be returned to the General Engineering Consultant with the County's comments. Fifteen (15) working days shall be allotted for reviews. The County at the 100% final stage shall give the Authority written approval of the plans and specifications. One set of full size and three sets of half size plans shall be submitted to the Department at the 100% final stage for its record and use.

a. Proposed revisions to the approved plans of the transit system which would affect Arlington County's facilities shall be submitted to the County for approval.

17. The County written approval of the plans and specifications shall constitute a general construction permit to the Authority to permit the construction of that section of the Rapid Transit System complete, with related facilities, and modifications to certain County facilities in conformity with approved plans and specifications.

18. The Authority shall assume full responsibility and cost of obtaining any needed modification to the Virginia Fire Safety Regulations necessary to permit the construction of subway stations similar to the Rosslyn Station.

19. The review, coordination and approval of the Authority's plans by the County shall be at the County's expense.

ARTICLE IV - DESIGN REQUIREMENTS AND CRITERIA

20. Relocation, modification and construction of County facilities shall conform to the design requirements of the respective Department and shall be in accordance with the latest edition of the following:

a. The Authority's Guide Specifications as approved by the Department.

b. Arlington County, Virginia, Department of Transportation, Street and Storm Sewer Construction Specifications, 1968.

c. Highway and Storm Sewer Standards, Arlington County, Virginia, Department of Transportation.

d. Arlington County, Virginia, Department of Utilities Sanitary Sewer and Water Main Specifications and Standards.

e. The American Association of State Highway Officials Design Specifications.

f. The American Society for Testing and Material Standards.

g. The Illuminating Engineering Society Manual.

21. In addition to the design standards above, the following specific policies shall apply:

a. A minimum thickness of 8" of concrete is required for all highway structure decks.

b. The Authority shall locate ventilation grating openings to cause the least effect on existing features of landscaping, improvements and the environment. They shall be located preferably in raised median strips, the public setback or in other public land. Placement of ventilation gratings in sidewalks shall be avoided, if practicable. Where location in other areas is impracticable, ventilation grate openings will be authorized at approved locations immediately behind the street curbs, provided the width does not exceed forty percent of the sidewalk width. Where possible, gratings will be located outside of the far tangent points at street intersections or outside of crosswalk area. Openings, such as mechanical access openings, will be permitted in side-

walks. A checker metal plate is permissible. All vent and fan shaft openings affecting the County facilities shall be submitted for Department review.

c. Sewers and Drainage

(1) Replacements of existing sewers and appurtenances shall provide services equivalent to those of the existing facilities.

(2) Minimum pipe sizes for sanitary sewers shall be 8" diameter and for storm sewers 15" diameter.

(3) In general, sewers shall be of the following materials:

Sanitary Sewers: 8" to 24" diameter concrete pipe, cement asbestos pipe or vitrified clay pipe.

Over 24" diameter, reinforced concrete pipe with rubber gaskets or reinforced concrete masonry, monolithic.

Storm Sewers: 15" to 24" diameter, reinforced concrete pipe unless otherwise approved.

Over 24" diameter, reinforced concrete pipe, or reinforced concrete masonry, monolithic.

(4) All sewers replaced within the limits of rapid transit excavation shall be installed on properly compacted backfill, on either a gravel or concrete cradle.

(5) Manholes, including frames and covers, shall be centered on sewer lines to facilitate the use of mechanical sewer cleaning equipment.

(6) Plans shall depict manholes with risers of 4' - 0" inside dimensions. The Authority's contractor shall be given the opportunity of submitting for approval alternate designs utilizing brick, precast concrete sections or reinforced concrete pipe.

(7) Service connections to adjoining properties shall be maintained by supporting in place or by providing alternate temporary facilities.

(8) Catch basins, utility drains, and subsurface drains shall not be connected to sanitary sewers.

(9) No surface drainage from adjoining areas shall be connected to the rapid rail transit system track drains.

d. Water

(1) Minimum size of replacement water mains shall be 6" diameter.

(2) Water mains removed from service shall be replaced by pipes of equal size, except that 6" diameter pipe shall be used in lieu of existing 4" diameter or smaller.

(3) All water mains and appurtnenaces replaced within the limits of rapid rail transit excavation shall be installed on properly compacted backfill. For sizes not exceeding 20" diameter, ductile iron pipe shall be used; for sizes larger than 20" diameter, ductile iron or prestressed concrete pipe shall be used.

(4) Pipe used for water mains shall be:

- (a) Ductile iron pipe, with bituminous seal coated concrete lining and mechanical joint. "Push-on" type joint may be used where earth settlement is not expected, or harnessing is not required.
- (b) Prestressed concrete pipe may be used as an alternate to ductile iron on sizes larger than 20" diameter.

(5) Provisions for harnessing and blocking water mains, where required, shall be in accordance with current Department of Utilities Standards.

(6) Design of water mains shall be based on reservoir overflow elevations, plus water hammer.

(7) House connections - Service shall be maintained at all times. Connections for both water and sewer shall be in accordance with the Plumbing Code of Arlington County.

22. The standard details pertaining to the relocation, modification and construction of County facilities shall be as shown on the latest revision of the following Authority Utility Standard Drawings:

ST-U-20	Arlington County	Sewer Details
ST-U-21	Arlington County	Sewer Details
ST-U-22	Arlington County	Water Details

The above drawings shall be incorporated in all sets of contract drawings involving the relocation, modification and construction of the County's facilities.

ARTICLE V - MAINTENANCE OF TRAFFIC

23. The Authority's construction on arterial, commercial, and office streets except in tunnel and under decking or on portions of roadways closed by permit, shall be conducted during peak traffic hours in such a manner so as to allow orderly movement of pedestrian and vehicular traffic. Trucking of excavated material, supplies, and equipment shall not be restricted except as required by Code of Virginia and the Arlington County Motor Vehicles and Traffic Code. The Authority and the Department of Transportation agree that they shall jointly approve a plan which shall govern the operations of the Authority's Contractor. The plan shall consider the contractual obligations of the Authority and the economic impact on the business establishments. Any exception to the restriction requested by the Authority which cannot be mutually resolved will be referred to the County Manager for resolution.

24. Access to business establishments: In the operations of the Authority's Contractor, special consideration shall be given to the necessity of providing access to business establishments for pedestrians, deliveries and fire-fighting equipment.

25. Street Closings: Streets in the construction area may be partially or completely closed and detours provided subject to prior approval by the Department of Transportation and the following limitations:

a. Signs, Pavement Markings and Barricades shall be installed and maintained by the Authority's Contractor in accordance with (1) the "Detour Plans" prepared by the Section Designer, (2) Arlington County Street and Storm Sewer construction specifications, (3) National and Virginia Manual on Uniform Traffic Control Devices.

b. In advance of any partial or complete closing of any street, the Authority's Engineer shall submit to the Traffic Engineering Division of the Department of Transportation for approval three (3) copies of his detailed plan showing the size, location and legends of signs, markings, and barricades which he proposed to install. The plan shall be submitted in sufficient time to permit approval at least three weeks in advance of the proposed closure.

c. The Department of Transportation shall give such public notice as required by County Ordinances of the necessity to close a street and shall notify the Fire and Police Departments of the street closing.

d. The Authority's Contractor shall notify the Department of Transportation 48 hours in advance of implementation of the approved plan to allow verification by the Department that all necessary detours, signs, pavement markings and other protective measures have been provided by the Authority's Contractor, and in order that the Department of Transportation may approve all said measures, which approval shall not be unreasonably withheld.

e. Partial closing of arterial cross streets shall be permitted during non-peak traffic hours and overnight traffic hours. When feasible, the Department of Transportation shall grant permission to close arterial cross streets to traffic during weekends (8:00 p.m. Friday to 5:00 a.m. Monday).

26. Bus Routing: The Department of Transportation shall be responsible for coordinating with the Washington Metropolitan Area Transit Commission the rerouting of bus traffic necessitated by construction of the rail rapid transit system.

27. Access ramps, pits and storage areas shall be located on side streets whenever possible. Access ramps shall generally be located in the center of the roadway, except on one way streets. Trucks entering or leaving the work area via access ramps shall be operated in such a manner to minimize interference with the flow of traffic in the traveled roadway.

28. To assist the Authority in the development of construction staging plans, the Department of Transportation upon request from the Authority's GEC, shall furnish the following information for each section of the rapid rail transit system:

a. The traffic requirements in lanes "X" feet wide during the following periods, with the time duration of each period:

- (1) Peak traffic hours - desirable
- (2) Peak traffic hours - minimum
- (3) Non-peak traffic hours - desirable
- (4) Non-peak traffic hours - minimum
- (5) Overnight traffic hours - absolute minimum

b. Streets which may be closed completely during construction and the duration of the closing.

c. Parking restrictions which will be imposed during the construction period.

d. Suggested location of access ramps within the area of the street.

ARTICLE VI - LANDSCAPING

29. Trees and landscaped areas under the control of the Department of Transportation shall be preserved whenever practicable. Trees in the construction area and which are to remain shall be protected in accordance with the Department of Transportation requirements and standards. Trees which must be removed shall be replaced with trees of a species in like kind unless otherwise designated by the Department. Replacement trees shall have a minimum of two and one-half (2-1/2) inch caliper and be guaranteed for a period of one year. Landscaped areas shall be restored to the original condition to the extent practicable.

ARTICLE VII - SURFACE AND STREET RESTORATION

30. All pavement restoration in public streets shall be in strict conformance with the current specifications and practices of the Department of Transportation, and shall be inspected by the Authority.

31. Restoration shall be accomplished by the Authority's contractor at Authority expense on the basis of a replacement in kind or to meet current standards of the Department of Transportation. Betterments related to surface and street restoration requested by the Department of Transportation and approved by the Authority shall be designed by the Authority's Section Designer and constructed by the Authority's Contractor. The design and construction costs related to the betterment shall be at the County's expense. The Authority's obligation shall be limited to the replacement cost alone.

ARTICLE VIII - STREET AND TRAFFIC LIGHTING SYSTEM

32. The Department of Transportation's street lighting system is normally served by cables and ducts owned by the Potomac Electric Power Company or the Virginia Electric and Power Company except that some are owned and maintained by Arlington County and served by private cable and ducts. The Department of Transportation traffic signal system is normally served by the Potomac Electric Power Company or Virginia Electric and Power Company to the Department of Transportation's cable and conduit within the intersection, except for detectors and interconnect cable which is not within the intersection. The Authority's plans shall, where practicable, indicate that the Authority's Contractor shall maintain the ducts and cables complete in place.

33. In those instances where the construction of the Authority's rapid transit system requires a temporary or permanent relocation of portions of the Department of Transportation's street and traffic lighting system, the Department of Transportation shall order the work for installing ducts, cables, and making connections in coordination with the schedule of operations of the Authority's Contractor, except that in decked areas, temporary poles, lights and ducts shall be furnished, erected and removed by the Authority's Contractor. Temporary work shall be coordinated by the Authority's Engineer with the Department of Transportation. Relocations required shall be requested by letter.

34. Work performed by the Department of Transportation in such relocations shall be at the Authority's expense on a reimbursable basis. Separate cost records shall be maintained by the Department of Transportation for each project. Work performed by the Potomac Electric Power Company or the Virginia Electric and Power Company for the Department of Transportation in such relocations shall be at the Authority's expense on a reimbursable basis. Billings for this work shall be direct from the Potomac Electric Power Company or the Virginia Electric and Power Company to the Authority and shall be accompanied by a letter from the County approving the work performed.

ARTICLE IX - PARKING METERS

35. The Department of Transportation shall remove and reinstall parking meters in coordination with the schedule of operations of the Authority's Contractor. The Authority's Contractor shall remove the posts for the parking meters and the Department shall store and reinstall the posts.

36. Work performed by the Department of Transportation in the removal and reinstallation of parking meters shall be at the Authority's expense on a reimbursement basis. Separate cost records shall be maintained by the Department of Transportation for each project.

ARTICLE X - PROJECTIONS IN PUBLIC SPACE

37. The Authority's plans shall indicate those vaults, signs, display windows, footings, foundations and other projections in public space which must be removed to accommodate the construction of the Authority's rapid transit system. The projections into public space affected by the construction shall be identified as early as possible in the final design phase by the Authority's Section Designers.

38. Upon a determination by the Authority that any projection into public space must be removed, the Authority shall notify the Department of Transportation which, after verifying the projection relative to the Department of Transportation's records, will initiate action for abandonment and removal of the projection in accordance with the procedures established and agreed upon by the Authority and the County.

39. To ensure that the future use of public and private space does not act to the detriment of the planned location of the Authority's rapid transit system, the County agrees to coordinate with the Authority any requests for the use of public and private space adjacent to the Authority's proposed facilities.

ARTICLE XI - INSPECTION AND APPROVAL OF CONSTRUCTION

40. The Authority and the County agree that a duplication of effort in the inspection of construction of the Authority's rapid transit system shall be avoided and in the furtherance of that objective the County agrees to the delegation of certain responsibilities for inspection.

41. Work performed by the Authority's Contractor shall be inspected by the Authority. If the Authority requests the County to provide personnel to augment the Authority's inspection forces and the County agrees, such inspection services shall be performed by the County on a reimbursable basis. Contacts of the County's inspectors with the Authority's Contractor shall be through the Authority's Engineer.

42. The County's responsibility for sheeting and shoring plans shall be limited to review and approval only for location. The Authority's Engineer shall inspect the installation, maintenance and removal of sheeting and shoring.

43. The Authority's Engineer shall inspect the County facilities, to insure that the work has been installed in compliance with the County standards and in accordance with the plans and specifications approved by the County. Upon completion of the construction under each contract, the Authority shall certify in writing to the County that the facilities have been constructed in accordance with the County's standards.

44. The Department of Building Inspections or any other County Agency may from time to time inspect the construction to determine compliance with laws and ordinances of the County of Arlington or the State of Virginia. The Authority agrees to require that its contractors comply with all laws and ordinances that are applicable.

ARTICLE XII - DESIGN AND CONSTRUCTION BY COUNTY
TO ACCOMMODATE AUTHORITY

45. The Authority and the County may agree that the County shall design and construct certain structures related to the Authority's system or that the adjustment of the County facilities is a direct result of the accommodation of the Authority's system. In such event, the approval of such projects shall be as follows:

a. Upon completion of preliminary design by the County the County shall provide the Authority with a preliminary cost estimate of the facilities to be paid by the Authority, together with three (3) sets of the preliminary plans and specifications.

b. Upon approval of the preliminary plans and cost estimate by the Authority, the County shall complete the design. The County, upon the Authority's approval of final design and cost estimate, shall advertise the project for bids. The County shall then inform the Authority of the Authority's share of the cost based upon the low bidder's unit prices, and shall furnish the Authority with (3) copies of the abstract of bids, together with three (3) sets of the final plans and specifications. The Authority shall have the right to review the bids, and reject or approve the lowest responsible bid in consultation with the County.

c. After review and approval of the budget estimate by the Authority, funds of the Authority shall be obligated. The County shall thereafter obtain the Authority's approval for modifications to the contract which will affect the Authority's portion of the project and shall inform the Authority promptly when the Department is aware that the budget estimate is likely to be exceeded.

d. The Authority shall reimburse the County monthly on a progress payment basis. Final allocation of costs shall be determined by the final quantities installed under the contract for the Authority.

e. The Authority shall have the right to review the amount and degree of inspection services performed on the project.

f. The County shall furnish the Authority a monthly progress report for each project.

ARTICLE XIII - FINAL INSPECTION AND ACCEPTANCE

46. In order to ensure the prompt transfer of responsibility for maintenance of County facilities as soon as the work has been completed, the Authority shall inform the respective Department in writing that the facility has been completed, and that the facility is ready for final inspection and acceptance. In the event mechanical equipment is involved such as for a pumping station, operation manuals and maintenance data shall be forwarded with the requests.

47. The final inspection shall be attended by representatives of the Authority, the County, and the Authority's Contractor. If deficiencies are found, the Authority shall direct the required corrective work. After all deficiencies are corrected and the new facility is acceptable to the County, the County shall forward a letter of acceptance to the Authority. If keys to a facility are involved, they shall be forwarded to the County immediately after receipt of the letter of acceptance.

48. The Authority shall furnish the County one set of reproducible "as-built" plans showing all County facilities constructed, relocated or modified resulting from construction of the rapid transit system.

ARTICLE XIV - DESIGN AND CONSTRUCTION BY AUTHORITY TO ACCOMMODATE COUNTY

49. The County projects, or portions thereof, which have been authorized and for which the preliminary engineering has been completed may, by mutual agreement, be constructed by the Authority. In such event, the County shall initiate a request to the Authority for the incorporation of specific parts of the project into a future Authority final design contract. The County and the Authority shall agree in advance as to the allocable costs to each. Generally, design costs shall be reimbursed on the basis of actual costs, and construction costs shall be allocated on the basis of unit bid prices of the accepted bidder. Final allocation of costs shall be determined by the final quantities installed under the contract.

50. After the Authority has started final design of a transit project, and the County determines through a review of the Authority's plans that economies in design and construction may be realized by the integration of a County project, or portion of such project, into the Authority project, the County shall inform the Authority. Thereafter the following procedure shall be followed:

a. After review and approval of the proposal by the Authority, the Authority shall negotiate a modification to the existing final design contract to incorporate the design of facilities requested by the County. The County shall be obligated to reimburse the Authority for the increase in design costs.

b. Upon completion of preliminary design by the Authority, the Authority shall provide the County with a preliminary estimate or costs of the facilities to be paid by the County, together with three (3) sets of the preliminary plans and specifications.

c. Upon approval of the preliminary plans and cost estimate by the County, the Authority shall complete the design. The Authority upon the County approval of final design and cost estimate shall advertise the project for bids. The Authority shall then inform the County of the County's share of the cost based upon the accepted low bidder's unit prices, and shall furnish the County with three (3) copies of the abstract of bids, together with three (3) sets of the final plans, and specifications. The County shall have the right to review the bids, and reject or approve the lowest responsible bid.

d. After review and approval of the budget estimate by the County, funds of the County shall be obligated. The Authority shall thereafter obtain the County's approval for modifications to the contract which will affect the County's portion of the project and, in any event, shall inform the County promptly when the Authority is aware that the budget estimate is likely to be exceeded.

e. The County shall reimburse the Authority monthly on a progress payment basis. Final allocation of costs shall be determined by the final quantities installed under the contract for the County.

f. The County shall have the right to review the amount and degree of inspection services performed on the project.

g. The Authority shall furnish the County a monthly construction progress report for each project.

51. In the event any publicly owned utility facilities must be relocated or rearranged to accommodate a street improvement desired by the County and is included in an Authority administered construction contract at the County's request but which is not necessitated by the Authority's rapid transit system construction, it is understood and agreed that such relocation will be accomplished at no expense to the Authority and that the County will issue all necessary notices to relocate or remove such facilities and pay all costs connected therewith that the affected utility is not legally obligated to assume.

ARTICLE XV - DISPOSITION OF SALVAGED MATERIALS

52. Materials salvaged by the operations of the Authority's Contractor such as catch basin and manhole tops, steps, and frames; storm sewer pipe; sanitary pipe; water pipe; water valves; fire hydrants; water valve boxes and covers; fittings; parking meter posts; and Street Light Standards and Traffic Lights, controls and related equipment: shall be used within the contract limits if approved by the County's Engineer. Material which is not reused and desired by County shall be delivered to the County. Material that is not reusable and not claimed by the County shall become the property of the Authority's Contractor, and shall be removed promptly by him, unless otherwise noted on plans.

ARTICLE XVI - AS-BUILT DRAWINGS

53. The Authority Engineer shall maintain a set of "as-built" drawings which shall be available for review by the County during the progress of the work.

54. Upon completion of the work under an Authority contract, the Authority shall furnish the County with polyester film reproductions or equivalent reproductions of plans showing all facilities installed.

ARTICLE XVII - REIMBURSEMENTS

55. The Authority shall reimburse the County for the following types of services provided by the Department:

a. Construction performed and/or materials supplied by the County resulting from a relocation of any of the County facilities.

b. Construction performed by the County resulting from a relocation of the County's Street and Traffic Lighting System.

c. Construction performed by the County in the removal and reinstallation of parking meters.

d. Design and construction performed by the County under the provisions of ARTICLE XII.

e. Inspection services, valve operation, review and approval of shop drawings related to County facilities.

f. Right-of-way purchased by the County for the Authority.

Upon approval of the Authority plans as provided in ARTICLE III, the County shall, within 15 days after such approval, provide the Authority with a budget estimate of the costs to be reimbursed to the County.

56. The County shall bill the Authority monthly on a progress basis for the reimbursable costs accumulated in the previous calendar month. Such invoices shall clearly show the Authority contract number and the County control number and shall be in such detail to permit an evaluation of the materials furnished and the services performed by the County. Credits due the Authority for betterments to the County's facilities shall be clearly delineated.

57. Design and construction performed by the Authority for the County under the provisions of ARTICLE XIV shall be reimbursed to the Authority by the County on a monthly progress basis.

58. The Authority shall have the right to audit the County's records at such times and places as mutually agreed to, to include books, records, documents, papers, and other supporting data involving those transactions in which the County performs construction and services for the Authority.

59. The County shall have the right to audit the Authority's records at such times and places as mutually agreed to, to include books, records, documents, papers and other supporting data involving those transactions in which the Authority performs construction and services for the County.

60. The Authority and the County agree that they shall jointly establish administrative procedures and guidelines which will expedite the review, approval and payment of reimbursement invoices by the Authority and the County, and which shall adequately protect the financial interests of both parties.

ARTICLE XVIII - CONSTRUCTION PERMITS

61. The written notice of approval of final plans and specifications as stated in ARTICLE III - paragraph 17 shall constitute a general permit from the County to the Authority to permit the construction of The Rapid Transit System complete, including related facilities and modification to certain County's facilities, in conformity with the plans and specifications for that section of the system.

62. The Authority's contractor, as soon as practicable after award of the contract and after approval by the Authority's Contracting Officer, shall submit his construction time schedule to the County Department of Transportation.

63. The Authority's contractor shall coordinate his work completely with each County Department affected by his activity.

64. The County shall make no charge for construction permits since the Authority is paying for the cost of inspection and "as built" plans.

65. Until further notice the following personnel are designated as points of contact for the Department:

Department of Transportation

Plan review at all stages Director	558-2551
Trees and Landscaping Director	558-2551
Materials of Construction Highway Inspection Supervisor	558-2560
Street Lights and Traffic Requirements Chief, Traffic Engineering Division	558-2255
Street Design Chief, Administrative Division	558-2551
Bridge Design Chief, Administrative Division	558-2551
Utilities Utilities Engineer	558-2551

Department of Building Inspection

Safety, Electrical, Plumbing and Building Director	558-2351
Specifications Chief, Operations Division	558-2551

Department of General Services

Fiscal Director	558-2341
Real Estate	558-2111

Department of Utilities

Plan review at all stages Director	558-2321
Water-Sanitary Sewer Design Chief, Water-Sewer Division	558-2321

66. Until further notice, the following personnel are designated as points of contact for the Authority:

Assistant Director
Office of Engineering 484-2695

Civil Engineer
Office of Engineering 484-2752

Director
Office of Construction 484-2664

Director
Office of Real Estate 484-2676

For De Leuw, Cather and Company

Chief Utilities Engineer 554-9330

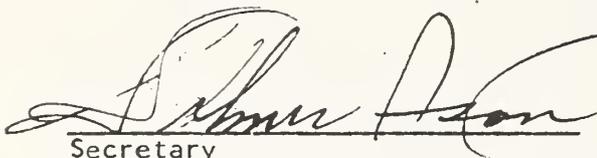
Chief Construction Engineer 554-9330

67. The parties agree that the article and paragraph headings are solely for convenience of reference and shall neither constitute a part of this agreement nor have any legal effect whatsoever.

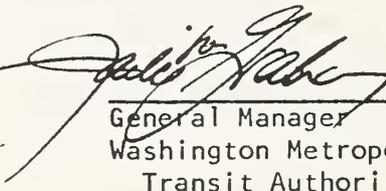
68. In witness whereof, the parties have executed this agreement as of the date entered on the first page.

ATTEST:

APPROVED:



Secretary
Washington Metropolitan Area
Transit Authority

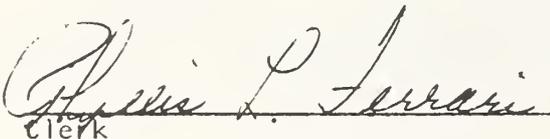


General Manager
Washington Metropolitan Area
Transit Authority

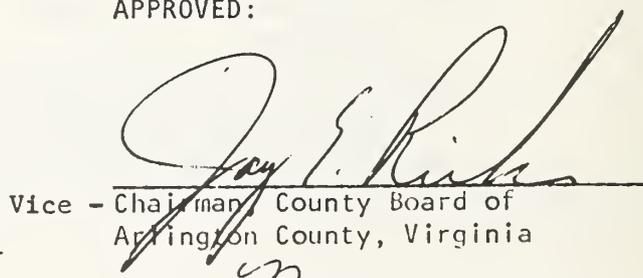
Date May 27, 1971

ATTEST:

APPROVED:



Clerk
County Board of Arlington
County, Virginia



Vice - Chairman, County Board of
Arlington County, Virginia

Date May 25, 1971

APPENDIX C: THE GEOLOGY AND WATERSHED STUDY: GEOLOGY,
GROUNDWATER AND SPOILS DISPOSAL

Geology

The Washington, D.C., area is one of diverse geology. It is composed of two geologic provinces, the Piedmont and the Coastal Plain, separated by an escarpment called the fall line.

The Piedmont is composed of metamorphic and igneous rocks. The metamorphics are of two types, metasediments, made from the Glenarm Series of sedimentary rocks, and metamorphosed igneous rocks, made from igneous rocks that intruded the Glenarm Series. These metamorphics are tightly folded with axes trending northeast-southwest. The rocks were formed in Paleozoic times by both dynamic and contact metamorphism. The igneous rocks are younger than the metamorphics, are in the form of intrusives, and are both felsic and mafic in composition.

At the fall line, which tends northeast-southwest and passes through Georgetown, the crystalline rocks dip under the more recent Coastal Plain sediments at the rate of about 125 feet/mile to the southeast. The crystallines are overlain here by the southeastward thickening wedges of the Coastal Plain sediments. These wedges decrease in dip as they become younger and are composed primarily of unconsolidated marine clays, silts, sands and gravels, interlensing in a complex fashion. The ages of the sediments range from Cretaceous at the base to Pleistocene caps on the ridges. The formations have been deeply incised by streams since the sea level fell, which results in the geological formation map resembling a topographic contour map.

The area seems to be geologically stable with infrequent and minor tremors. Care must be taken not to put too much weight on steep slopes in the Piedmont that are underlain by micaceous formations such as schists. Micas tend to aggregate in layers with their perfect cleavage planes parallel to the layers. Water can easily get between the platelets, dissolve the cementing ions and render the layers susceptible to slippage. On a slope, excessive weight could trigger a slump of the hillside.

In the Coastal Plain, the unconsolidated nature of the sediments causes problems. Landslides, slump, and creep are all problems with unretained steep slopes, or lesser slopes with weight on them especially in the clayey layers. The plasticity in some clayey lenses and the greater strength in some sandy and gravelly lenses causes differential bearing strengths and subsequent differential settling, a possible negative impact if not corrected for. Reference should be made to the accompanying maps illustrating Patapsco Sediments which potentially present severe problems of this sort.

<u>Formations</u>	<u>Slope Stability</u>	<u>Foundation Stability</u>
Quaternary alluvium fill	4:1 to 1.5:1	Poor
Quaternary terraces and gravels	1.5:1	Good; 2.5 - 4 tsf
Tertiary gravels and sands	2:1	Good; 4 - 5 tsf
Cretaceous clays and sands	3:1 to 1.5:1	Average to good; 2 - 5 tsf
Piedmont crystallines	near vertical, except where extensively fractured or weathered	Excellent; greater than 30 tsf

References:

- Johnston, P.M., Geologic Map of Washington, D.C. and Vicinity U.S.G.S., 1958.
- Johnston, P.M., Geology and Ground-Water Resources of Washington, D.C., and Vicinity, Geol. Survey, Water Supply Water, 1776, 1964.
- Withington, C.F. and Froelich, A.J., Preliminary Geologic Map of the Beltsville Quadrangle, Prince George's, Montgomery, and Howard Counties, Maryland, U.S.G.S., MF-582, 1974.

Groundwater

The groundwater regime in the D.C. area is complex and not fully understood. However, certain generalizations can be made and possible resultant impacts of Metro construction and operation can be derived.

Piedmont

The groundwater in the crystalline Piedmont is relatively unimportant for water supply. It is located in the numerous and often interconnecting systems of joints, fractures, faults, and along intrusive surfaces. The water is primarily in unconfined and occasionally in confined conditions. Often there is groundwater in the overlying regolith, concentrated mostly in the saprolite or decomposed rock zone. Average yields are on the order of 10 gallons per minute, which is sufficient for private use wells only. Such wells, which are often shallow, would be affected by Metro. Those closer to the tubes would be most affected, generally. A deep cut and fill segment, for instance, would intersect many fracture systems and, even after covering it back over, would serve as a large catch basin, pirating groundwater if the area is a discharge area and feeding polluted groundwater if the area is a recharge area. In the case of pirating groundwater, the water table will become locally depressed and shallow wells could go dry. If the walls of such a cut were to be sealed, groundwater would be backed up behind the subterranean dam on one side and the opposite side would become water starved, and wells may go dry.

Groundwater would be polluted from construction and subsequent Metro operation. The small amount of water in the rocks would not be able to dilute the pollutants effectively and the groundwater would decrease in quality.

Dewatering during construction should have no real effects on the bearing capacity of the rocks.

Coastal Plain

The groundwater in the Coastal Plain is significant and located in four primary aquifers, all of which are artesian, the Patuxent, Patapsco, Magothy, and Aquia formations. All four of these are composed of marine sands and gravels. These aquifers, sandwiched by clayey units known as aquicludes, become increasingly water-rich to the south-east, which is natural since they thicken to the south-east and there is more room for water. These aquifers have been known to yield up to 1,500 gpm, which is more than adequate for public water supply wells.

The groundwater in the Coastal Plain comes from precipitation falling on the aquifer recharge areas, not from groundwater flowing down from the Piedmont as had been previously believed.

The extensive interlensing of the clayey and sandy members of the coastal plain formations cause uncertainty in determining groundwater movement. Also, subtle faulting causes problems in groundwater movement.

Salt water contamination is a negative impact which must be guarded against. The salt water wedge has been known to encroach past the confluence of the Anacostia and Potomac Rivers. Dewatering during construction at or near a segment of one of the rivers with a salt wedge present, could cause a temporary local recharge area. This would draw salt water into the aquifers, thus polluting it.

Dewatering and subsequent water table depression could cause shallow wells nearby to dry up during the dewatering.

If a tunnel or deep cut were to puncture an artesian aquifer, an undesirable impact would be made. Construction dewatering and pumping to keep the operating tubes dry would have the effect of putting a drain on the aquifer. Also, the cut into the aquifer would cause it to lose much of its head until it re-equilibrated.

Chemicals and other pollutants generated by construction and subsequent operation will decrease the water quality of a significant public water source.

Breaking through a perched aquifer's aquiclude would cause it to partially drain and shallow wells to it may go dry.

Dewatering during construction can cause an instability in the formations. Water in sands and clays often bears a significant amount of the weight of the overburden. Dewatering sometimes causes grain packing to collapse to a lower order with less volume and subsidence occurs. When only a linear dewatering is performed, there is a linear subsidence and buildings nearby may have a corner or two under mined.

References:

Johnston, P.M., Geology and Ground-Water Resources of Washington, D.C., and Vicinity, Geol. Surv., Water Supply Paper 1776, 1964.

Mack, F.K., Ground Water in Prince George's County, Maryland Geol. Surv., Bulletin 29, 1966.

Spoils Disposal

A list of spoils sites for Metro-generated spoils was compiled in the following manner. Licensing agencies were contacted and asked for a list of currently operating disposal sites. WMATA was contacted and asked for a list of spoils sites used by its contractors and a list of its contractors was obtained. The most current list of spoils sites is 1972, and the hauling contractors list was prepared within the current year. The hauling contractors were contacted and asked to indicate the disposal sites they used for Metro spoils. Out of 15 haulers, 9 responded and 6 of those 9 said that their contracts had expired. Most of the spoils disposal sites currently in use are in the southeastern portion of the Washington metropolitan area. Spoils disposal sites usually do not cater to Metro haulers alone; rather they accept any spoils as long as the hauler has the dumping fee and the quality of his spoils meet the requirements of the dumping site. While it is not possible to identify the precise proportion of disposal material at any of the sites used by Metro spoils hauling contractors, it is clear that at least some portion of any adverse impacts at any disposal site accepting spoils from WMATA can be attributed to current disposal of WMATA spoils. It is necessary therefore to take such impacts into account in this study although quantification is not possible. Environmental regulation of the sites is the responsibility of the local jurisdictions. Inconsistent enforcement of the environmental regulations in some areas causes Metro spoils to be a partial contributor to negative impacts. A generalized list of impacts generated by less than perfect adherence to strict standards of operations follows:

Perhaps the greatest impact caused by spoils disposal sites is erosion of the uncovered and unconsolidated soil and the subsequent drastic increase in particulates in the stream into which the runoff flows. Soon the stream's load exceeds its carrying capacity and siltation fills in the channel. This causes a reduced capacity and an increased propensity to flood. After siltation ceases, a stream sometimes returns to its former configuration after 3 to 5 years, and sometimes it does not. The increased sediment load reduces light which harms aquatic plants. Sudden siltation smothers benthic life, and most fish cannot easily respire with a high concentration of particulates in the water. Pollutants in the spoils also get into the stream and these further decrease the water quality.

Contamination of groundwater by pollutants in the spoils is another hazard.

Immediate construction on top of fill without the allowance of a sufficient period of time to permit compaction and settling is yet another problem.

Existing vegetation and wildlife habitats are disrupted or eliminated by the dumping of spoils.

The major proposed spoils disposal site is Smoot's Cove, south of the I-495 Woodrow Wilson Memorial Bridge in Maryland on the east bank of the Potomac River. It is a 240 acre artificial cove formed earlier this century by a sand and gravel operation. 10 million cubic yards of spoils would return the shoreline to its previous location, which, as shown by old maps, was stable. The operation would recreate about 35 acres of marshland with the rest being made into a golf course and a park. In doing this, the erosion of the steep banks would be stopped, a site for the Metro spoils would be provided, public access to the Potomac would be created, shelter for wildlife made, and a community oriented center would be provided. Ready access to this site is provided by I-495. A recent study prepared for the owners of Smoot's Cove by R.A. Erb of the Franklin Research Labs indicates that it might be a suitable spoils disposal site.

There are four potential problems to reckon with. The Potomac is in equilibrium with the cove. Filling in the cove would force the river to re-equilibrate, possibly causing navigational hazards. Next, if extreme care were not taken in constructing a rock retention dike, massive erosion of the fill would cause a large increase in the load carried by the Potomac, further degenerating the river. Any unclean fill would cause polluted water to get into the Potomac. Finally, in making marsh, there would be a risk of its becoming quick. Marine sands from the coastal plain have a high spericity index and when dumped, lack the structure they had in situ. Being deposited in such a manner that they are constantly saturated, they could become quick, a danger to nature observers.

There are a number of possible ways in which WMATA might attempt to assist in meeting local spoils disposal regulations: WMATA might, in cooperation with local governments, specify a limited number of sites where Metro spoils might be disposed of to facilitate local regulation of spoils disposal procedures; alternatively WMATA might develop

contract specifications setting up specific criteria for sites to be used for spoils disposal; finally WMATA might look into the feasibility of undertaking a small scale demonstration project with local government cooperation demonstrating proper techniques of spoils disposal.

References:

Cauthorn Hauling Co., Washington, D.C., personal communication study, 1975.

Erb, R.A., "Environmental Considerations: Smoot Property Restoration and Development." Prepared for Urban Pathfinders by the Franklin Institute Research Labs, Philadelphia, Pa.

Marvaco, Inc., Washington, D.C., personal communication, 1975.

Omega Equipment Co., Beaver Heights, Md., personal communication, 1975.

Tielkemier, V.H., Director of the Division of Solid Waste, Fairfax County, Va., personal communication, 1975.

Wolman, V.G., "Problems Posed by Sediment Derived from Construction Activities in Maryland." For Maryland Water Pollution Control Commission, 1964.

Actions WMATA Proposes To Take To Modify or Correct
Groundwater, Surface Water, and Geology Impacts

The following is a partial but representative list of those actions which WMATA proposes to take to ameliorate possible negative impacts to the groundwater, surface water, and geology of the area. It also shows some actions WMATA will take to avoid negative impacts on Metro by the groundwater, surface water, and geology.

These were taken from General Provisions and Standard Specifications for Construction Projects published by WMATA in 1973. Reference should be made to this publication for more specific information. If precise on-site information is required, please refer to the individual specifications manuals for the various segments of the various Metro routes.

Section 101 3.D.(25).a. The contractor shall conduct his operations in a manner to minimize pollution of the environment surrounding the area of work by every means possible.

(1) Trucks are to be cleaned of mud before going on public roads and are to be loaded so that nothing will spill in transit and if there is any spillage the contractor will immediately clean it up.

(2) No waste or erosion materials shall be allowed to enter natural or man-made water or sewage removal systems. The contractor will use whatever means necessary to achieve this.

Section 101 3.D(25).b. The contractor shall submit a program for pollution control to the Engineer for his approval prior to beginning operations.

Section 101 3.D(16).a. To detect subsidence and damages wrought by it on buildings and structures, a system of horizontal and vertical control points will be established.

b. Weekly checks will be made and if any damage occurs, repairs will be made.

Section 205 1.2A2. Design dewatering methods so that after initial development, the quantity and size of soil particles will decrease until no soil particles are present in water being pumped at any time after 12 hours initial pumping. This will reduce siltation of adjacent surface water.

Section 205 3.1A and D. Divert surface water around construction site and return it to original place after construction.

Section 205 3.2B. Install settling basins.

Section 205 3.4. Maintain records on groundwater levels before and during dewatering using piezometers.

Section 206 1.2A. Support excavation cuts in such a manner as to prevent and minimize any slumping, sliding, or falling of cut walls.

Section 210. Install and maintain underpinning to those buildings which may sustain damage on subsidence from Metro activities.

Section 701. Make Metro tunnels waterproof. This will help keep any pollutants out of groundwater while Metro is in operation.

References:

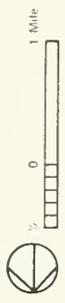
WMATA, General Provisions and Standard Specifications for Construction Projects. 1973.

Parsons Assoc. & D.N. Yerkes Assoc., Specifications Section A9a Rockville Route Tunnels 1A0091. Prepared for WMATA. August, 1973.



GEOLOGY

**WMATA SYSTEM IMPACT STATEMENT
ROUTE A**

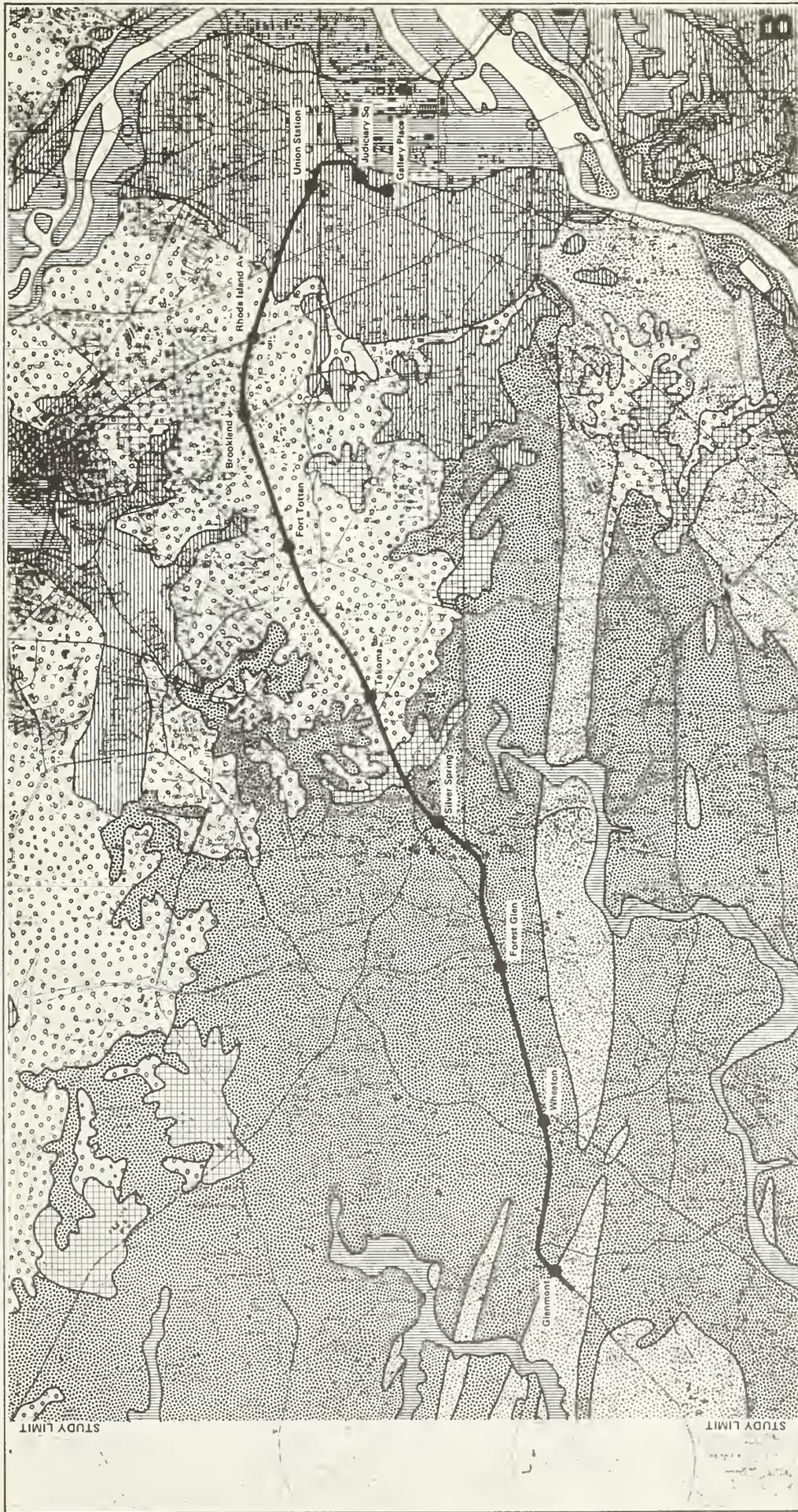


1. Pamlico fm
2. Wicomico fm/sunderland fm
3. Brandywine fm/bryon mawr fm/chesapeake group-pamunky group (lewis fm/nanjamoy fm)
4. Monmouth fm/patuxco fm/patuxent fm
5. Bear island granodiorite/Kanington granite gneiss
6. Sykesville fm/Wisshahochon schist

- Quaternary: Igneous-granitoids-metals⁵
- Quaternary: Metamorphics-schistose-granite-schist-gneiss⁶
- Tertiary: Alignment
- Crataceous: Station

- Holocene & pleistocene: alluvium & fill¹
- Pleistocene-terrace-sands & gravels²
- Pliocene-miocene-eocene: gremardi-sands & gravels-clays³
- Sands & gravels-clays⁴

Source: Johnston, Geologic Map of Washington, D.C. and Vicinity, 1958



GEOLOGY

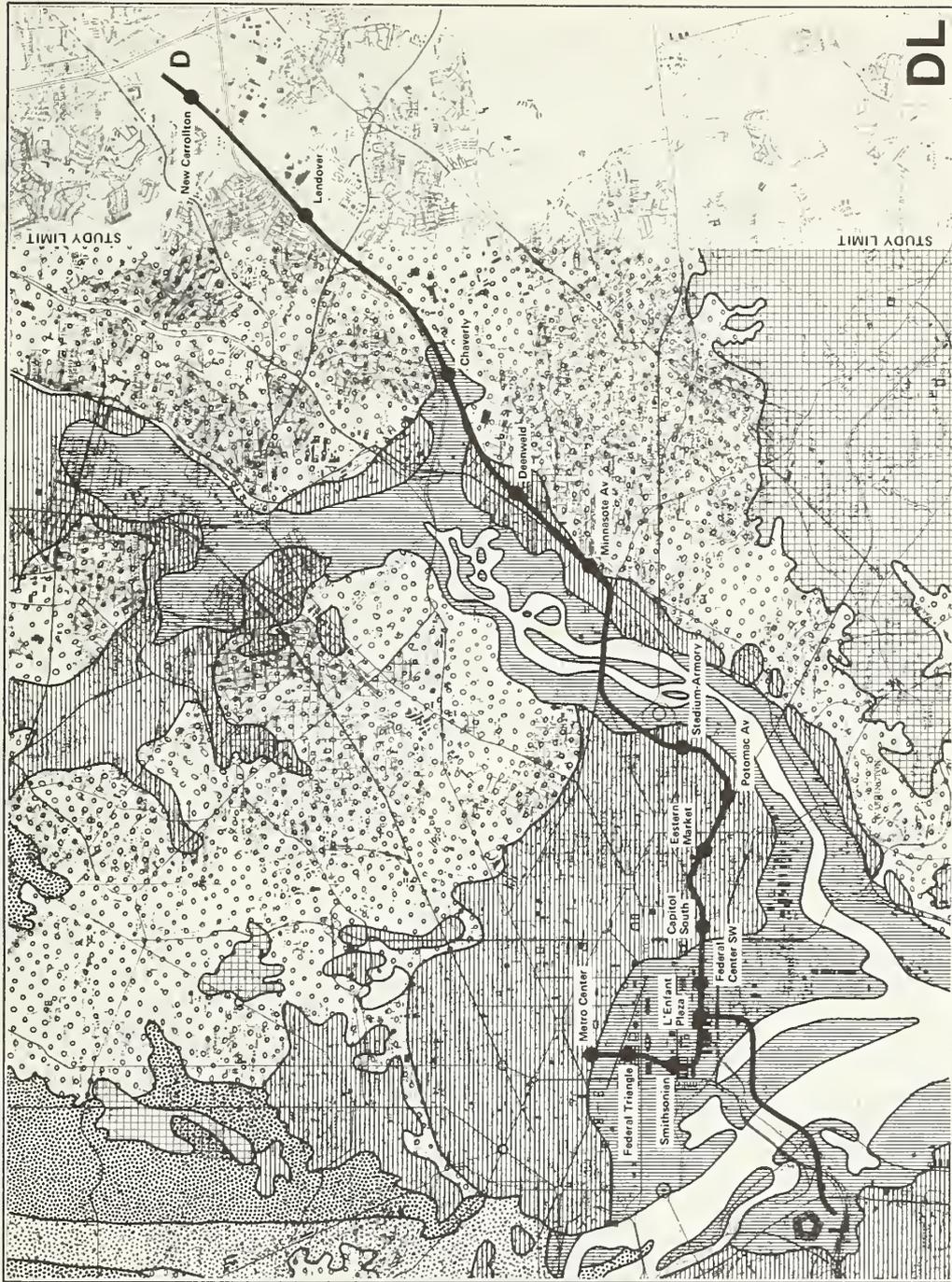
WMATA SYSTEM IMPACT STATEMENT

ROUTE B

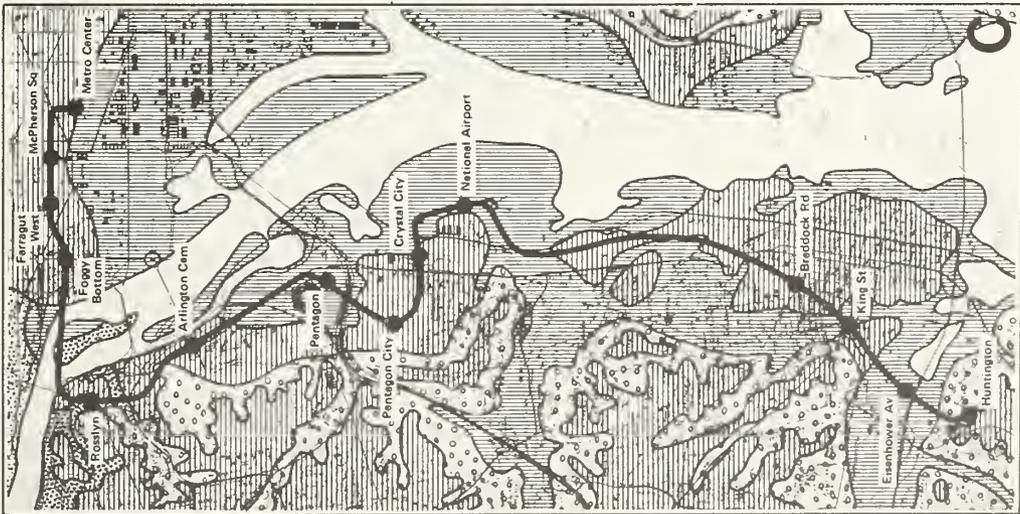


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|--|--|--|------------|--|--|--|---|
| | Holocene & Pleistocene alluvium & fill ¹ | | Quaternary | | Igneous-granitic/metals ⁵ | | 1. Permian fm |
| | Pliocene terraces-sands & gravels ² | | Quaternary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | 2. Wicomico fm/funderland fm |
| | Pliocene-miocene greenlands-sands & gravels ³ | | Tertiary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | 3. Brandywine fm/byron maver fm/chesapeake group-pamunky group (louis fm/nanjemoy fm) |
| | Sand & gravels-clays ⁴ | | Tertiary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | 4. Monmouth fm/potapoc fm/potuxent fm |
| | | | Tertiary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | 5. Bear Island granodiorite/Kanstoning granite gneiss |
| | | | Tertiary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | 6. Sykesville fm/Wissahickon schist |
| | | | Tertiary | | Metamorphic-schistose granite-schist/gneiss ⁶ | | Station |

Source: Johnston, Geologic Map of Washington, D.C. and Vicinity, 1958



DL



GEOLOGY
WMATA SYSTEM IMPACT STATEMENT
ROUTES C-D-L



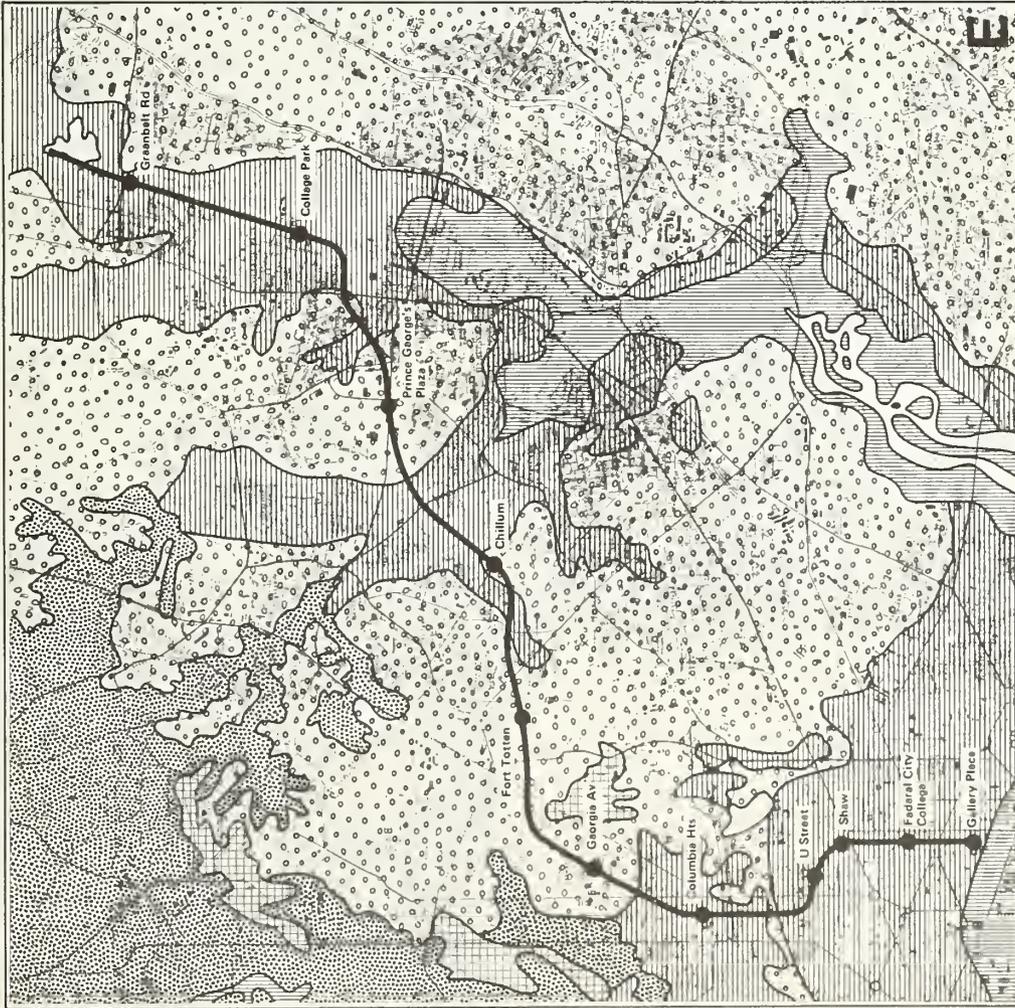
Source: Johnston, Geologic Map of Washington, D.C. and Vicinity, 1958

1. Pamlico fm
2. Wicomico fm/sunderland fm
3. Brandwine fm/byron mssgr fm/chesapeake group
Pamunky group (aque m/r/ingomay fm)
4. Monmouth fm/patuxent fm/patuxent fm
5. Beer Island gneiss/Kensington granite gneiss
6. Sykesville fm/Wisconsin schist

- igneous-gneissics-mefics⁵
- Metamorphic-schistose granite-schist-gneiss⁶
- Alignment
- Station

- Holocene & pleistocene-alluvium & fill¹
- Quaternary
- Quaternary
- Tertiary
- Creteceous

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GEOLOGY
WMATA SYSTEM IMPACT STATEMENT
ROUTES E-F

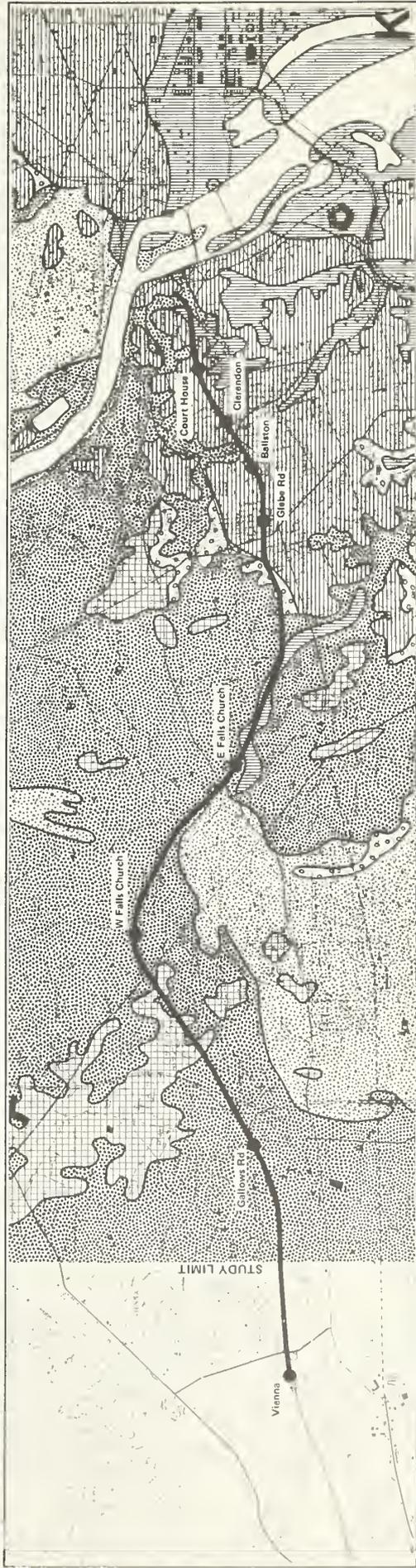
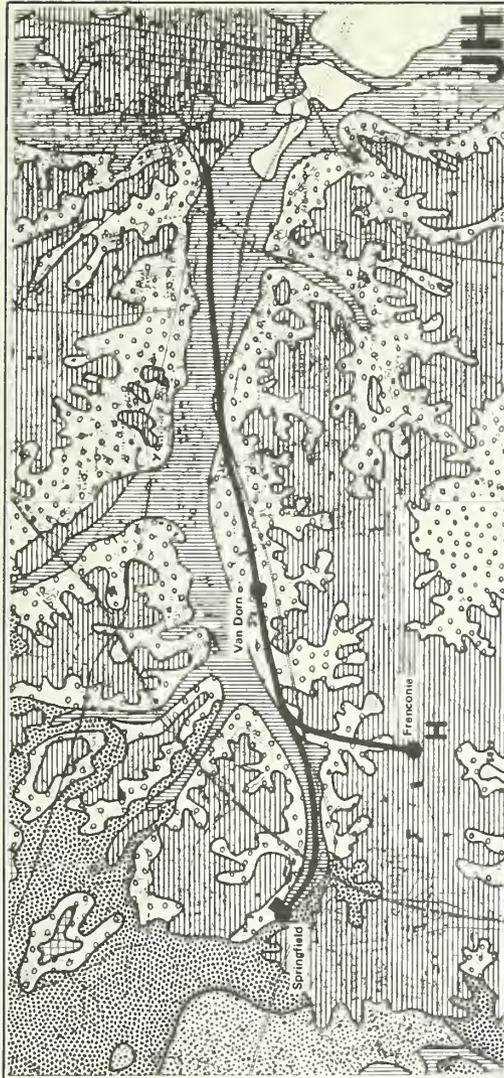
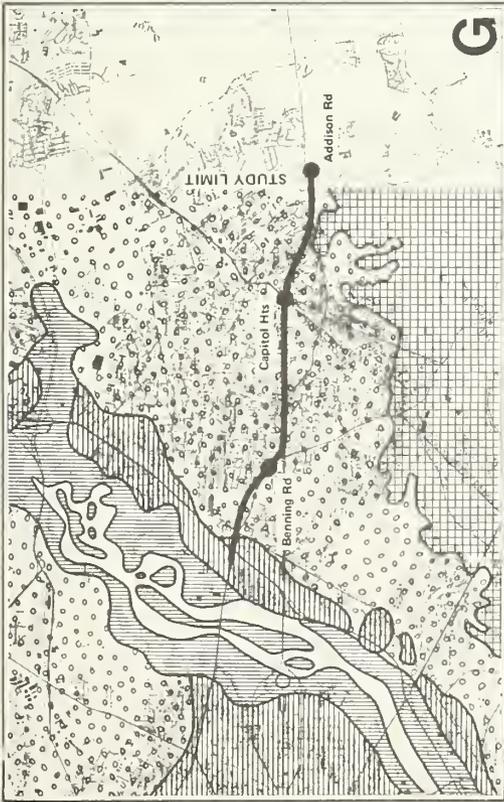


Source: Johnston, Geologic Map of Washington, D.C. and Vicinity, 1958

1. Pemlico fm
2. Wicomico fm/sunderland fm
3. Branchville fm/brya maver fm/chesapeake group/pamunky group (equia fm/nanjemoym fm)
4. Mornmouth fm/patepsco fm/potowent fm
5. Beer island granodiorite/Kensington granita gneiss
6. Sykesville fm/Wissahichon schist

- Igneous-granitics-mafics⁵
- Metamorphics-schistose granite- Lower paleozoic schist-gneiss⁶
- ▬ Alignment
- Station

- ▨ Holocene & pleistocene alluvium & fill¹
- ▨ Pleistocene terraces-sands & gravels²
- ▨ Pliocene miocene-eocene-grainsands-sands & gravels-clays³
- ▨ Sands & gravels-clays⁴
- Quaternary
- Quaternary
- Tertiary
- Cretaceous



GEOLOGY

WMATA SYSTEM IMPACT STATEMENT

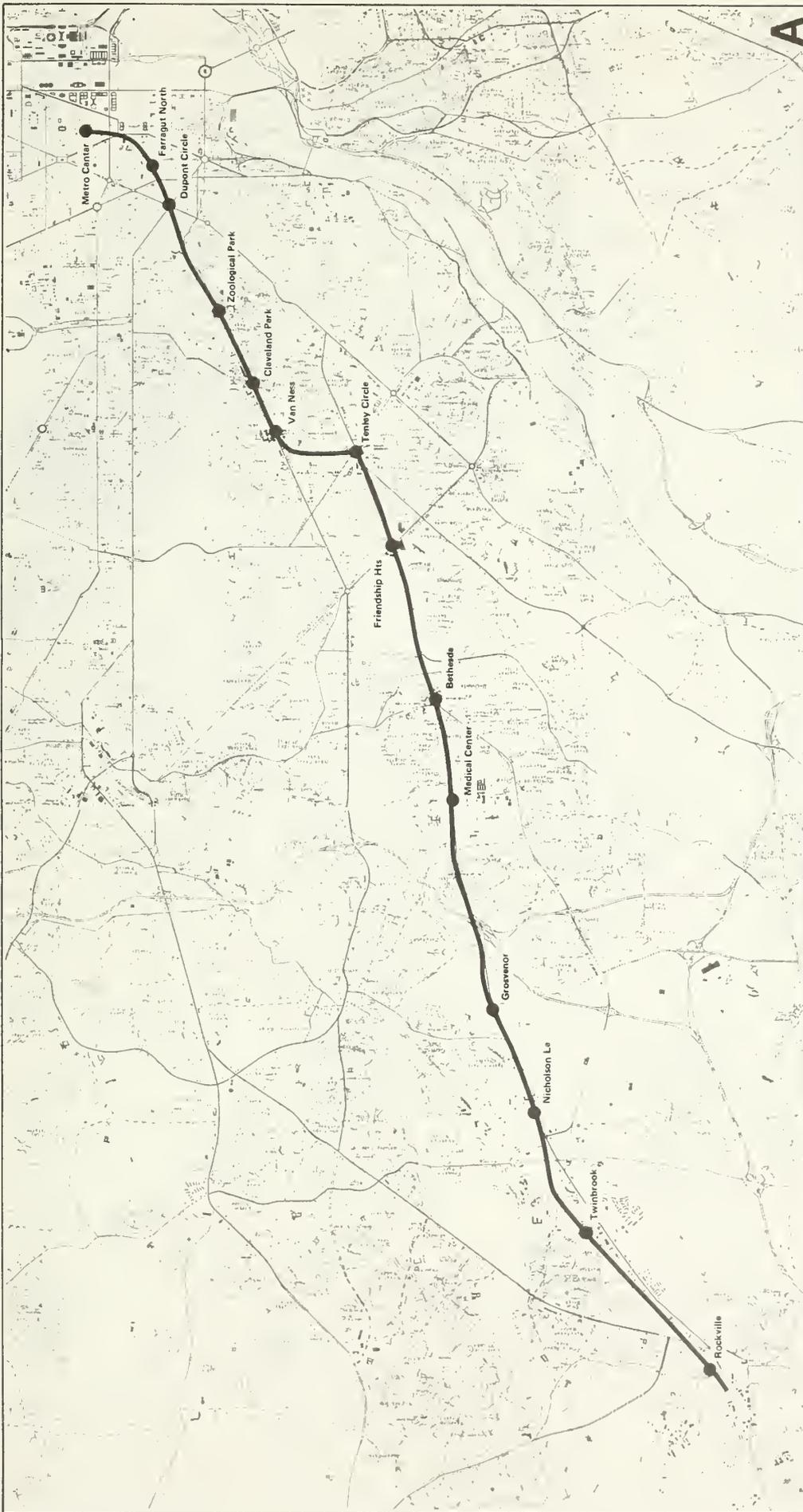
ROUTES G-H-J-K



Source: Johnston, Geologic Map of Washington, D.C. and Vicinity, 1958



<ul style="list-style-type: none"> 1. Holocene & pliocene alluvium & fill¹ 2. Pliocene-terrace sands & gravel² 3. Pliocene-miocene-ecocene-earliest sands & gravels-clay³ 4. Sands & gravels-clay⁴ 	<ul style="list-style-type: none"> Quaternary Quaternary Tertiary Cretaceous 	<ul style="list-style-type: none"> Igneous-granitic-mafics⁵ Metamorphic-schistose granite-schist-gneiss⁶ Alignment Station 	<ul style="list-style-type: none"> 1. Pamlico fm 2. Wicomico fm/landward fm 3. Brandywine fm/bays mawr fm/chesapeake group-pamunky group laqua fm/nanjamoy fm 4. Monmouth fm/patuxco fm/potomac fm 5. Bear island granodiorite/Kensington gneiss 6. Sykesville fm/Wisatchicon schist
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Patapsco fm (undifferentiated)*

Marine clays of patapsco fm**

Alignment

Station



PATAPSCO SEDIMENTS

WMATA SYSTEM IMPACT STATEMENT

ROUTE A



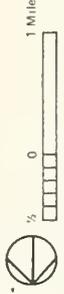
- Source 1. Geologic Map of Prince George's County & Washington, D.C. —Mariland Department of Geology, Mines and Water Resources—1951*
 2. Map of Limits of Marine Clays and Silty Clay Sediments of the Patapsco Formation—County of Fairfax, Virginia—1974**



B

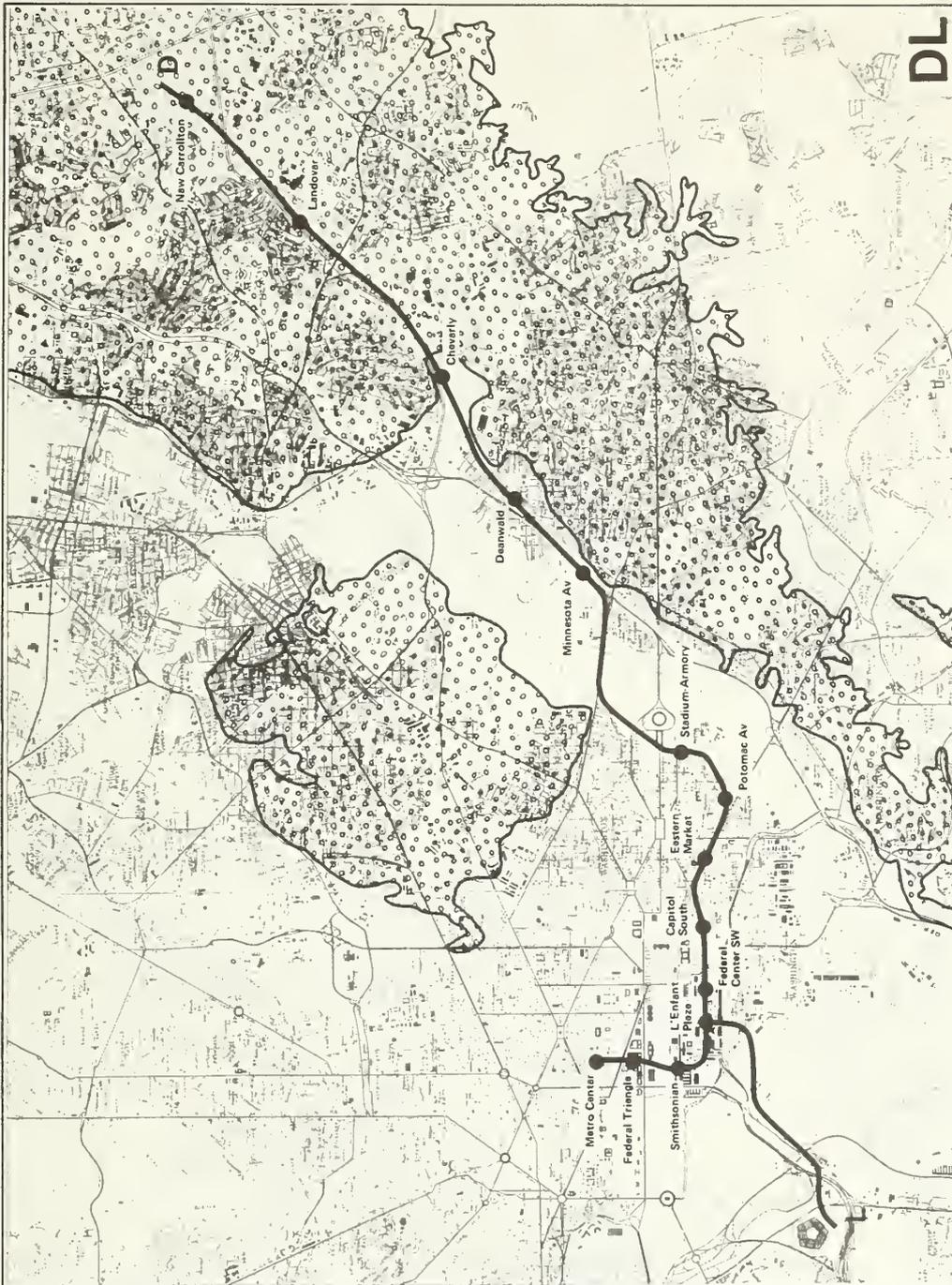


PATAPSCO SEDIMENTS
WMATA SYSTEM IMPACT STATEMENT
ROUTE B



Source 1. Geologic Map of Prince George's County & Washington, D.C.—Maryland Department of Geology, Mines and Water Resources—1951
 2. Map of Limits of Marine Clays and Silty Clay Sediments of the Patapsco Formation—County of Fairfax, Virginia—1974

	Patapsco fm (undifferentiated)*
	Marine clays of patapsco fm**
	Alignment
	Station



PATAPSCO SEDIMENTS
WMATA SYSTEM IMPACT STATEMENT
ROUTES C-D-L

0 1/2 1 Mile

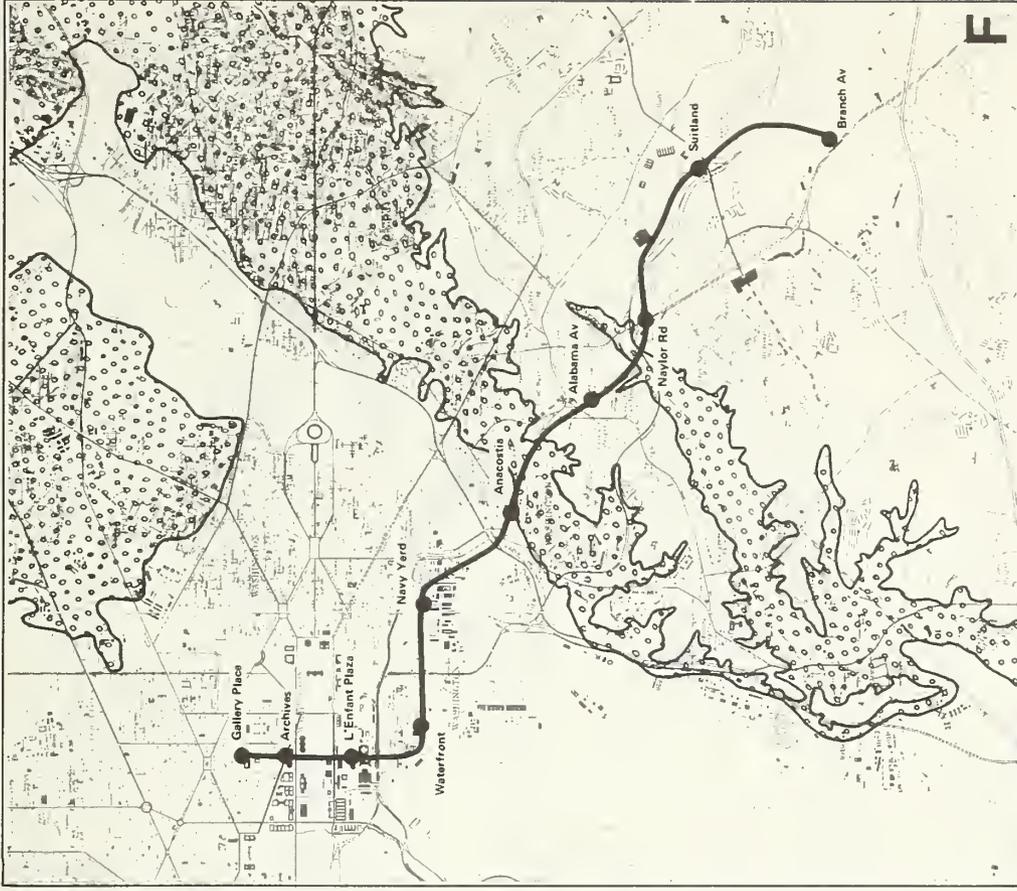
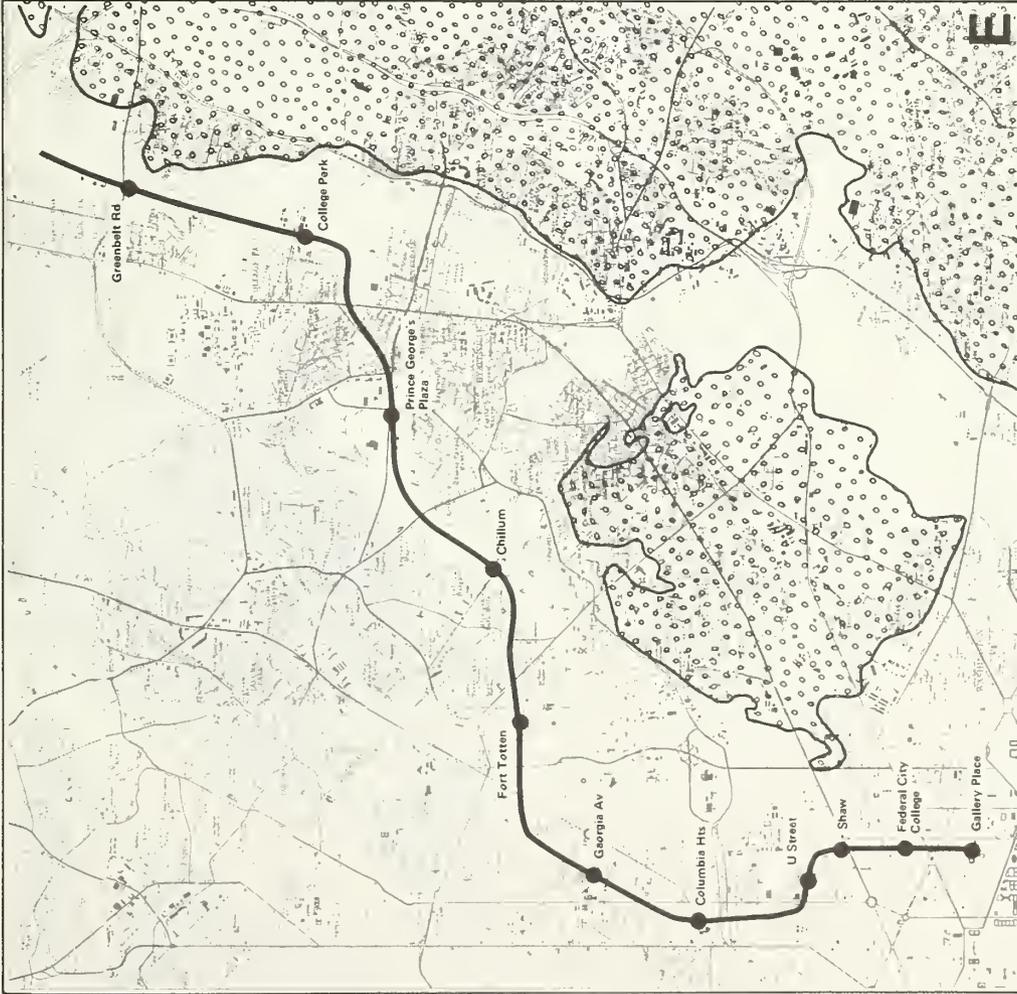
Sources: 1. Geologic Map of Prince George's County & Washington, D.C.—Maryland Department of Geology, Mines and Water Resources—1951*
 2. Map of Limits of Marine Clays and Silty Clay Sediments of the Patapsco Formation—County of Fairfax, Virginia—1974**

Patapsco fm (undifferentiated)*

Marine clays of patapsco fm**

Alignment

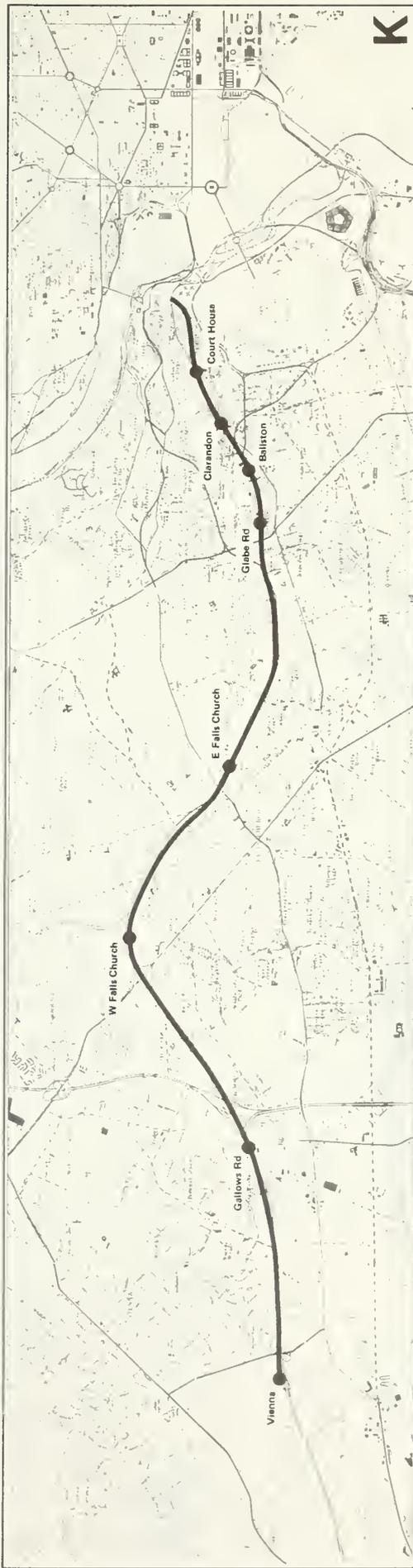
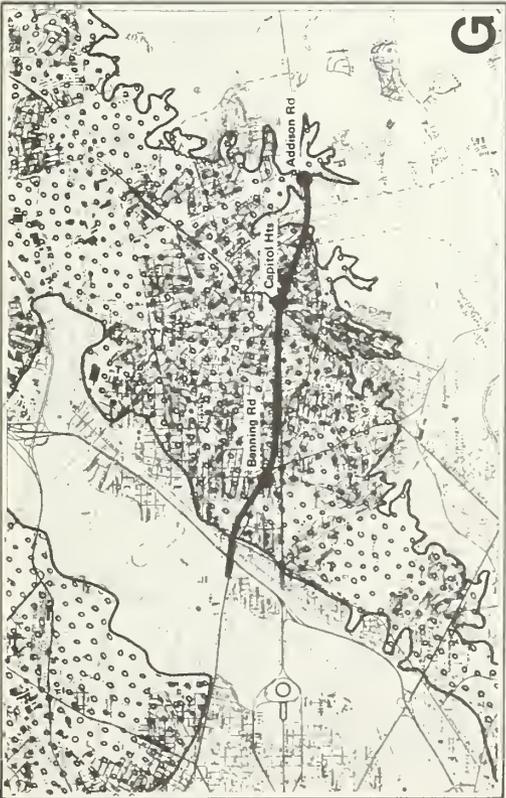
Station



Sources: 1. Geologic Map of Prince George's County & Washington, D.C.—Maryland Department of Geology—Mines and Water Resources—1951*
 2. Map of Limits of Marine Clays and Silty Clay Sediments of the Patapsco Formation—County of Fairfax, Virginia—1974**



PATAPSCO SEDIMENTS
WMATA SYSTEM IMPACT STATEMENT
ROUTES E & F



Patapasco fm (undifferentiated)*

Marine clays of patapasco fm**

Alignment:

Station

PATAPSCO SEDIMENTS

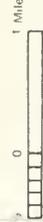
WMATA SYSTEM IMPACT STATEMENT

ROUTES G-H-J-K



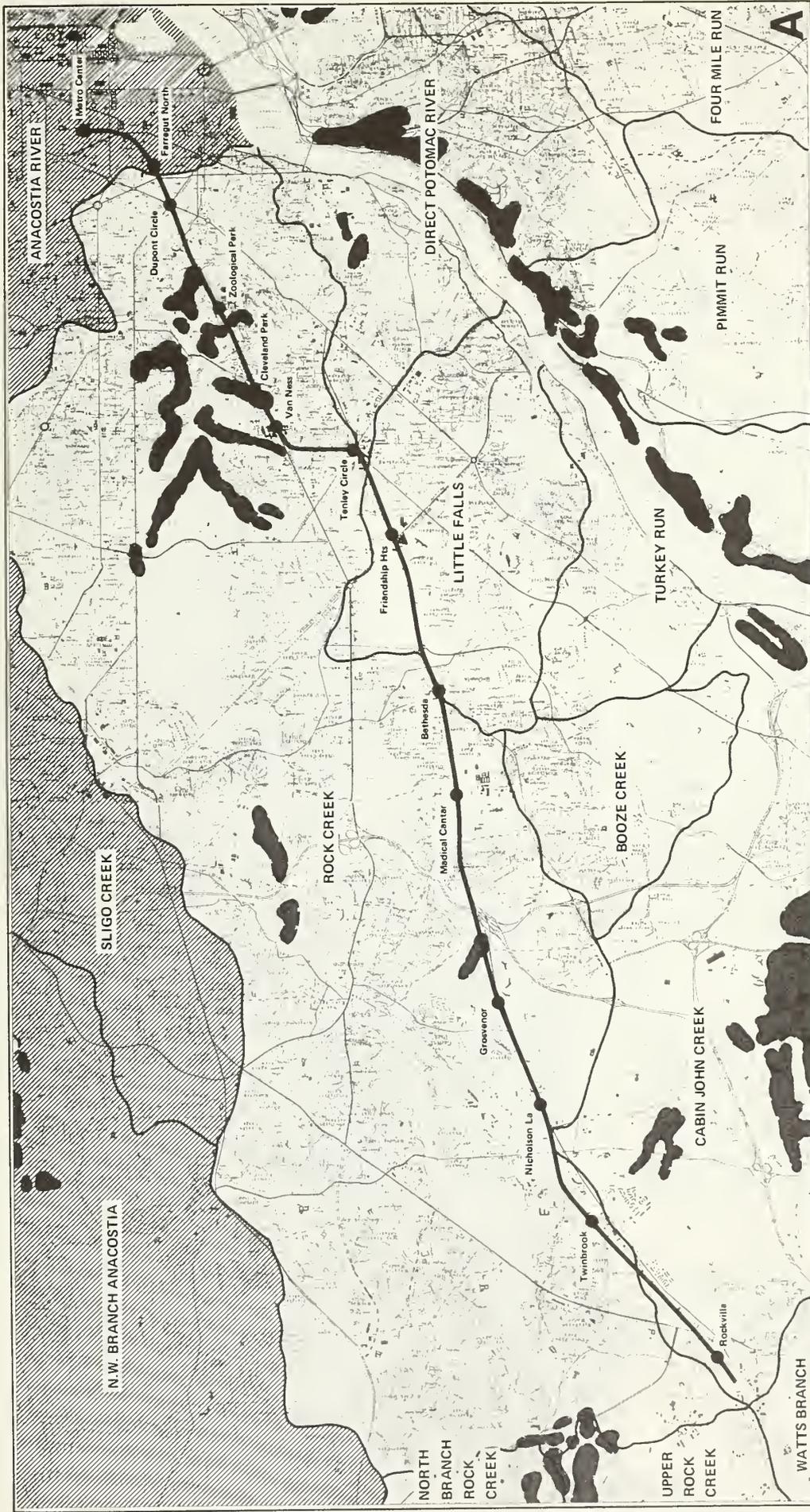
Source: 1. Geologic Map of Prince George's County & Washington, D.C.—Marine Department of Geology, Mines and Water Resources—1951*

2. Map of Limits of Marine Clays and Silty Clay Sediments of the Patapasco Formation—County of Fairfax, Virginia—1974**









WATERSHEDS & STEEP SLOPES
WMATA SYSTEM IMPACT STATEMENT
ROUTE A

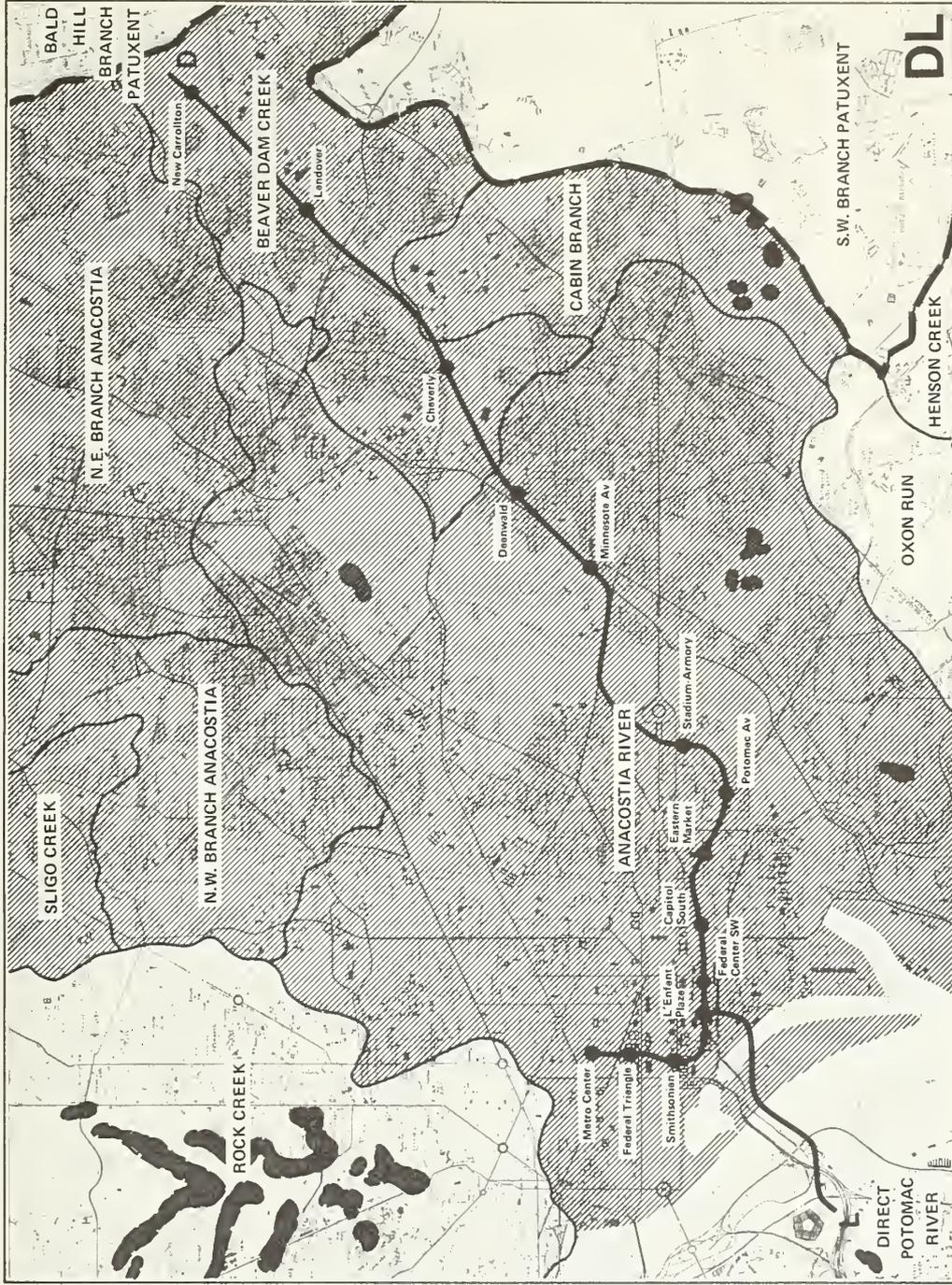
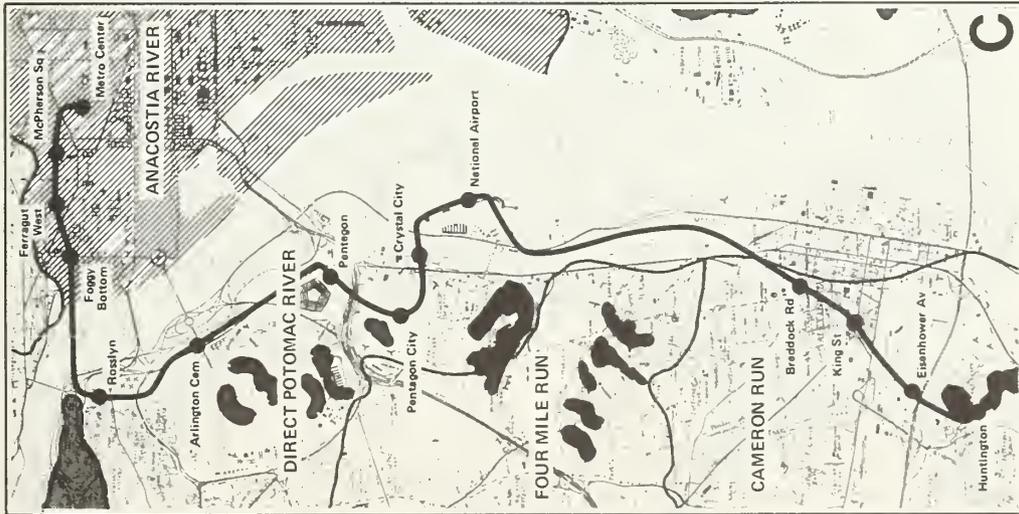
Source: Metropolitan Washington Council of Governments
 Base Maps: 1:8000 - 1967.



Source: Metropolitan Washington Council of Governments
Base Maps, 1:8000 - 1967.

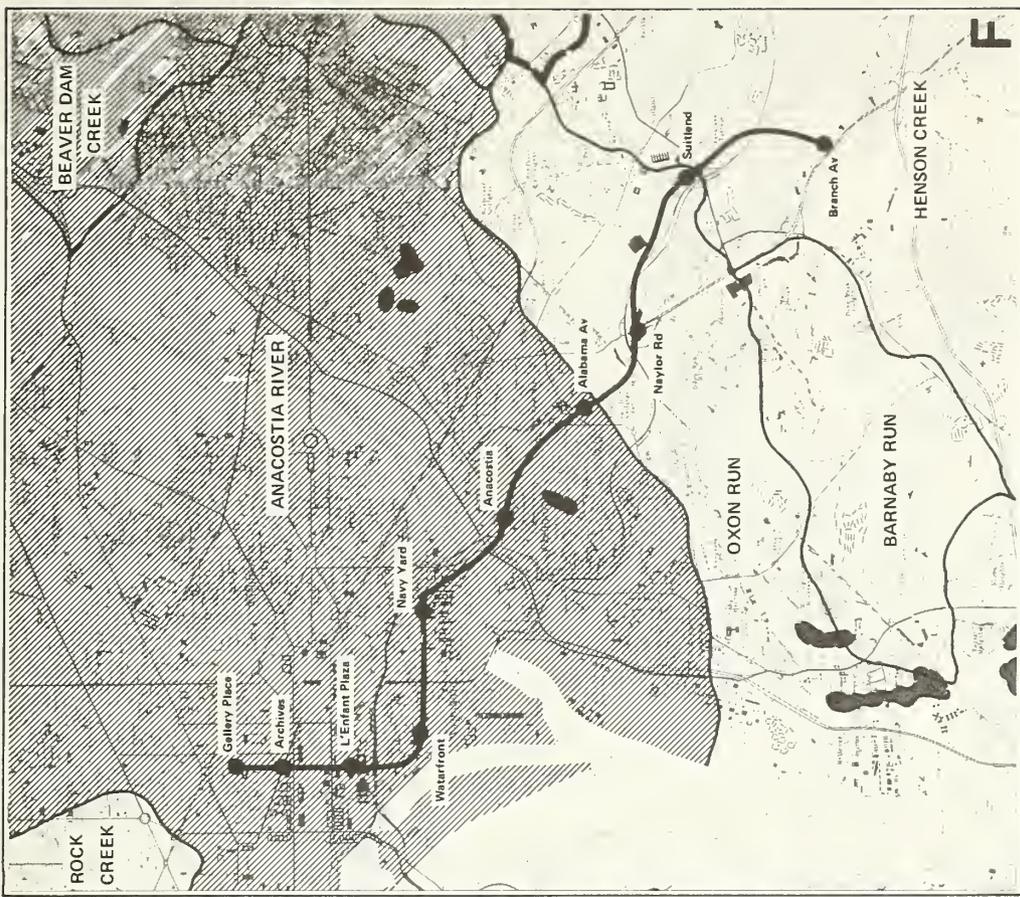
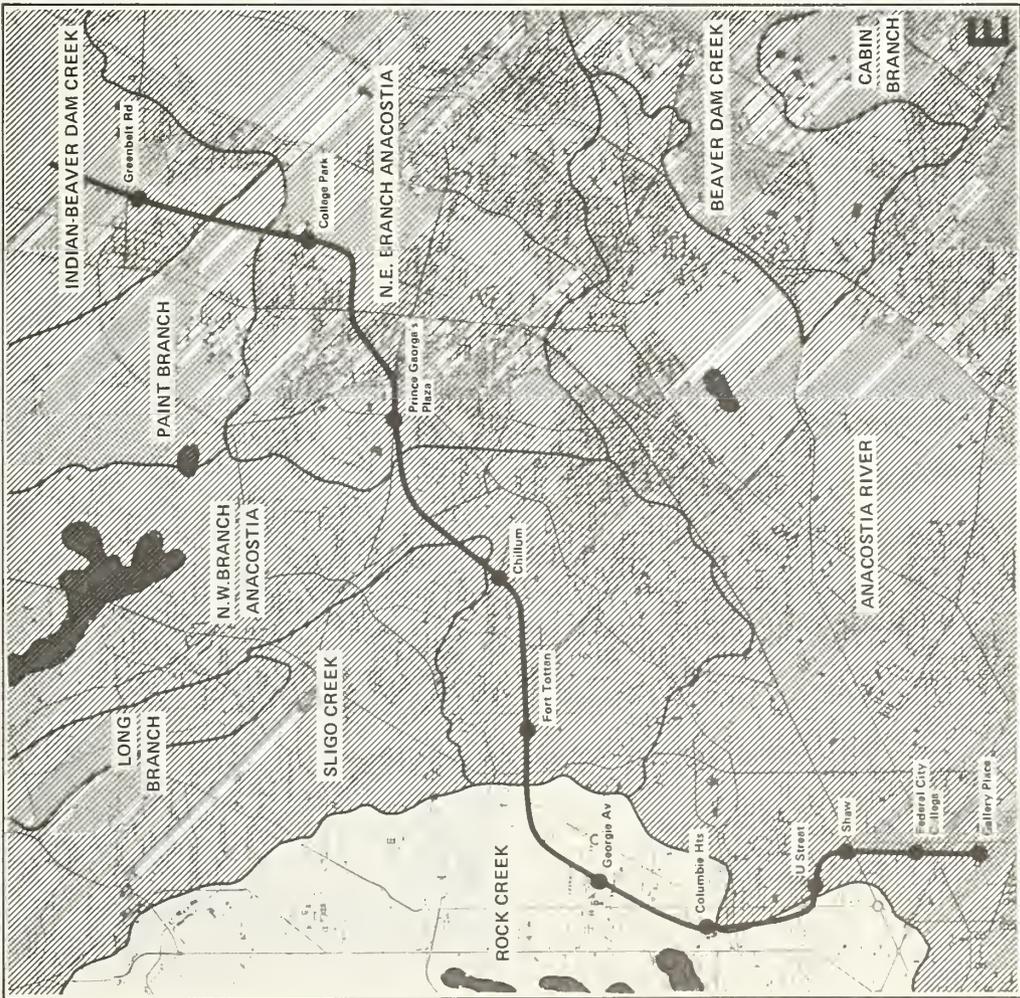
WATERSHEDS & STEEP SLOPES
WMATA SYSTEM IMPACT STATEMENT
ROUTE E





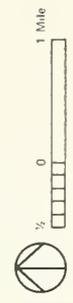
WATERSHEDS & STEEP SLOPES
 WMATA SYSTEM IMPACT STATEMENT
 ROUTES C-D-L

Source: Metropolitan Washington Council of Governments
 Base Maps, 1:8000 - 1967.

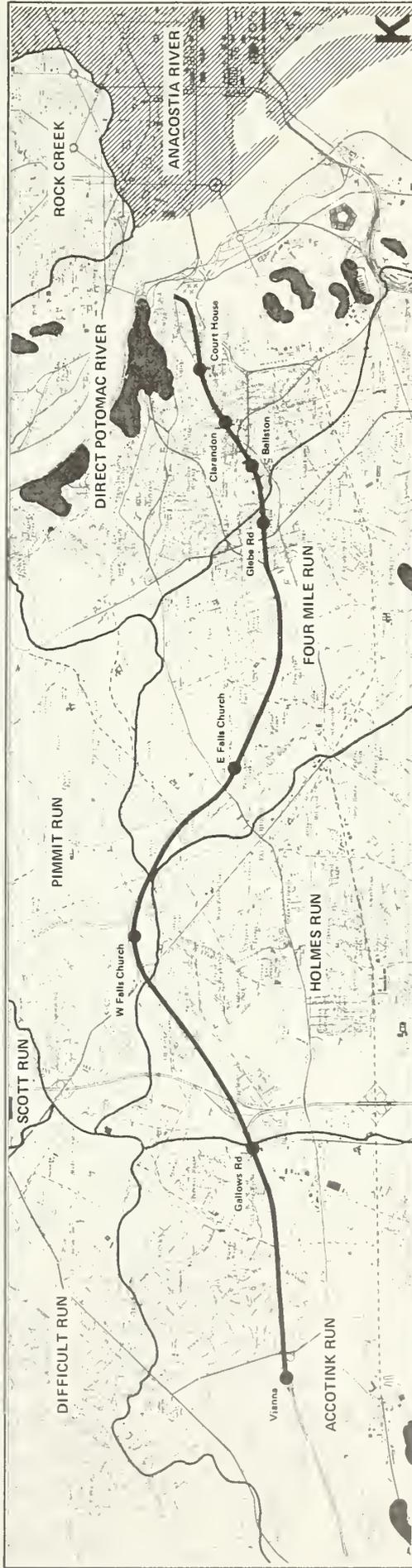
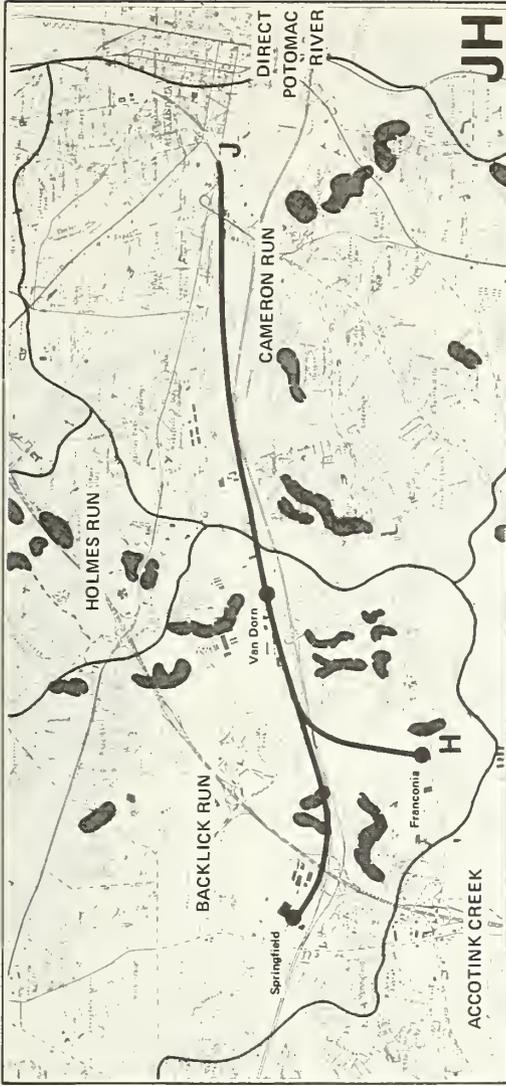
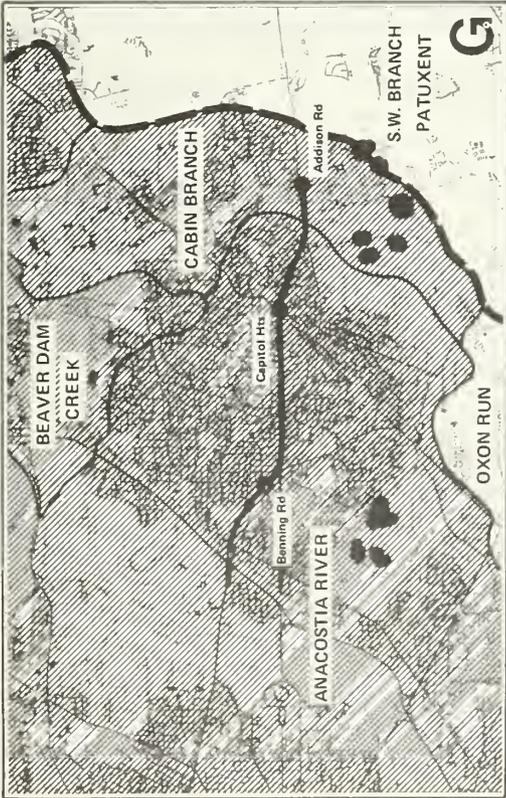


- Washed boundary
- Anacostia watershed
- Potomac/patuxent divide
- Slopes greater than 15%
- Alignment
- Station

WATERSHEDS & STEEP SLOPES
WMATA SYSTEM IMPACT STATEMENT
ROUTES E-F

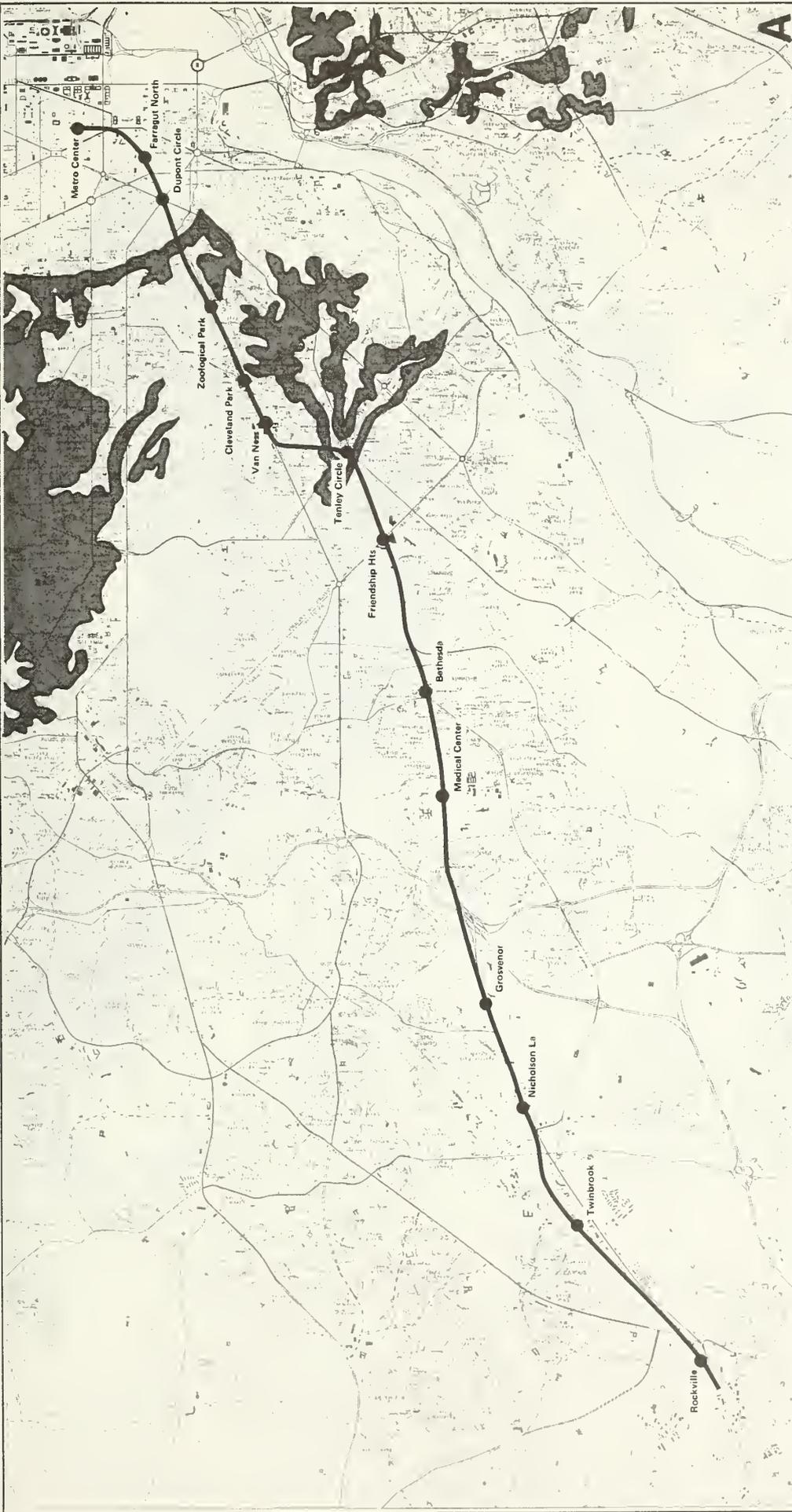


Source: Metropolitan Washington Council of Governments
 Base Maps, 1:50,000 - 1967.



WATERSHEDS & STEEP SLOPES
 WMATA SYSTEM IMPACT STATEMENT
 ROUTES G-H-J-K

Source: Metropolitan Washington Council of Governments Base Maps, 1:8000 - 1967.



- Megothly fm + pataspico fm + patuxent**
- Aque fm***
- ▬ Alignment
- Station

*If not sealed by an impervious surface, these areas provide direct recharge to water rich formations through their outcrops.
 **Excellent aquifer
 *** Good aquifer

Sources: 1. Johnston, P.M. "Geology & Ground Water Resources of Washington D.C. & Vicinity". Geologic Survey Water Supply Paper 1776 - 1964
 2. Wolimon, A. et al., "Future Supply: Metropolitan Washington Regions - 1967"

PRIME AQUIFER RECHARGE AREAS*

WMATA SYSTEM IMPACT STATEMENT

ROUTE A



A



Magdaly fm + patuxco fm + patuxent**

Aquia fm***

Alignment

Station

- *If not sealed by an impervious surface, these areas provide direct recharge to water rich formations through their outcrops
- **Excellent aquifer
- ***Good aquifer

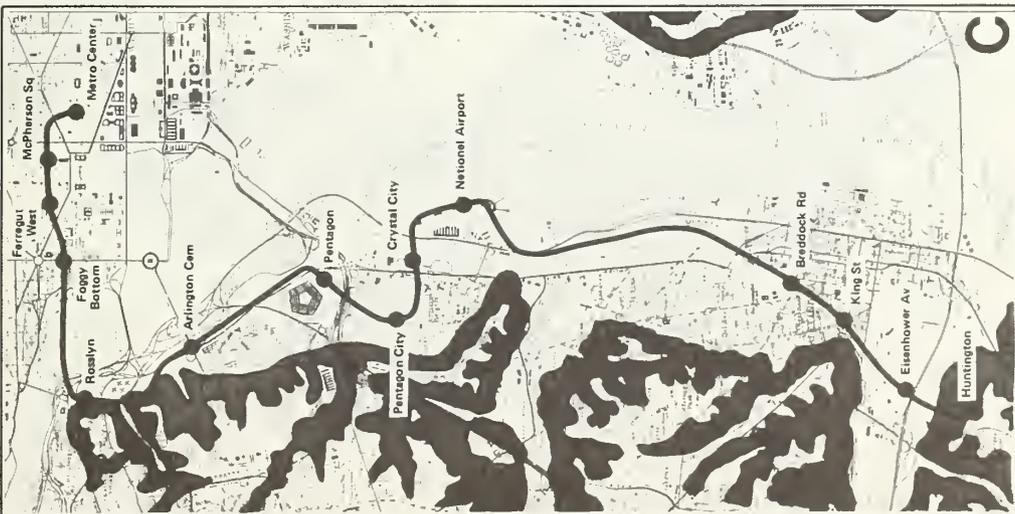
Source: 1. Johnston, P.M. "Geology & Ground Water Resources of Washington D.C. & Vicinity" Geologic Survey Water Supply Paper 1776 - 1964.
 2. Wolman, A. et al. "Future Supply: Metropolitan Washington Regions - 1967"

PRIME AQUIFER RECHARGE AREAS*

WMATA SYSTEM IMPACT STATEMENT

ROUTE B



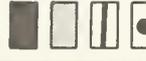


Megaphy fm + petaspico fm + petasent**

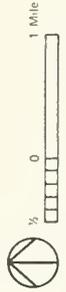
Aquia fm***

Alignment

Station



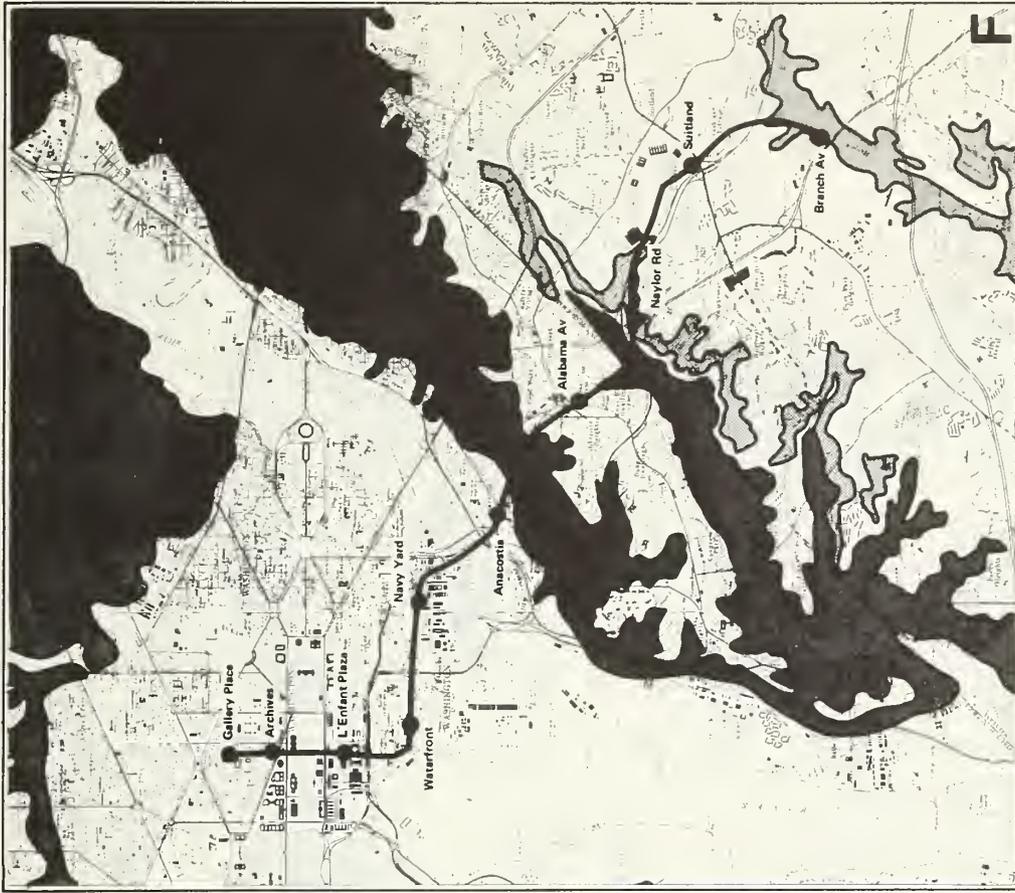
PRIME AQUIFER RECHARGE AREAS*
 WMATA SYSTEM IMPACT STATEMENT
 ROUTES C-D-L



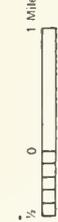
Source: 1. Johnston, P.M. "Geology & Ground Water Resources of Washington D.C. & Vicinity", Geologic Survey Water Supply Paper 1776 - 1964
 2. Wolmen, A. et al., "Future Supply: Metropolitan Washington Regions" - 1967

*If not sealed by an impervious surface, these areas provide direct recharge to water rich formations through their outcrops.
 ***Excellent aquifer
 **Good aquifer





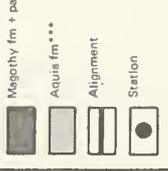
PRIME AQUIFER RECHARGE AREAS*
WMATA SYSTEM IMPACT STATEMENT
ROUTES E-F

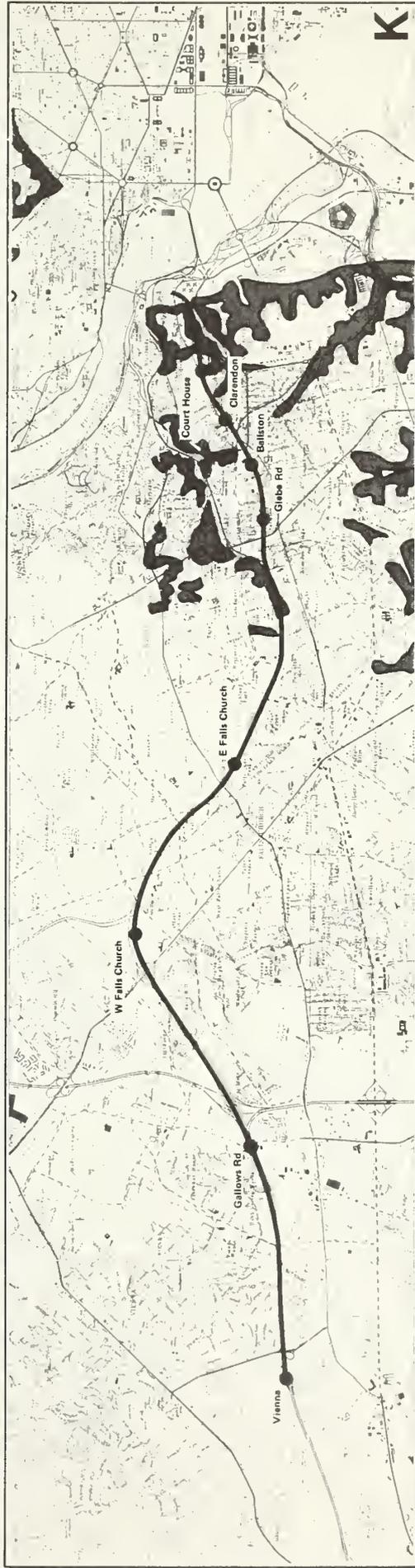
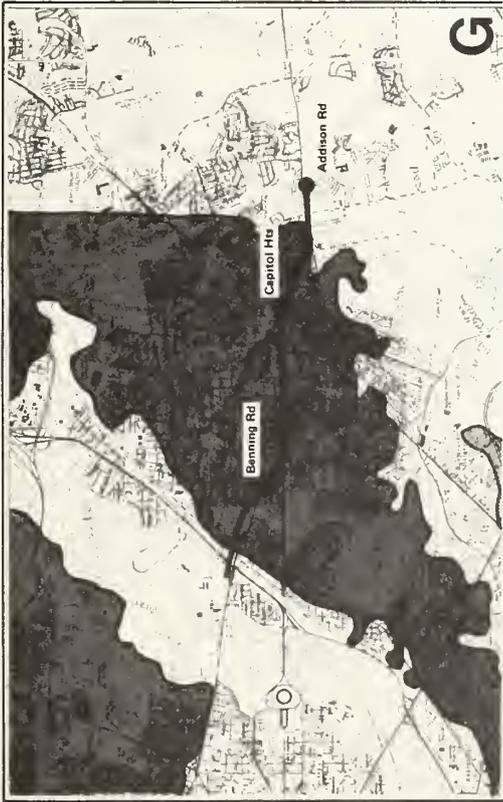




Source: 1. Johnston, P.M. "Geology & Ground Water Resources of Washington D.C. & Vicinity" Geologic Survey Water Supply Paper 1776 - 1964.
 2. Wolman, A. et al., "Future Supply: Metropolitan Washington Regions - 1967."

*If not sealed by an impervious surface, these areas provide direct recharge to water rich formations through their outcrops.
 **Excellent aquifer
 ***Good aquifer

Maghpy fm + patapsco fm + patuxent**
 Aquia fm***
 Alignment
 Station





Magothy fm + pasapaco fm + pituxent**

Aquie fm***

Alignment

Station



PRIME AQUIFER RECHARGE AREAS*

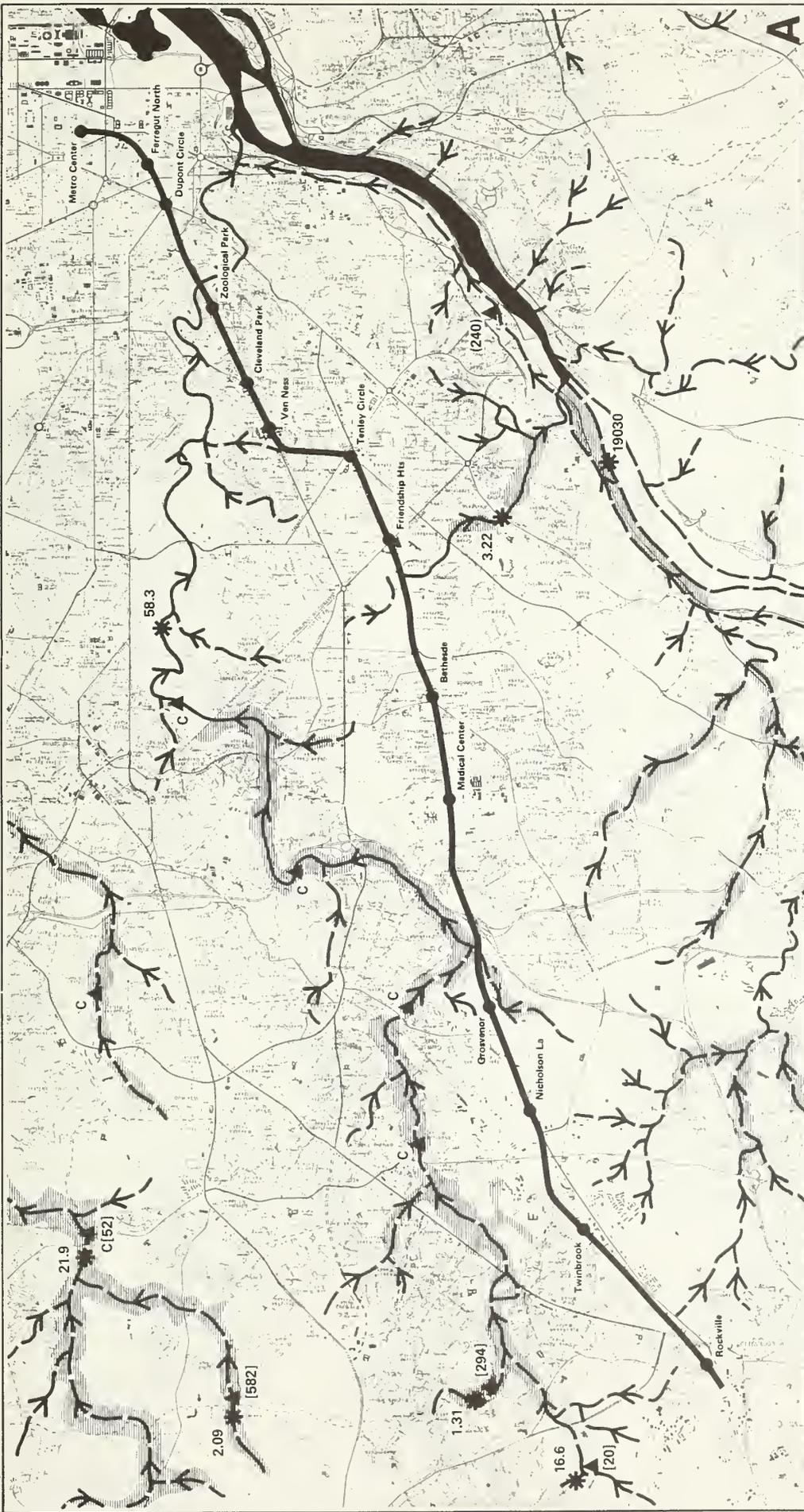
WIMATA SYSTEM IMPACT STATEMENT

ROUTES G-H-J-K



- Sources: 1. Johnston, P.M. "Geology & Ground Water Resources of Washington D.C. & Vicinity", Geologic Survey Water Supply Paper 1776 - 1964.
 2. Wolimon, A. et. al., "Future Supply" Metropolitan Washington Regions" - 1967.

*If not sealed by an impervious surface, these areas provide direct recharge to water rich formations through their outcrops.
 ** Excellent aquifer
 *** Good aquifer



SURFACE HYDROLOGY

WMATA SYSTEM IMPACT STATEMENT

ROUTE A



*Incomplete information
 Source: 1. U.S.G.S. 7.5' Flood Prone Areas
 2. Resource Identification Study for the Annapolis River Basin, Volume V, Maryland
 3. Water Resources for Maryland & Delaware, Parts 1 & 2 - 1972, U.S.G.S.
 4. Water Resources for Virginia, Parts 1, 2 & 3 - 1973, U.S.G.S.
 5. Metropolitan Washington Council of Governments, Floodplains Map, 1:8000-1967

[52]	Average mean concentration suspended sediments in mg/liter
[106]	Total dissolved solids in mg/liter
—	Alignment
●	Station

42.1	Average flow in cfs
▲	Water quality station
C	High fecal coliform count
⊕	Low fecal coliform count

	Stream
	Stream affected by METRO
	100 year floodplain*
	U.S.G.S. gauging station



SURFACE HYDROLOGY
WMATA SYSTEM IMPACT STATEMENT
ROUTE E



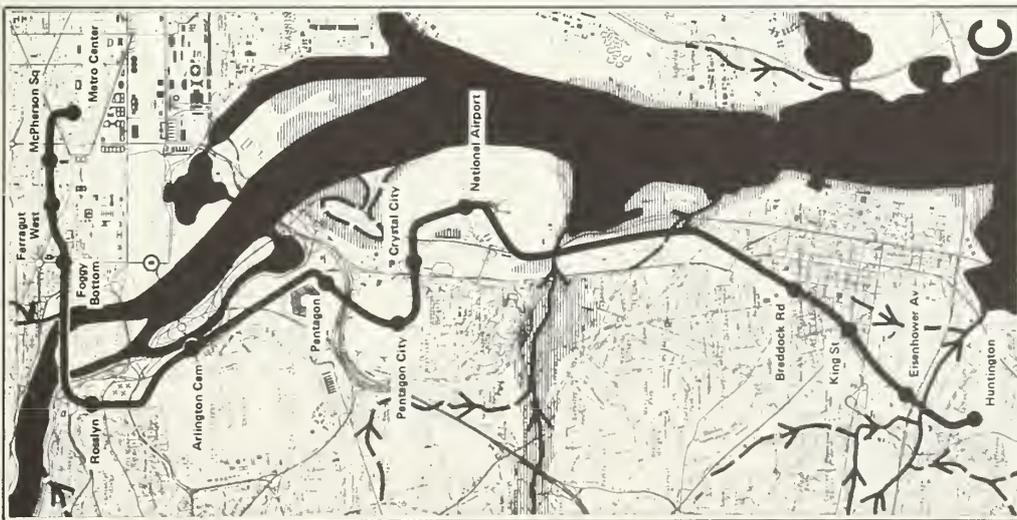
***Incomplete information**
 Source: 1. U.S.G.S. 7.5' Flood Prone Areas
 2. Resource Identification Study for the Annapolis and Potomac River Watersheds
 3. Water Resources for Maryland & Delaware, Parts 1 & 2 - 1972; U.S.G.S.
 4. Water Resources for Virginia, Parts 1, 2 & 3 - 1973; U.S.G.S.
 5. Metropolitan Washington Council of Governments, Floodplains Map, 1:5000 - 1967.

Average mean concentration suspended sediments in mg/liter
 Total dissolved solids in mg/liter
 Alignment
 Station

Average flow in cfs
 Water quality station
 High fecal coliform count
 Low fecal coliform count

Stream
 Stream affected by METRO
 100 year floodplain*
 U.S.G.S. gauging station

[52]	42.1	[582]
[106]	▲	▲
—	C	C
●	⊕	⊕



DL

SURFACE HYDROLOGY

WMATA SYSTEM IMPACT STATEMENT

ROUTES C-D-L

Stream

Stream affected by METRO

100 year floodplain*

U.S.G.S. gauging station

Average flow in cfs

Water quality station

High fecal coliform count

Low fecal coliform count

Average mean concentration suspended sediments in mg/liter

Total dissolved solids in mg/liter

Alignment

Station

[52] [106]

[42.1] [▲] [C] [C]

* Incomplete Information

Sources: 1. U.S.G.S. 7.5' Flood Plain Areas

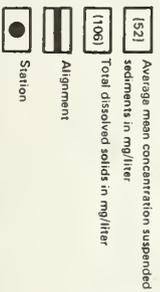
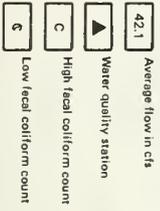
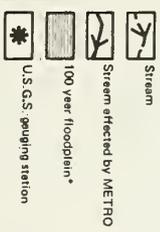
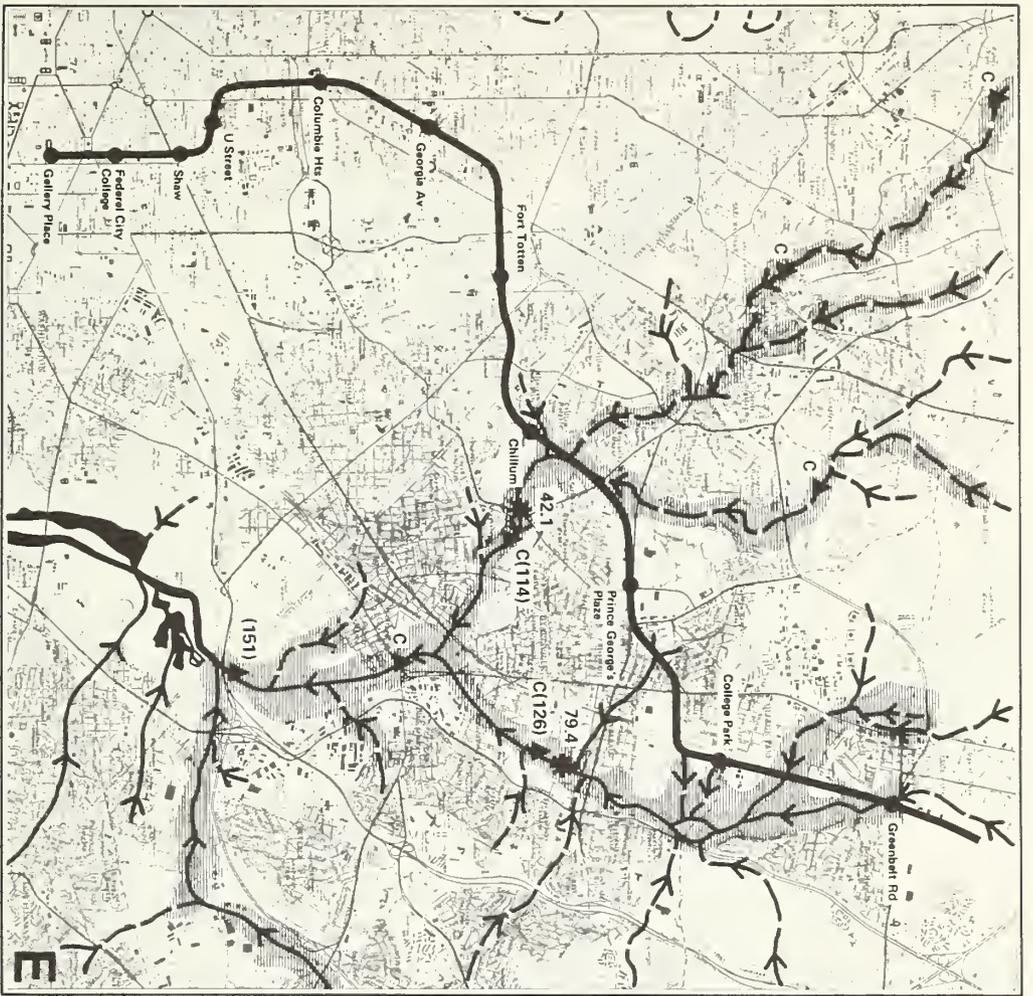
2. Resource Identification Study for the Anacostia River Basin, Volume V, Maryland Department of National Resources

3. Water Resources for Maryland & Delaware

4. Water Resources for Virginia, Parts 1, 2 & 3 - 1973; U.S.G.S.

5. Metropolitan Washington Council of Governments, Floodplains Map, 1:8000 - 1967.

DL

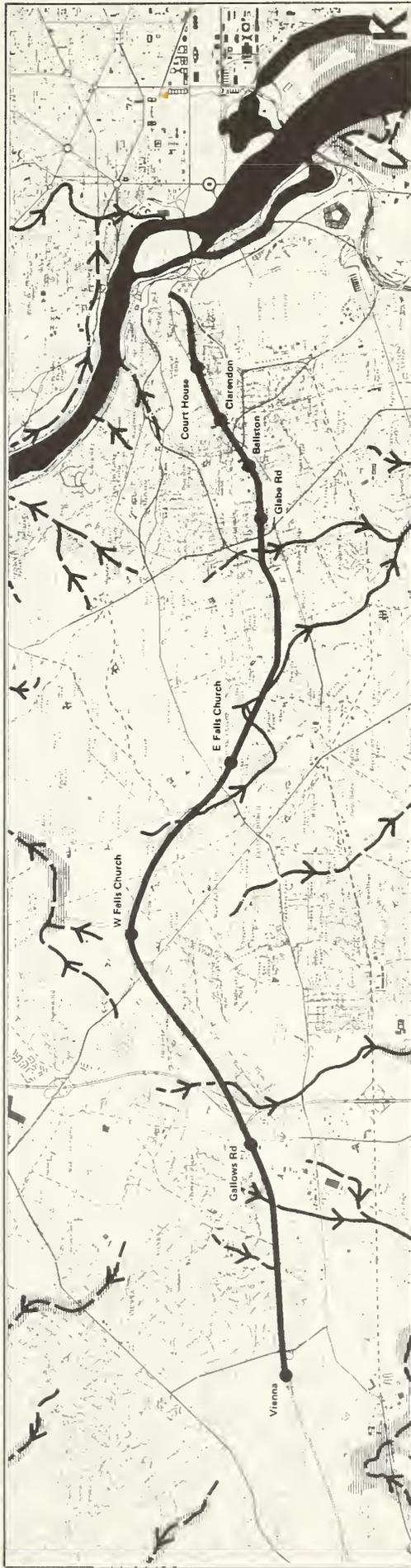
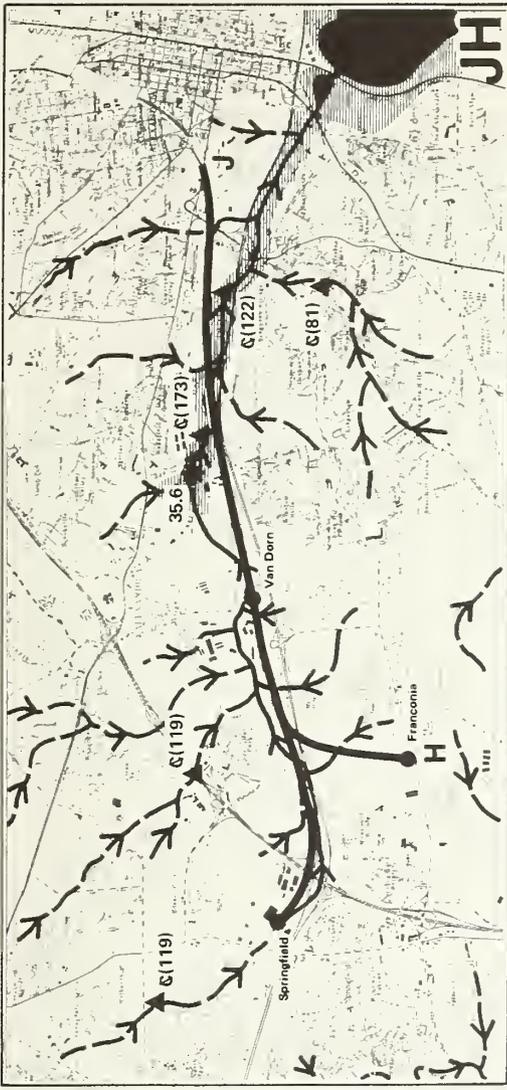


*Incomplete information
 Source: 1. U.S.G.S. 7.5 Flood Prone Areas
 2. U.S.G.S. 7.5 Flood Prone Areas
 3. Water Resources for Maryland & Delaware,
 Department of National Resources
 Parts 1 & 4 - 1972; U.S.G.S.
 4. Water Resources for Virginia, Parts 1, 2 & 3
 5. 1973; U.S.G.S.
 5. Manomet, Floodplains Map, 1:8000 - 1967.

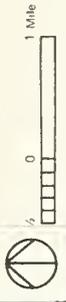
SURFACE HYDROLOGY

WMATA SYSTEM IMPACT STATEMENT
ROUTES E-F





SURFACE HYDROLOGY
WMATA SYSTEM IMPACT STATEMENT
ROUTES G-H-J-K



*Incomplete information
 Source: 1. U.S.G.S. 7.5' Flood Prone Areas
 2. Resource Identification Study for the Anacostia River Basin, Volume V, Maryland Department of Natural Resources, Parts 1 & 2 - 1972, U.S.G.S.
 3. Water Resources for Virginia, Parts 1, 2 & 3 - 1973, U.S.G.S.
 4. Metropolitan Washington Council of Governments, Floodplains Map, 1:8000 - 1967

Average mean concentration suspended sediments in mg/liter [52]
 Total dissolved solids in mg/liter {106}
 Alignment []
 Station [●]

Average flow in cfs [42.1]
 Water quality station [▲]
 High fecal coliform count [C]
 Low fecal coliform count [c]

Stream []
 Stream affected by METRO []
 100 year floodplain* []
 U.S.G.S. gauging station []

SPOILS DISPOSAL SITES IN WASHINGTON, D.C. AREA

Site
Num.

1. Addison Road and Central Avenue – Seat Pleasant, Maryland^{1-*}
2. Walker Mill Road – District Heights, Maryland^{**}
3. 28th and Austin Streets – S.E., Washington, D.C.^{**}
4. 24th and Ainger Streets – S.E., Washington, D.C.^{**}
5. Bowling Field Air Force Base – Washington, D.C.^{2-**}
6. I-495 and Route 4 – Maryland^{3-**}
7. I-66 and West Ox Road – Fairfax County, Virginia^{4*}
8. I-95 and Furnace Road – Fairfax County, Virginia^{5-6-*}
9. I-95 and Furnace Road adjacent to I-95^{5-6-*}
10. Route 1 near Lorton, Virginia^{6*}
11. Loisdale Road near Springfield, Virginia^{*}
12. Utterback Store Road, NW of Route 7 near Herndon, Virginia^{6-*}
13. NW of Route 7 on Hidden Lane – Loudon County, Virginia^{6-*}
14. Gravel pit at Route 5 and Beltway^{***}
15. Mixing bowl at I-95, south of Pentagon^{***}
16. Andrews Air Force Base^{***}
17. New York Avenue and Eastern Avenue^{***}
18. 52nd and Kenilworth Avenue^{***}
19. Possible future site – Smoot's Cove
20. Montgomery County Landfill; S. Lawn Lane – Rockville, Maryland^{*}
21. 28th and Fort Baker Drive – Washington, D.C.^{**}

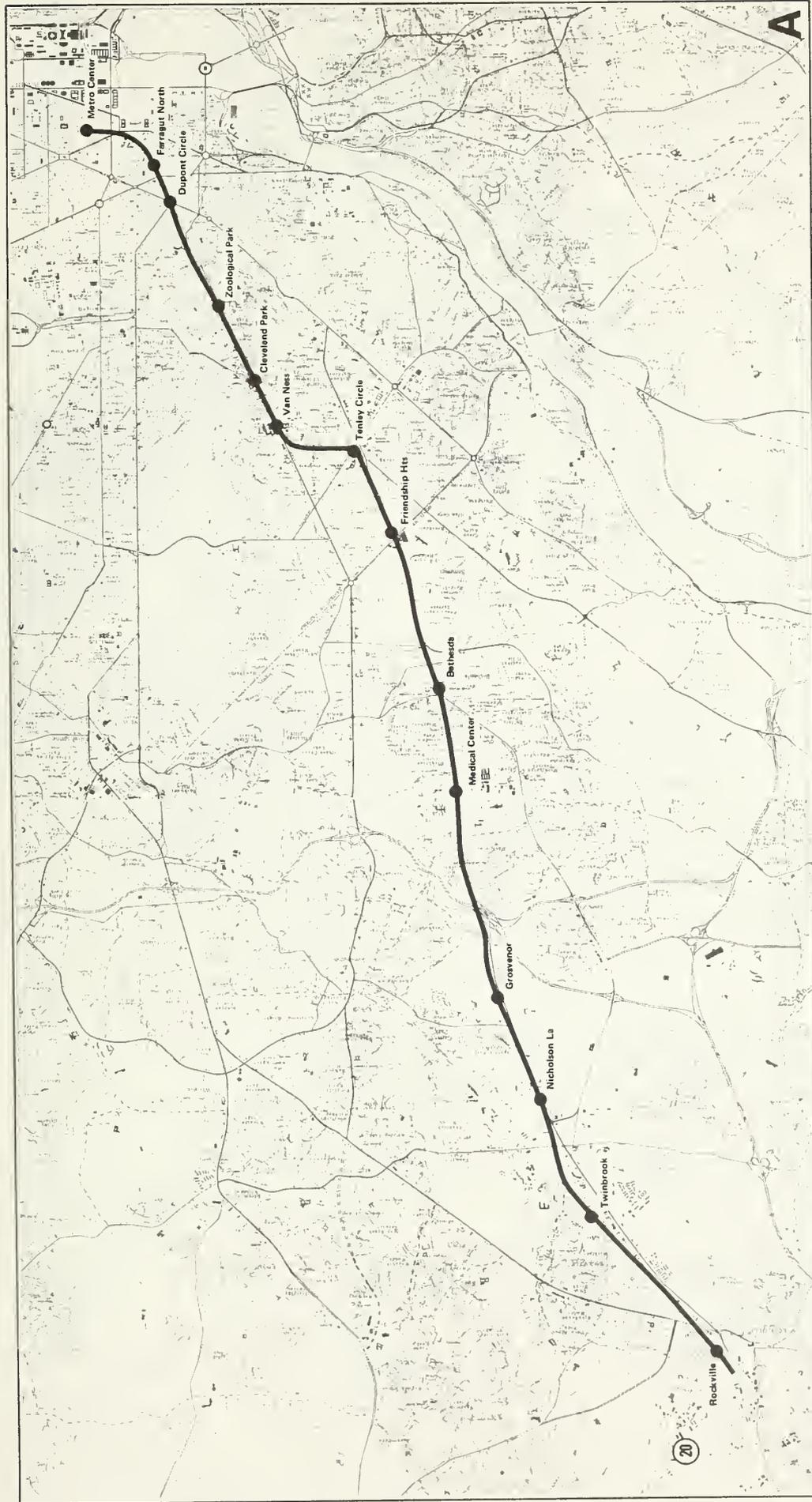
NOTES:

*Currently operating, but not known if used by METRO contractors.

**Currently in use by METRO contractors.

***Used by METRO contractors in 1972.

1. Remaining capacity about 200,000 cu.yds.
2. Almost filled
3. Remaining capacity about 500,000 cu.yds.
4. Sanitary landfill (no stumps, rocks or debris)
5. Public landfill
6. Site outside region



SPOILS DISPOSAL SITES*

WMATA SYSTEM IMPACT STATEMENT

ROUTE A



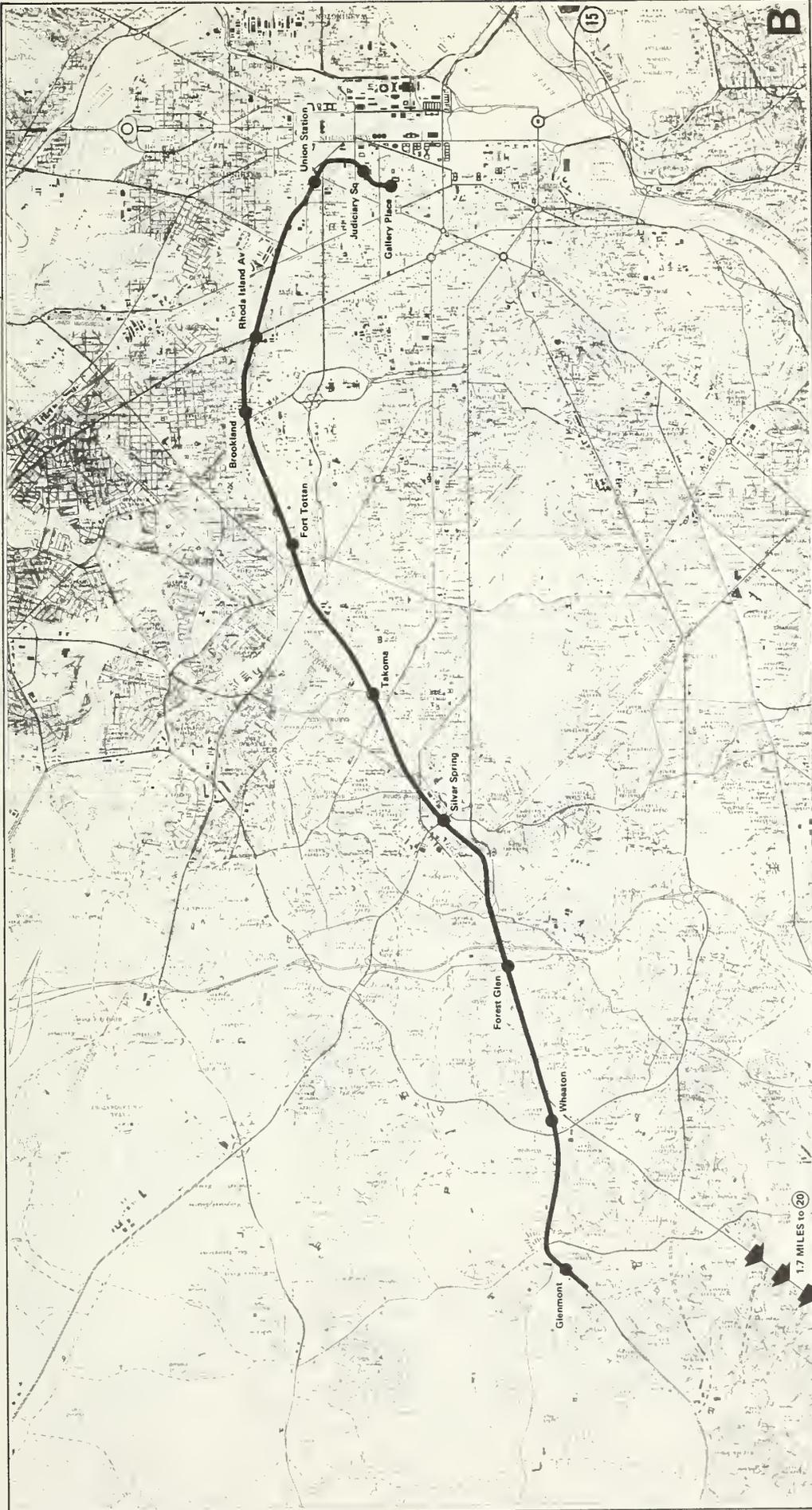
Approximate site location*

Alignment

Station



* For details see SPOILS DISPOSAL SITES list preceding these maps.



SPOILS DISPOSAL SITES*
 WMATA SYSTEM IMPACT STATEMENT
 ROUTE E

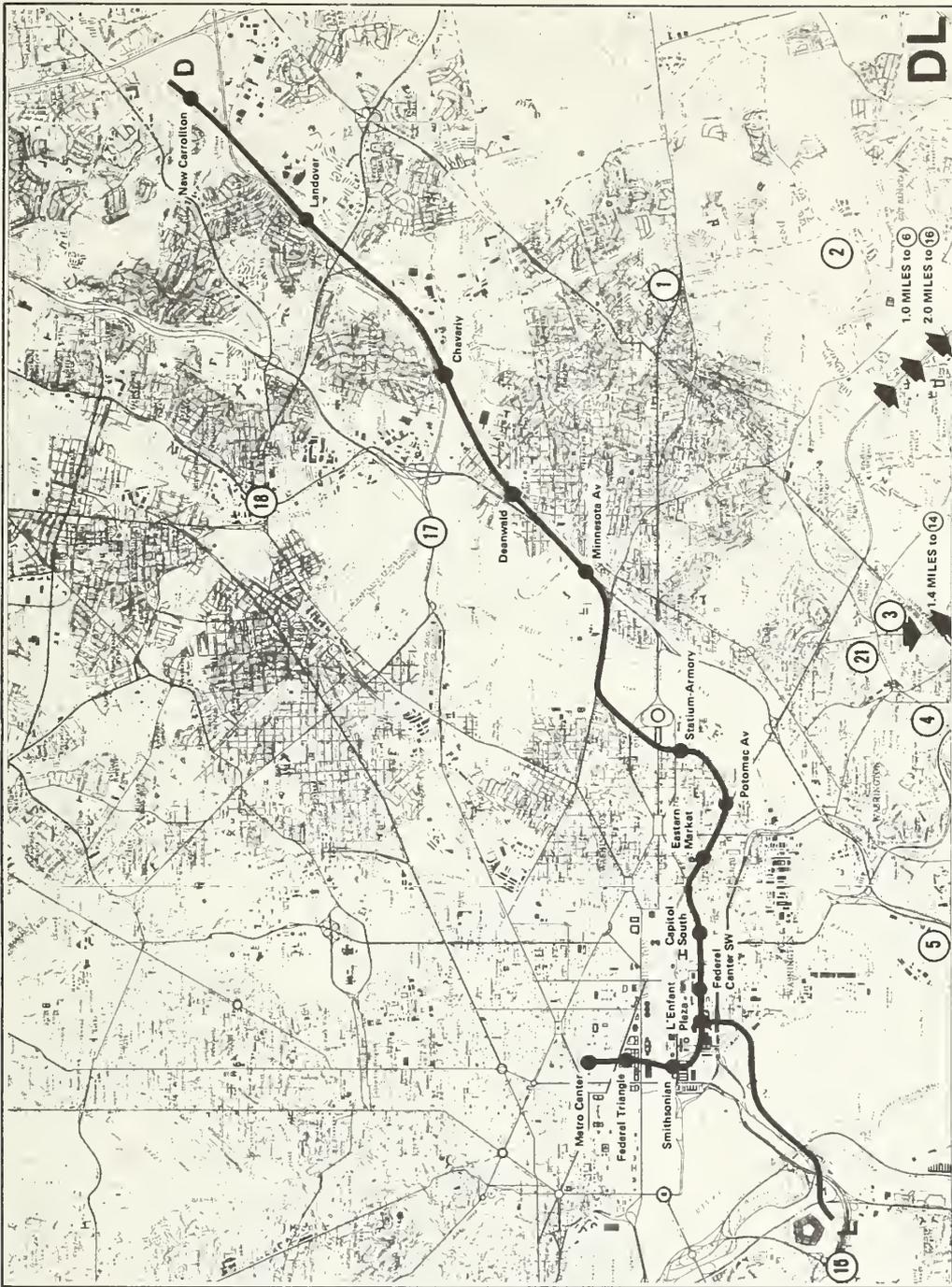
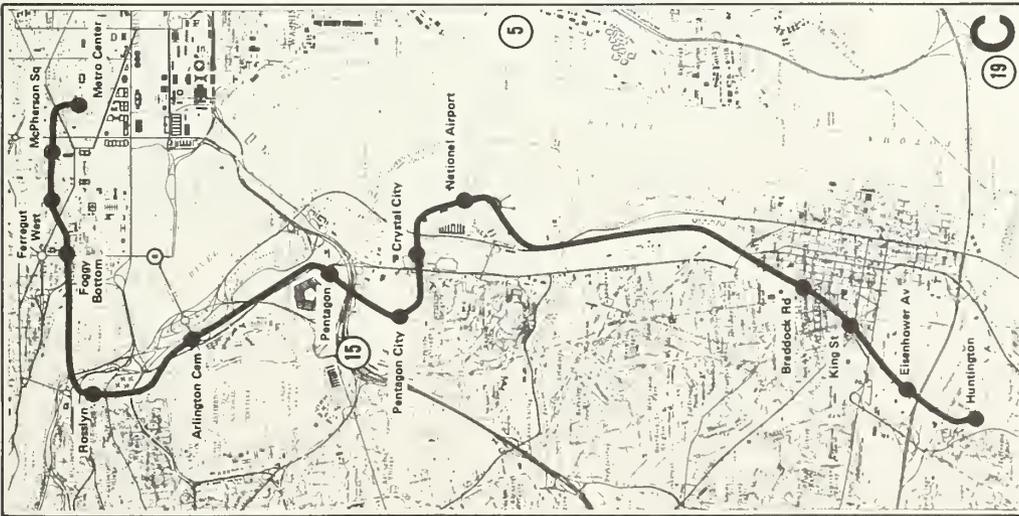


* For details see SPOILS DISPOSAL SITES (list preceding these maps).

○ Approximate site location*

▬ Alignment

● Station



Approximate site location*

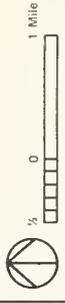
Alignment

Station

SPOILS DISPOSAL SITES*

WMATA SYSTEM IMPACT STATEMENT

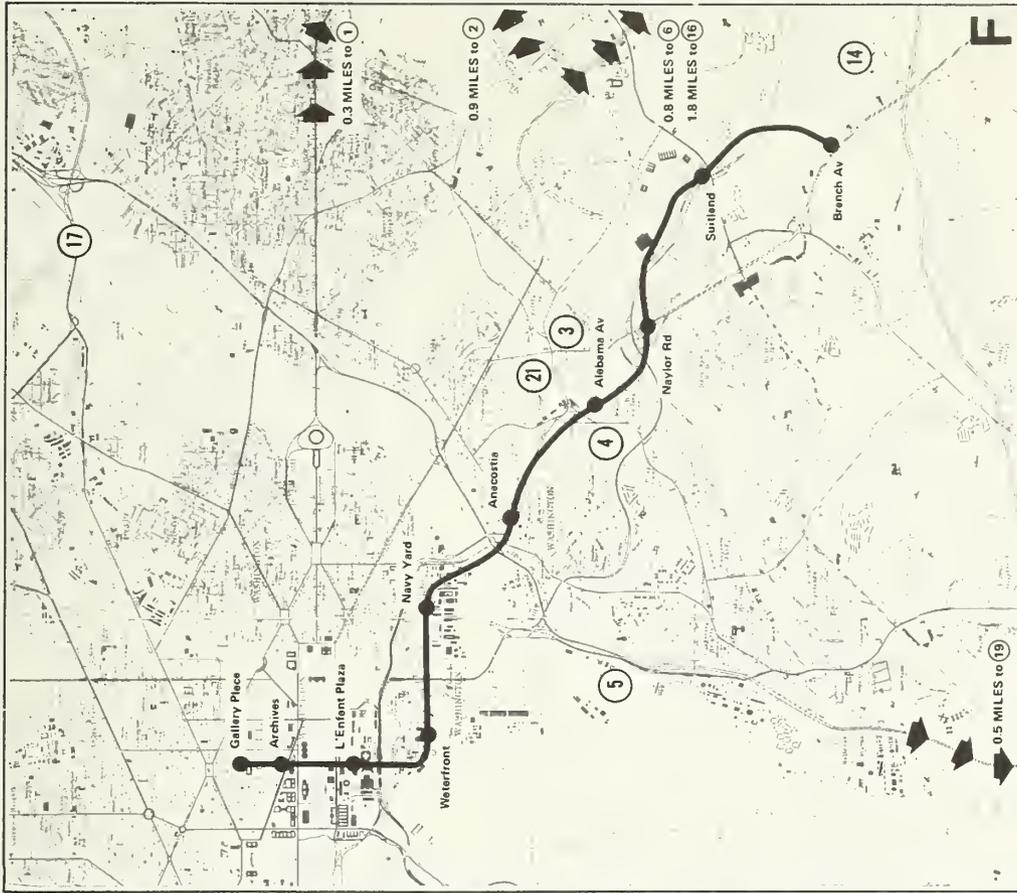
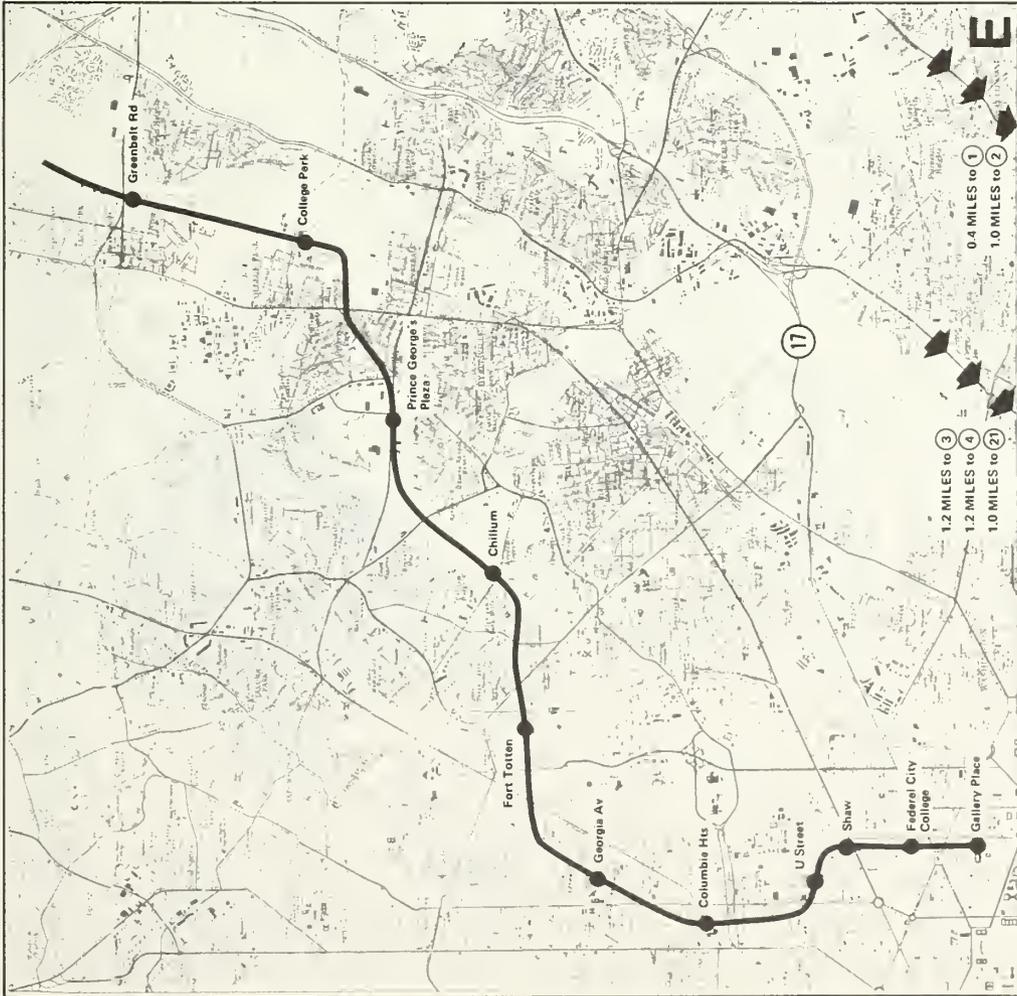
ROUTES C-D-L



* For details see SPOILS DISPOSAL SITES list preceding these maps

DL

19C



Approximate site location*

Alignment

Station

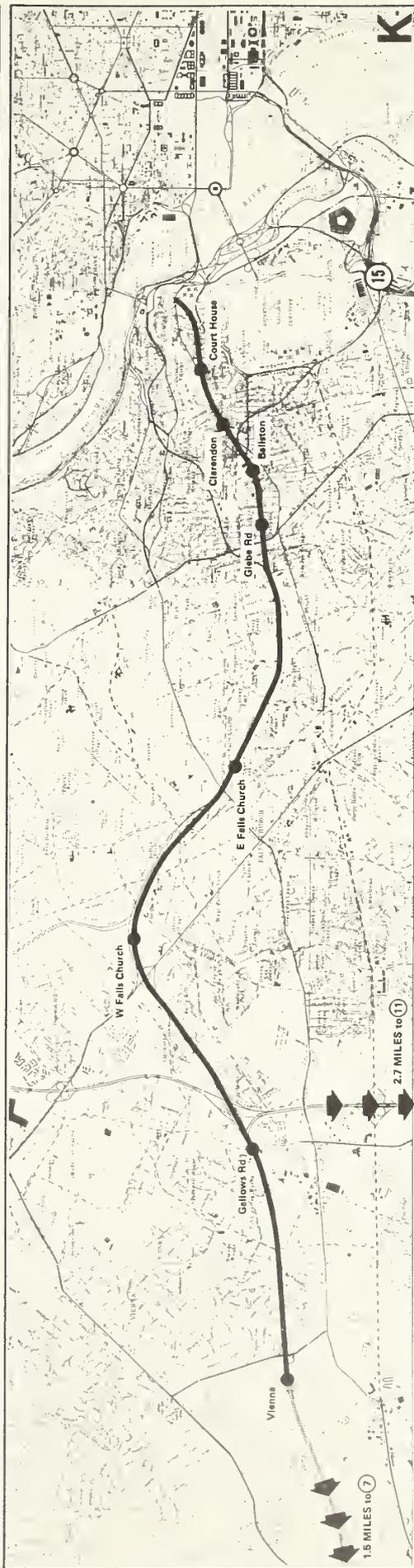
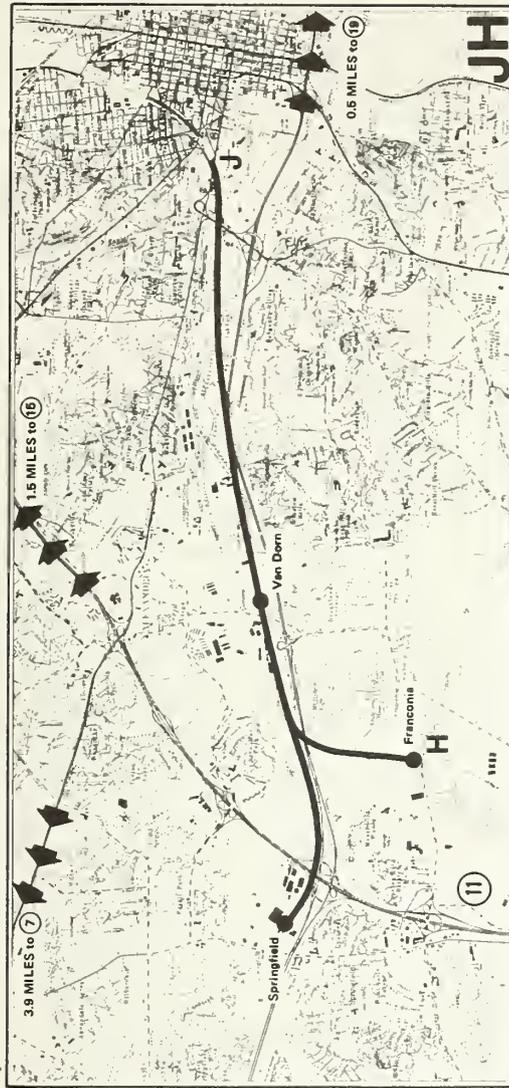
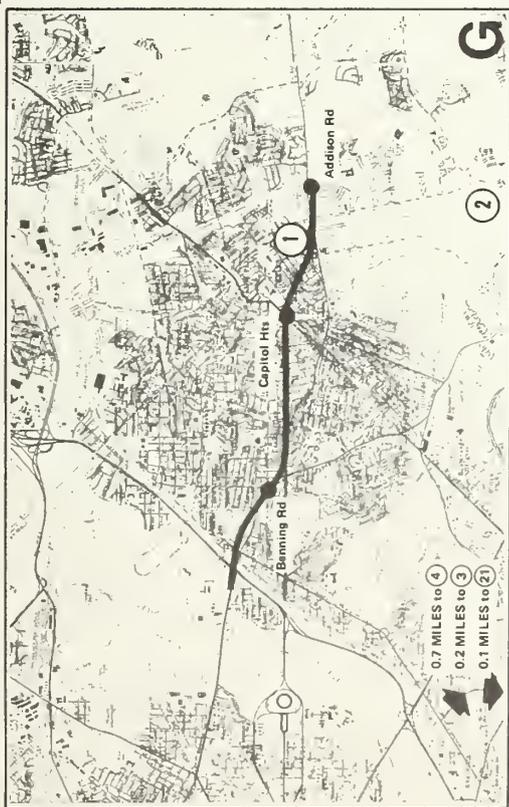


SPOILS DISPOSAL SITES*

WMATA SYSTEM IMPACT STATEMENT
 ROUTES E-F



* For details see SPOILS DISPOSAL SITES list preceding these maps.



○ Approximate site location*

▬ Alignment

● Station

SPOILS DISPOSAL SITES*
WMATA SYSTEM IMPACT STATEMENT
ROUTES G-H-J-K

* For details see SPOILS DISPOSAL SITES list preceding these maps.



0 1 Mile



APPENDIX D: METRO SYSTEM CHARACTERISTICS: THE METROBUS
SYSTEM AND BUS-RAIL INTEGRATION; PARKING;
PHASING AND CONSTRUCTION; POST-CONSTRUCTION
FUNDING; SAFETY AND SECURITY; INCREASED TRANSIT
ACCESSIBILITY FOR THE AGED AND HANDICAPPED

THE METROBUS SYSTEM AND BUS-RAIL INTEGRATION

Pursuant to the provisions of Public Law 92-517, in 1973 WMATA acquired the operating assets of the D.C. Transit System, Inc., the Washington Virginia and Maryland Coach Company, the WMA Transit Company and the Alexandria Barcroft and Washington Transit Company. These acquisitions placed the area's financially troubled bus companies under public ownership.

WMATA has the authority under P.L. 89-774 to plan, develop, finance and cause to be operated, improved transit facilities in coordination with transportation and general development planning for the WMATA transportation zone, as part of a balanced regional system of transportation, utilizing, to their best advantage, the various modes of transportation and to coordinate the operation of the public and privately owned or controlled transit facilities, to the fullest extent practicable, into a unified regional transit system without unnecessarily duplicating service.¹

The Transit Technical Studies, authorized by the Authority, have been undertaken for the development of a plan to facilitate the coordination and unification of the present and planned transit facilities. The mass transit plan developed under these studies must be consistent and compatible with comprehensive planning for and the development of the Washington Metropolitan Area. To insure such consistency and compatibility WMATA participates in and utilizes the results of the continuing comprehensive metropolitan planning process carried on by COG.

The major objective of the Transit Technical Studies project is "to provide a continuum of bus service under any situation that is likely to occur; to provide for the most efficient and economical operation of the area bus facilities before, during and after construction of the rapid rail system; and to establish a level of service compatible with the needs of the area."² To achieve this objective it is necessary, among other inputs, to prepare detailed plans for the orderly and efficient consolidation and integration of the surface bus system with the various stages of Metro operations.

¹Application of the Washington Metropolitan Area Transit Authority for a Technical Studies Grant under the Urban Mass Transportation Act of 1964, as amended, January 1972.

²WMATA Transit Technical Studies Project Description and Work Program.

In developing viable plans for a unified and coordinated rail-bus transit system it is intended that such plans be developed to the operational level of detail to permit implementation on short notice, to permit the modification of service where demand increases or decreases without substantial perturbation of the basic system, and to enable the WMATA staff to develop the optimum bus service projected for each of the operational phases of Metro.

"The main change in bus utilization that is anticipated for the integrated bus and rail system is a re-allocation of bus fleet from line haul to both a local function and feeder/distribution function...Even in those corridors where Metro lines are operating, it is expected that a high level of bus service will be needed to provide a local service, with the Metro providing express service along the same route."¹

"Of particular importance...will be the design of efficient all-bus corridor and cross town services in the areas not directly served by rail lines. Since there are many important travel corridors that will not have direct rail service in the early phases of Metro, failure to provide efficient all-bus service could lead to peripheral traffic congestion tending to negate rail service benefits and to imbalances in urban mobility and land use development."²

The aim of the 1980 bus system should be "to introduce a route network which will complement the Metro, meet riders' needs more exactly, match headways to demand, and secure a simple and more economical operation."³

Emphasis must be given to both the development of a 1980 integrated transit system and to a wide range of early action transit improvements as the latter can significantly alter travel patterns and habits and influence longer range land development and transportation plans and programs.

Since such early action transit improvements will largely involve the Metrobus fleet, it has been necessary for the WMATA staff to develop Metrobus Service Objectives⁴ against which improvements can be judged. Among the proposed objectives are the following:

¹"Design and Detail of 1974/75 Bus Plan", (Preliminary Draft) Memorandum Report No. 12, Transit Technical Studies Subtask 2.b.11. Prepared for WMATA by Wilbur Smith and Associates, January 1974, p.54.

²Appendix to Application of WMATA for Technical Studies Grant.

³"Design and Detail of 1974/75 Bus Plan", p.59.

⁴The existing Metrobus Service Objectives are in draft form and represent WMATA staff position only as these have not to date been reviewed by the Board.

The Transit system will be designed to serve and support desirable patterns of land use and land use intensities and will be compatible with other existing and planned components of the regional transportation network.

Metrobus transit service improvements will be coordinated with regional development goals and will be compatible with the growth policies and development plans adopted by the communities served.

TRAVEL TIME

Services shall be designed to minimize door-to-door travel times for both present and potential patrons. This will involve applying the available transit modes to their best use to improve the walk, wait, ride and transfer elements of the total trip.

Transit origin-to-destination times shall be the shortest possible by adopting a policy of utilizing the highest quality transportation facility available to complete the trip. Transferring will be minimized by continuously seeking more effective routing of services between origin and destination. Where transfer elimination is impossible, services will be carefully coordinated and adequate facilities for protection from weather will be provided for transferring passengers. It is also the objective of the Authority to minimize walk and wait portions of the transit trip by efficient spacing of routes and stops to provide reasonable walking distances and by providing service frequencies as closely spaced as possible within economic constraints.

ROUTE SPACING FOR AREA COVERAGE

In the determination of route coverage and alignment, all relevant population, employment, socio-economic and geographic factors will be considered. Those include but are not limited to:

- (1) Density and spatial distribution of population;
- (2) Distribution and concentration of employment;
- (3) Income and age structure of the population;
- (4) Availability and acceptability of fringe parking as related to the degree of car ownership or availability;

- (5) The nature of the terrain and available street pattern with particular regard to physical suitability for bus operation;
- (6) Trip patterns of the population in service area;
- (7) Siting of retail shopping and service areas; and
- (8) Location of school, churches, hospitals and medical care centers, welfare and social service facilities and recreation areas.

The spacing of service will conform to the above user and spatial characteristics. The goal is that, generally, in continuously built-up areas of high population density and low automobile ownership, parallel or adjacent routes serving corridors of passenger movements will be spaced so that no substantial number of present or potential bus riders will be more than one-quarter to three-eighths of a mile from service. The aim will be to avoid any significant number of potential bus users being more than a 5-minute walk at normal walking speeds from a bus stop.

For less densely built up areas or where there are scattered concentrations of population, particularly where car ownership is relatively high, a one-half mile spacing of bus service will be the objective. For this situation a 10-minute walk at normal walking speeds to reach a bus stop will be acceptable. In outer areas of low population density with high automobile ownership, the service coverage will be individually determined, according to the merits of each case.

FREQUENCY OF SERVICE

Scheduled headways during the peak periods will be as evenly spaced as practicable at all points along the route. It will be permissible to operate a restricted amount of uneven spacing whenever the loading analysis indicates that it would be desirable for trips originating at turn-back points or operating to short service points to carry a longer headway in order to achieve a more even distribution of passenger loading at the maximum load point(s). It is recognized that in the interests of achieving better utilization of vehicle and manpower and to provide rides because of lack of vehicle availability, some further relaxation of this peak-hour standard may be essential.

On regular base day services in areas of close route coverage, an average frequency of not less than two trips per hour will be provided on weekdays, but a one trip per hour standard may be applied in the early morning and late evening operating periods. Headways for lines providing common service along the same roads for any significant length of the trip will be coordinated whenever loading standards permit, except when conditions on the individual service sections preclude coordination.

Scheduled headways during non-peak periods will be set to a "clock-face" principle (intervals divisible into 60 minutes) whenever practicable, subject to the need for meeting special timings for particular movements and for overall operating efficiency. Where it is practicable to do so, having particular regard to possible running time variations, the same clock-face timings will apply throughout the week, whenever the same headway frequency is appropriate for the ridership demand. When the minimum service of 1 or 2 buses per hour operates, the minutes past each hour should as far as practicable remain at times of comparable trips made with the closer frequency. Although patronage may not alone justify an operation, policy headways may be established where need or desirability override economic justification.

FINANCIAL AND ECONOMIC ROUTE ANALYSIS

Within the frameworks of providing service to the community, one of the objectives is to provide this service as economically as possible. To achieve this objective regular financial and economic analysis of routes will be undertaken to evaluate the financial performance of a route or segment of a route as needed.

Although routes will be subject to economic analysis as indicated above, the Authority will also include in its evaluation the benefits that the service may be providing to the community as a whole. The role played by individual services in the achievement of social goals discussed previously will be assessed before decisions are taken to initiate the removal of a service from a particular community or neighborhood.

SYSTEM DESIGN AND BUS-STOP SPACING

In serving residential and employment concentrations, the objective will be to provide the closest route and bus stop practicable while avoiding circuitous routing which would deter riders and add costs. Every effort will be made

to directly connect as many residential and employment concentrations as possible. Connecting lines shall be provided where direct routings are not possible so as to maximize distribution throughout the service area.

Routes will have as direct an alignment and as little turning and doubling back as the street pattern and the requirement of service coverage will permit.

Bus-stop spacing will take into account both the convenience of the passenger and accessibility to the general development.

POLICY ON TRAFFIC FLOW

The Authority will examine and promote measures that will provide efficient traffic movement for its bus services. Based on its larger passenger capacity and the public service nature of its operation, priority consideration will be sought over the private automobile in those instances where it is necessary to provide efficient bus service. Traffic operating measures to be advocated include:

- (1) Efficient bus stop location;
- (2) Exclusive right-of-way busways;
- (3) Exclusive bus lanes;
- (4) Contraflow bus operations;
- (5) Bus-only streets;
- (6) Bus-only turning movements;
- (7) Bus priorities at street intersections; and
- (8) Bus priorities at highway merging points.

Approximately twenty-five miles of bus priority lanes exist to date in the District of Columbia and several bus priority lanes are in Maryland and Virginia. Shirley Highway has an exclusive lane for buses and car pools (4 persons in a car) during peak hours.

Turning again to the Transit Technical Studies and to recent developments that will affect bus-rail integration one can discern three general phases of planning and development: (1) FY 1973 - FY 1974; (2) FY 1974 - FY 1978; (3) The 1980 mass transit network.

At present WMATA provides mass transit bus service within the Washington Metropolitan Area Transit Zone which consists of the District of Columbia, the cities of Alexandria, Falls Church and Fairfax and the counties of Arlington and Fairfax and political subdivisions of the Commonwealth of Virginia located in those counties, and the counties of Montgomery and Prince George's in the State of Maryland and the political subdivisions of the State of Maryland located in those counties. Except for the lightly settled outer portions of Fairfax County, Virginia and Prince George's and Montgomery Counties in Maryland, mass transit bus services extend throughout the Zone.

WMATA owns and operates 1,674 mass transit buses within the Zone. It also operates under contract with the Northern Virginia Transportation Commission the 90 buses of the Shirley Highway Express Bus-On-Freeway Demonstration Project and under contract with the District of Columbia the 15 Midibuses of the D.C. Government Midibus Demonstration Project, both UMTA-sponsored projects. Mass transit bus service is provided on 465 routes over approximately 1,200 miles of area streets. WMATA operates 14,311 trips each weekday.¹

Service is provided 24 hours each day.

This service will be improved and integrated with Metro operating phases on a phase by phase basis.

Since WMATA's acquisition of the four privately owned companies' 620 new air conditioned buses equipped with the latest emission control devices have been ordered. The first 100 of these buses placed into service are to reduce overcrowding on existing routes. The next 369 new buses are to replace equipment at least 14 years old. The final 151 buses are to be used for an expansion of service to new areas.² The EPA has required that 750 buses be added to the existing fleet to serve increased ridership. 251 of the 750 will be provided by the above acquisition. The remainder should be purchased during the FY 1974 - FY 1976 period. Furthermore, approximately 900 buses should be replaced during the FY 1976 - FY 1978 period.³

¹Preliminary Application of WMATA for a Mass Transportation Capital Improvement Grant under the Urban Mass Transportation Act of 1964, as amended, February 7, 1974.

²Metro News Release, March 21, 1974.

³"Short-Range Transit Development Program for the Washington Metropolitan Area." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, March 1974, pp.1-2.

To begin fulfilling EPA requirements, WMATA has applied to UMTA for a mass transportation improvement grant to fund in part the purchase of 175 new air conditioned buses equipped with the latest emission control devices, the purchase of 25 two-way radios and other equipment. The additional 175 buses will enable the operation of an additional 5 million miles of service per year. "By FY 1977...it will be possible to operate a total additional 15.0 million bus miles.

The expanded service is planned to include:

- (a) new suburban local and express routes during the peak period;
- (b) new and more frequent suburban service during the base day and early-late periods;
- (c) increased crosstown and cross-county service;
- (d) an upgrading of the present service."¹

Among other proposals covering the 5-year period FY 1974 - FY 1978 is the recommendation that WMATA purchase the 15 midibuses currently used in the Downtown Washington Midibus Demonstration Project and continue this Shopper's Special service. The assumption of this responsibility is projected for FY 1975.²

Montgomery County DOT anticipates purchasing 30 minibuses in FY 1974. These buses will interface with Metrobus routes and terminals to serve the Bethesda-Friendship Heights and Takoma East - Silver Spring areas.³

To maximize efficiency of present and future bus operation WMATA intends to equip all buses, both new and old, with a public address system which would be used to disseminate information such as announcements of transfer points, major discharge points and special instructions and information required to facilitate ease of passenger travel. WMATA further intends to equip the bus fleet with radio communications. Radio communications between drivers and a central dispatching facility will permit efficient surveillance of the bus operation and will improve schedule adherence as well as public safety.

¹Ibid, p.13.

²Ibid, pp.3-4

³Ibid.

At regular intervals during the phasing in of Metro the bus route structure will be analyzed and where necessary there will be a new route structure and/or a reallocation of bus frequencies in accordance with observed and anticipated needs.

Interim bus feeder studies are underway through Phase I of Metro ¹ and bus feeder studies through Phase IIA of Metro are expected to begin in the latter part of 1974. WMATA will continue to initiate studies regarding interim bus routing as future Metro phases near completion so that new feeder bus routes can be implemented during the same time period a new Metro phase opens.

The 1974/75 proposed bus plan reflects many of the concerns WMATA has and will have as it develops interim bus plans as well as a 1980 transit plan. For example, WMATA is concerning itself with fringe areas when planning the bus service system. In the preliminary draft of the 1974/75 Bus Plan it is proposed that additional coverage be provided to suburban and outlying areas by initiating bus service on 113 miles of streets which do not to date have bus service and by giving frequent rush hour service and an all-day service to areas which have had only occasional service.

Furthermore, it is proposed that the bus system concentrate on providing direct service between suburban traffic generators, as well as providing suburban-downtown service. This would be accomplished via crosstown and cross-county circumferential routes.

The preliminary draft of the 1974/75 Bus Plan also proposes that the most significant increase of service be to those areas with the highest proportion of disadvantaged and transit dependent persons.

Finally, reflecting yet another WMATA concern, it is proposed that special interest groups, which make many of their trips in off-peak hours, be better served by increasing the base and mid-day service where necessary.

¹See section on "Phasing and Construction" for Metro phases.

By improving the Metrobus service on one hand and studying and planning for an efficient and effective bus-rail system on the other, WMATA is attempting to develop one of the finest mass transit systems in the nation to serve all residents of the Washington Metropolitan Area.

PARKING

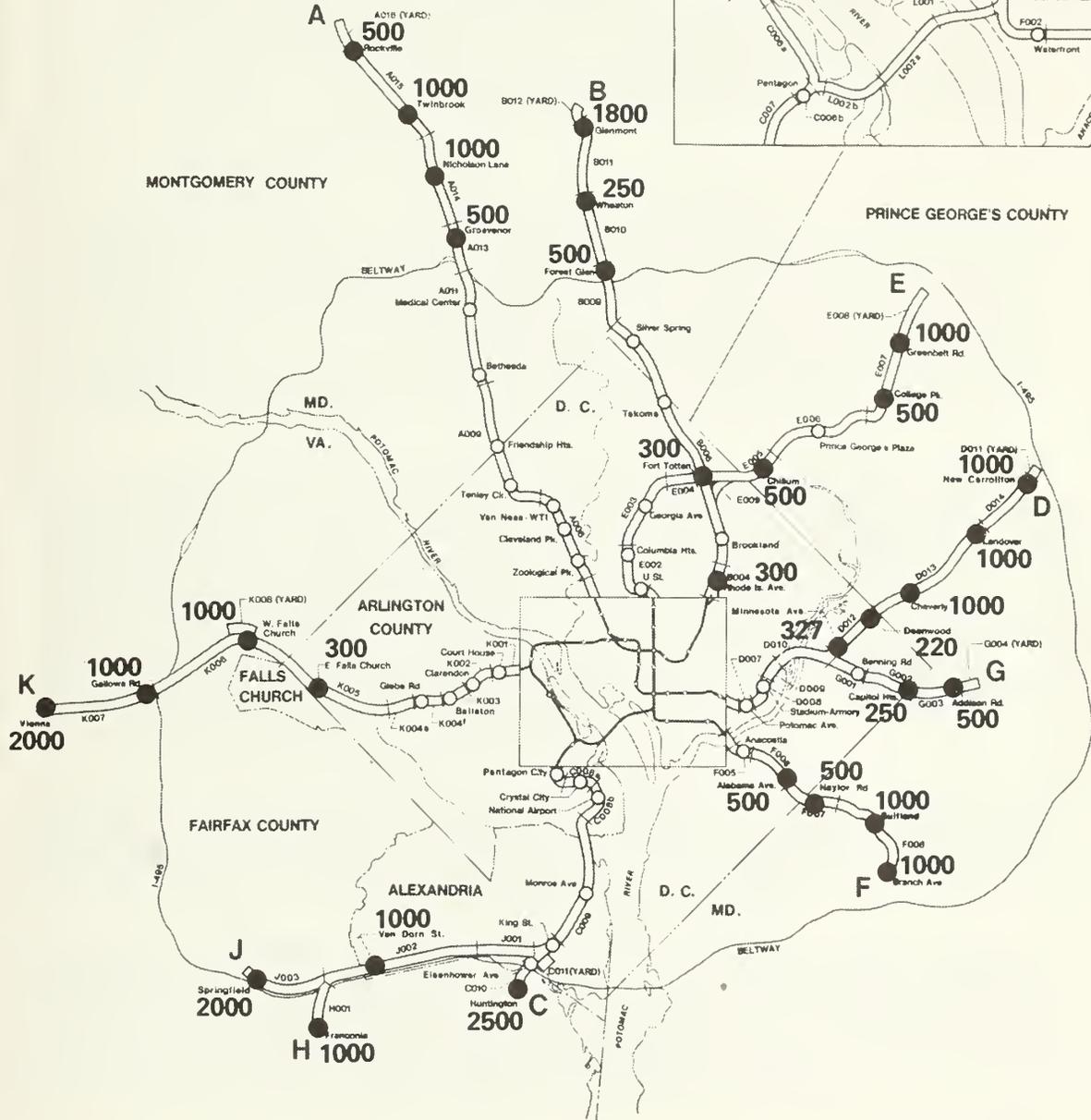
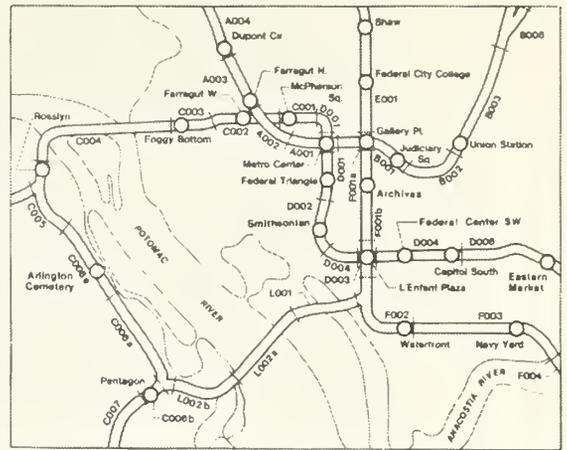
Under the rubric of parking the following will be considered: (1) Park-ride facilities for automobiles at Metro stations; (2) Kiss-and-ride facilities at Metro stations; (3) Bus bays at Metro stations; (4) Bicycle parking facilities at Metro stations; (5) Fringe parking facilities throughout the Washington Metropolitan Area.

Park-Ride Facilities

A model was developed by WMATA consultants to describe the future demand for access to rapid transit by automobile. Application of the model produced estimates of the demand for park-ride and kiss-ride facilities at stations on the Adopted Regional System in 1990.

The number of park-ride spaces proposed by WMATA for individual stations reflects a weighing of several major factors which include the projected demand for spaces, the availability of land adjacent to stations and its cost (economic as well as social cost such as displacements), the quality of arterial access to a station, the nature and intensity of land use in the station area, and local jurisdictional desires. The accompanying table indicates the changes that have occurred since 1968 in the number of park-ride spaces allocated to individual stations. These changes over time primarily reflect the opposition manifested by local jurisdictions vis-a-vis parking facilities. WMATA is presently designing to the figures in the last column. In part, as a result of the constraining factors mentioned above and largely as a result of effective local opposition, the number of park-ride facilities to be constructed does not adequately reflect need.

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- Sources: (a) "Supplemental Report No. 2; Net Income Analysis; Park Ride Analysis; prepared for WMATA by W.C. Gilman & Co., Inc. and Alan M. Voorhees & Associates, Inc., 1969.
- (b) Memorandum Report No. 14 (Preliminary Draft), Transit Technical Studies, "New Fringe Parking and Express Bus Service" Subtask 1.K. Prepared for WMATA by Wilbur Smith and Associates, Dec. 1973.
- (c) WMATA planning staff.



1000 Park and ride

PROPOSED VEHICULAR FACILITIES





If sufficient parking is not available at a particular station several actions may be taken by a patron forecasted to drive to the rail system: he may attempt to park in streets near the station or in private off-street parking facilities; he may be forced to ride a feeder bus to the station; he may drive to another station that has sufficient parking accommodations; or he may decide to revert back to driving his automobile and eliminate the rail trip altogether. It is presently estimated that the transit system will lose only a small percentage of the unsatisfied park-ride demand to the automobile due to available access to rapid transit by other modes such as kiss-and-ride and feeder bus. Nonetheless, attention must be given to the above possibilities as they affect local traffic, feeder bus operations, and particular station design respectively.

Notwithstanding the benefits patrons and the rapid rail system will derive from park-ride facilities, it must be noted that many of the proposed park-ride facilities will represent major peak-period traffic generators and will therefore have an impact on local development and traffic circulation. It is anticipated that this impact will be controlled and directed by means of effective traffic engineering and station site planning.

In already heavily congested and highly developed areas such as the District of Columbia there has been strong opposition to both park-ride and kiss-ride facilities. The District wants to encourage patrons near or within its boundaries to use buses, to walk to stations or to use parking facilities outside of the District, thereby eliminating all parking facilities. A compromise has been reached whereby WMATA will construct only a limited number of park-ride facilities within the District but none will be located within the CBD area.

Another issue WMATA has concerned itself with is making parking accessible to the handicapped. A discussion of this topic is found in the section on "Increasing Transit Accessibility for the Aged and Handicapped".

Parking at Metro stations will not be free. While a schedule of parking fees is yet to be established, WMATA anticipates charging more for parking the closer one gets to the District's CBD, thereby discouraging transit patrons from drive to already highly congested areas.

Kiss-and-Ride Facilities

Kiss-and-ride involves transit travel in which the transit patron is driven to and picked up from a rail station in a car which is not parked for any significant duration.

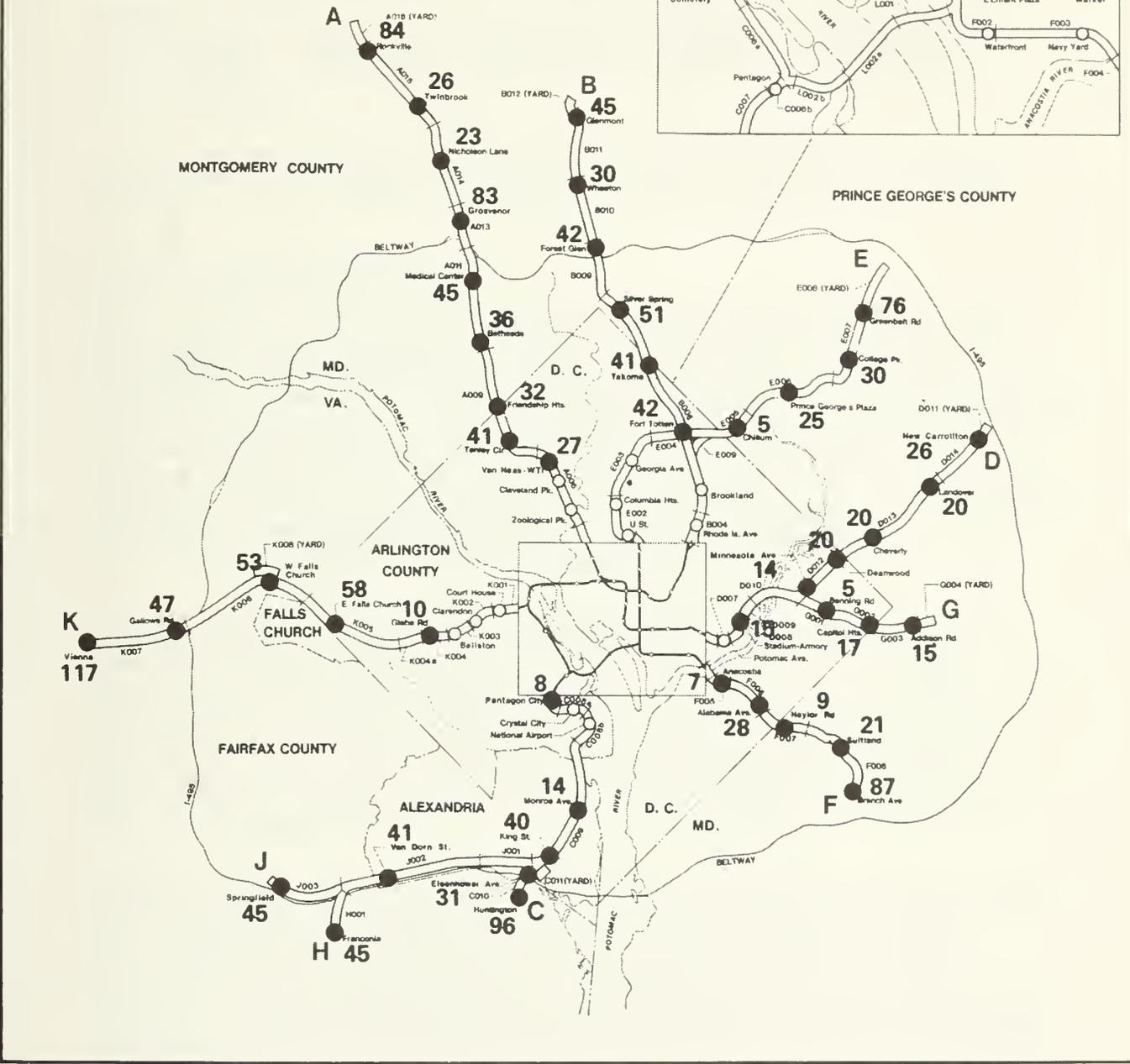
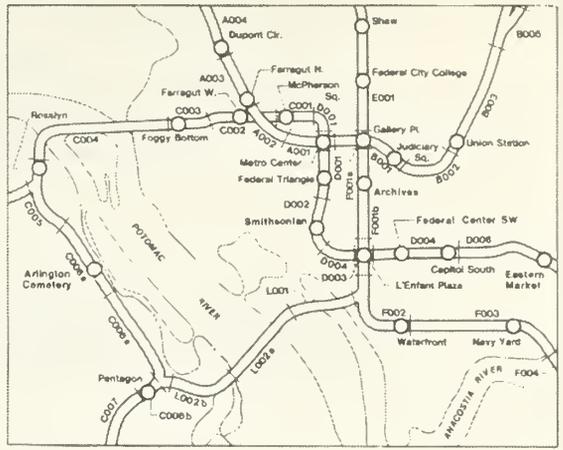
In the A.M., no parking time whatsoever is necessary as a patron is simply dropped off in a drop-off zone (see accompanying prototype of kiss-and-ride facility). However, for the P.M. pick-up the automobile must usually be stored briefly at the station while waiting for the passenger(s) to arrive. The average parked time of kiss-and-ride vehicles is expected to be 9 minutes. Therefore, the maximum kiss-and-ride parking requirements per station become a function of the number of kiss-and-ride patrons expected to leave the station in a 9-minute period during the peak hour. The maximum requirements represent the number of desired spaces. This number was modified by WMATA to reflect the amount of real estate available at a particular station, to reflect jurisdictional desires, and to be compatible with the site plan. As a result of the foregoing considerations, kiss-and-ride facilities are not located in the District's CBD and satisfy only in part the demand for such facilities.

Bus Bays

Bus bays allow feeder buses to park at Metro stations for short durations while they wait for exiting rail passengers. Bus bays are intended for nearly all Metro stations excepting those within the District's CBD and at those few non-CBD stations where WMATA cannot purchase real estate. In cases where land is difficult to acquire and there is a demand for both bus bays and kiss-ride facilities, WMATA is giving priority to bus bays as buses serve more patrons.

To determine the number of bus bays necessary to meet projected demand it was first established that under ideal circumstances a bus would have an approximate 5-minute lay-over at a station. One can thus ideally fit 12 buses per hour in a bay. However, in practice, the WMATA staff used a lower figure so as to prevent the queuing of buses which would negatively affect circulation in the area adjacent to stations.

To determine the actual number of bus bays per station the projected bus network was analyzed to obtain the number of routes that would feed into a particular station. Each bus route was then assigned to a particular bay and the number of buses per route was calculated. (If a route has



58 Kiss and ride

PROPOSED VEHICULAR FACILITIES



a low number of buses, more than one route was assigned per bay). The foregoing information, including the lay-over factor, the amount of real estate available at a particular station and local jurisdiction desires were the major factors balanced by the WMATA staff in order to arrive at the specific recommended numbers.

Bicycle and Motorcycle Facilities

WMATA has added space for bicycle storage to most station facilities. Generally, space for 50 bicycles has been designated. Initially, racks to receive 20 bicycles will be installed.

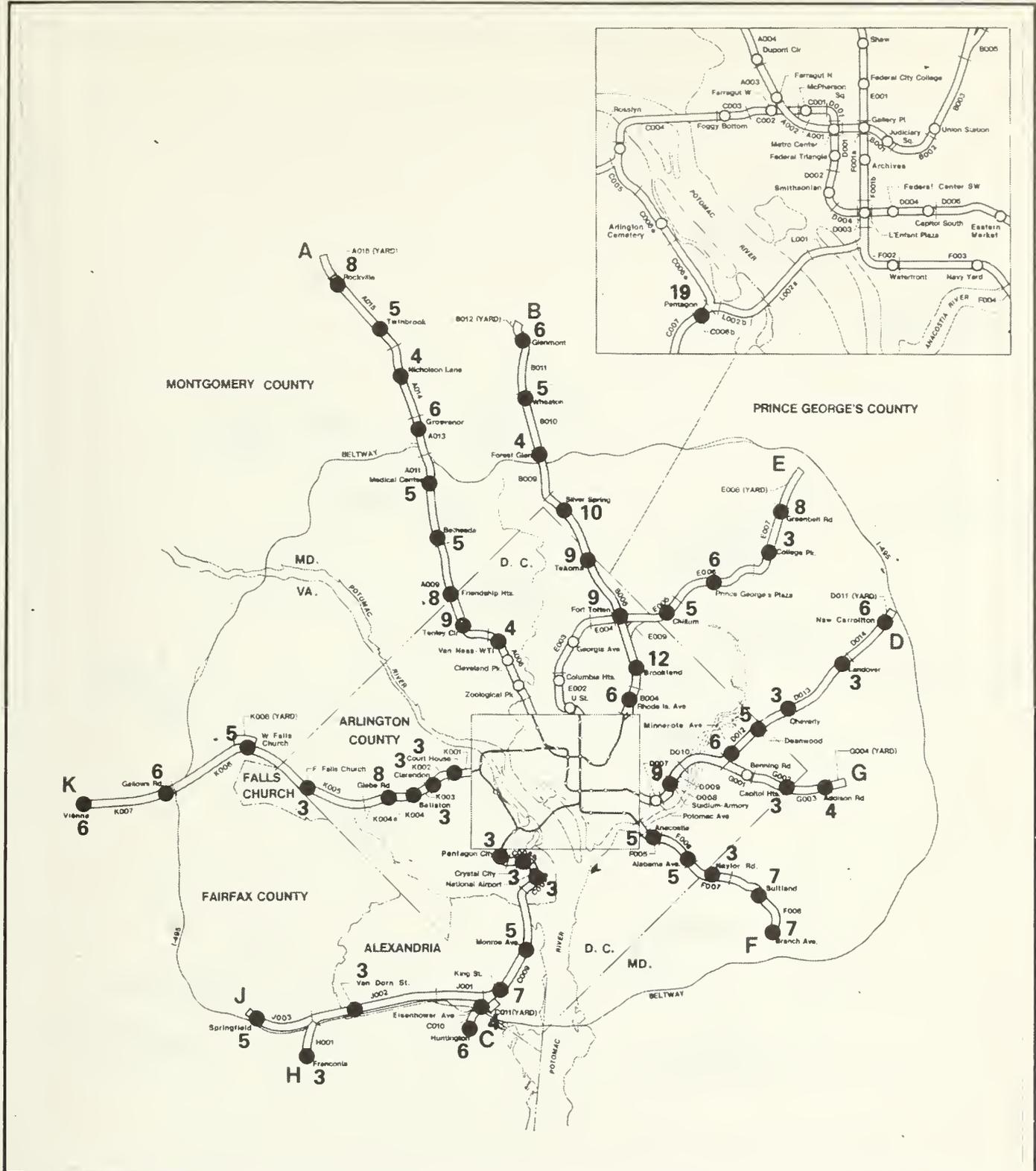
In the kiss-ride or park-ride area of a station a yet to be determined number of spaces will be reserved for motorcycles.

Fringe Parking Facilities

At present, fringe parking lots provide all day free parking facilities to transit patrons in various locations throughout the Washington Metropolitan Area. (See accompanying map). The D.C. Government operates lots at five locations within the District, nine regional shopping centers permit all day free parking, and various state and county agencies provide several fringe parking facilities. (See accompanying chart.) Some of the existing fringe parking lots have been officially designated as such whereas others have not but are used for parking by bus transit patrons.

Fringe parking lots serve as accumulators at locations outside or beyond the most heavily congested sections of arterial streets which lead to the District's CBD. Buses (express or limited-stop wherever possible) serve these lots and achieve greater efficiency by one stop loading and by proceeding non-stop, as much as possible, into the CBD. This service reduces the number of automobiles on arterials and aims at concomitantly reducing the travel time to the CBD by patrons.

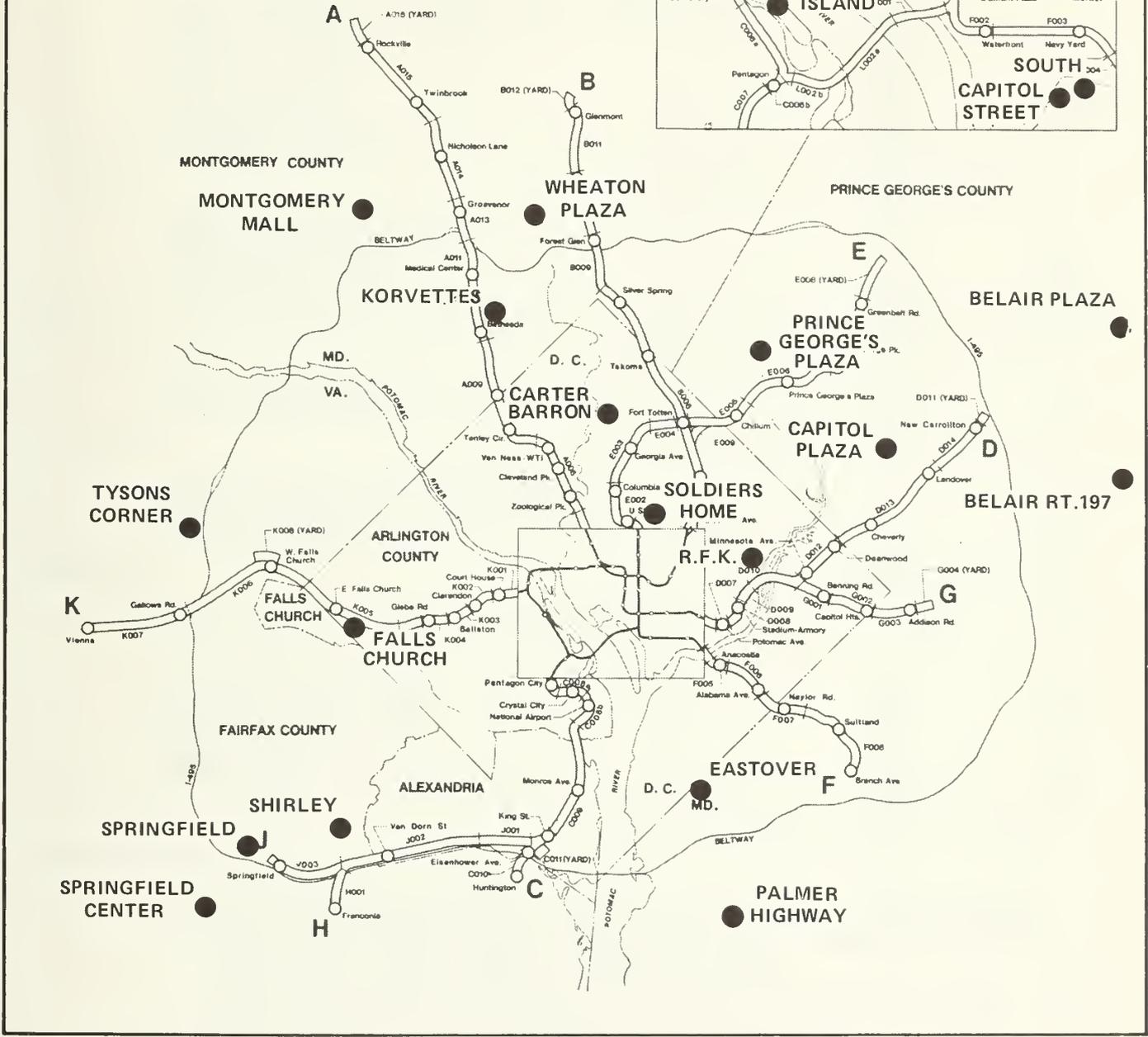
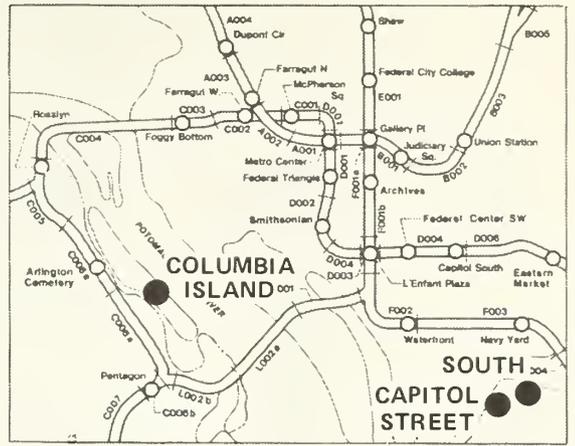
WMATA and local municipalities are studying the possibility of developing additional fringe parking lots to serve transit patrons and perhaps car pools. Some fringe parking facilities are proposed for future Metro station sites, similar to the existing lot at Backlick Road on the planned Metro site in Springfield; some are anticipated on already publicly owned land; suitable locations are being explored for others.



5 Bus bays

PROPOSED VEHICULAR FACILITIES





 Approximate location

FRINGE PARKING LOTS FOR EXPRESS BUS SERVICE - DECEMBER 1973

Source: Memorandum Report No. 14 (Preliminary Draft) "New Fringe Parking & Express Bus Service", Wilbur Smith & Associates



EXISTING FRINGE PARKING AREAS

WASHINGTON METROPOLITAN AREA - 1973

<u>LOT NO.</u>		<u>OPERATED BY (1)</u>	<u>SPACES AVAIL.</u>	<u>BUS FARE</u>
1	South Capitol St. Lot 1	A	321	.40
2	South Capitol St. Lot 2	A	414	
3	Soldiers Home	A	290	.40
4	Carter Barron	A	800	.40
5	RFK Stadium	A	250	.40
6	Columbia Island	A	300	.50
Sub-Total			<u>2375</u>	
7	Tyson's Corner, Va.	B	250	.70
8	Montgomery Mall, Md.	B	200	1.00
9	Korvette's, Md.	B	400	1.00
10	Prince George's Plaza, Md.	B	200	.80
Sub-Total			<u>1050</u>	
11	Eastover Shopping Center, Md.	C	200	.75
12	Palmer Road, Md.	C	120	.85
Sub-Total			<u>320</u>	
13	Backlick Road, METRO Station	D	400	.70
14	Springfield Plaza, Va.	D	400	.80
15	Shirley Plaza, Va.	D	200	.70
Sub-Total			<u>1000</u>	
16	City of Bowie (Belair @ Rt. 197)	E	120	.90
17	Belair Plaza, Md.	F	150	.95
18	Wheaton Plaza, Md.	F	200	.90
19	Capital Plaza, Md.	F	400	.75
20	Falls Church, V.	F	200	.70
21	Lee Highway & Quinn St., Va.	F	140	.50
Sub-Total			<u>1090</u>	
GRAND TOTAL			5955	

- (1) = A = Lots operated by D.C. Dept. of Highways and Traffic
 B = Shopping Center lots in Capitol Flyer Demonstration, use continued after Demo. Program ended
 C = Lots in South Capitol Street Urban Corridor Study, use continued after corridor study completed
 D = Lots used in Shirley Busway Corridor
 E = Lot owned by City of Bowie, Md.
 F = Informal lots in shopping centers and vacant areas convenient to local transit.

Source: Memorandum Report No. 14 (Preliminary Draft)
 "New Fringe Parking and Express Bus Service"
 Wilbur Smith and Associates

Fringe parking lots must be located where potential users pass close to the lot on the route they would take if they were driving to work. Few drivers will go out of their way to change modes or will drive long distances to change modes. Furthermore, in order to persuade patrons to change modes, buses will have to effectively shorten travel time, provide frequent peak hour service, and be in such numbers as to provide adequate seating capacity.

Fringe facilities are of two types: those intended for temporary bus commuting until Metro rail arrives; and those intended to remain after the Metro rail system is completed.

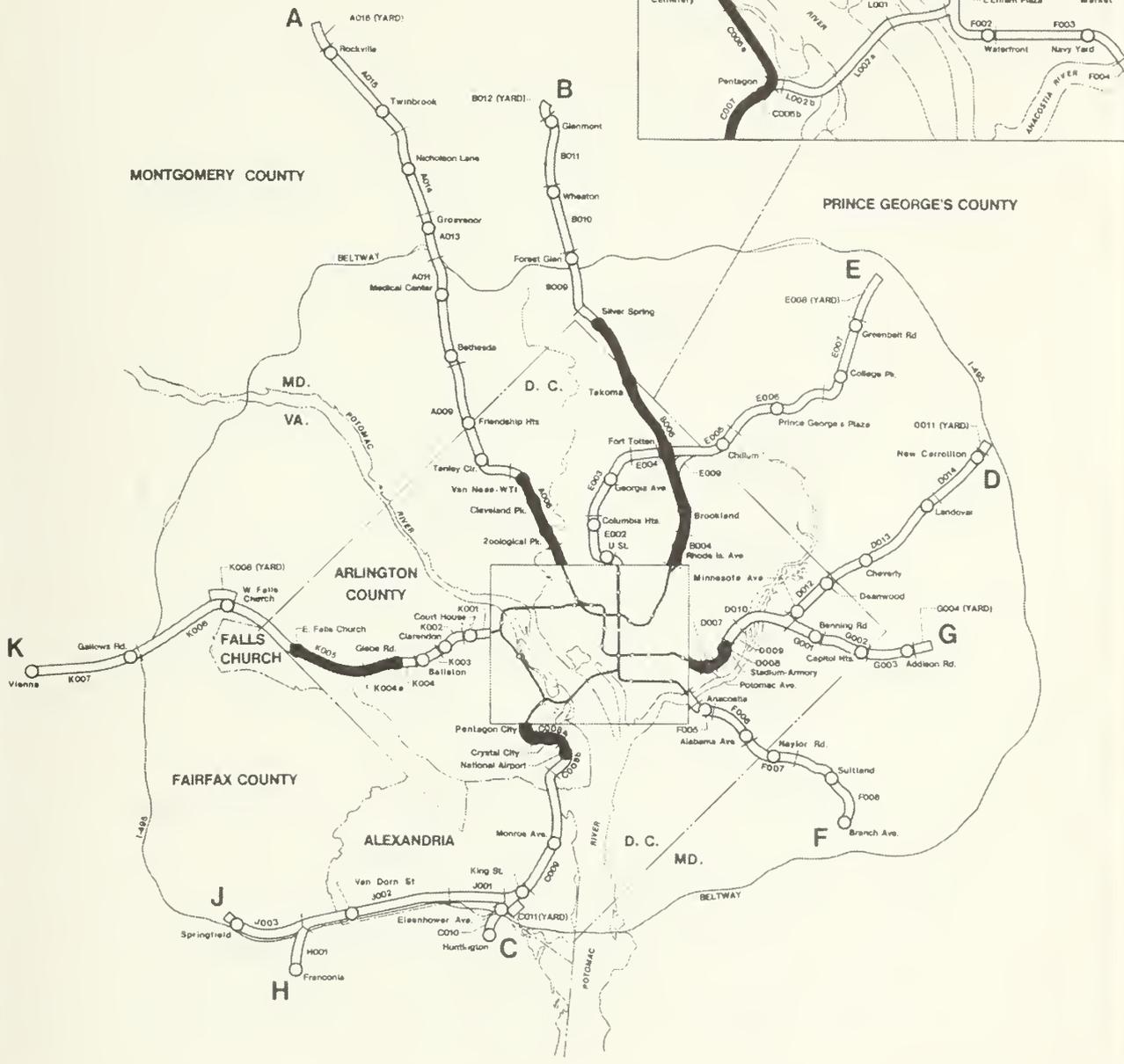
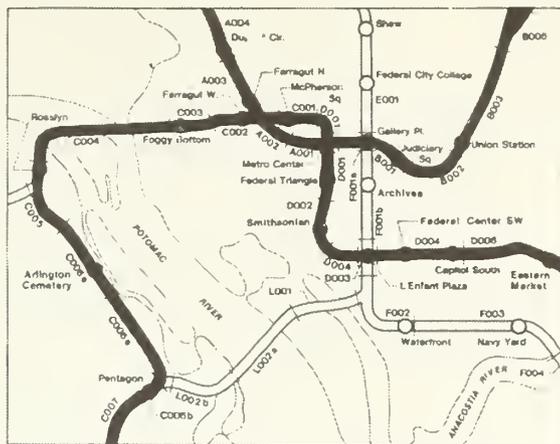
Before Metro is completed it is important to initiate express bus transit from parking lots in the Metro corridors in order to begin developing a market that will eventually be absorbed by the Metro rail system. Even when the entire Metro system is completed there will remain significant residential areas which will not conveniently be served by Metro trains. Fringe parking facilities will thus be necessary to meet the requirements of transit riders who use cars to gain access to express bus transit from residential areas where it is not economically feasible to provide high frequency local transit service of a quality which will attract drivers from their cars.

Express bus service from fringe parking lots to Metro trains or express bus service to major employment centers in corridors not served by Metro trains offers a practical means of bringing transit service to low-density, car-oriented suburbs.

The growing concern with environmental air pollution from cars and the energy crisis, which has underscored the necessity of conserving fuel, have given added impetus to the use of car pools, buses, and rail and to the use of fringe parking areas. Fringe lots will probably be studied to see how these may better serve car pools as well as buses.

At present, the existing lots are experiencing varying degrees of success and are generally underutilized. To increase their effectiveness as inducements for getting motorists to leave their cars and ride a bus, buses will have to serve these lots in adequate numbers and a better quality of bus service will have to be provided.

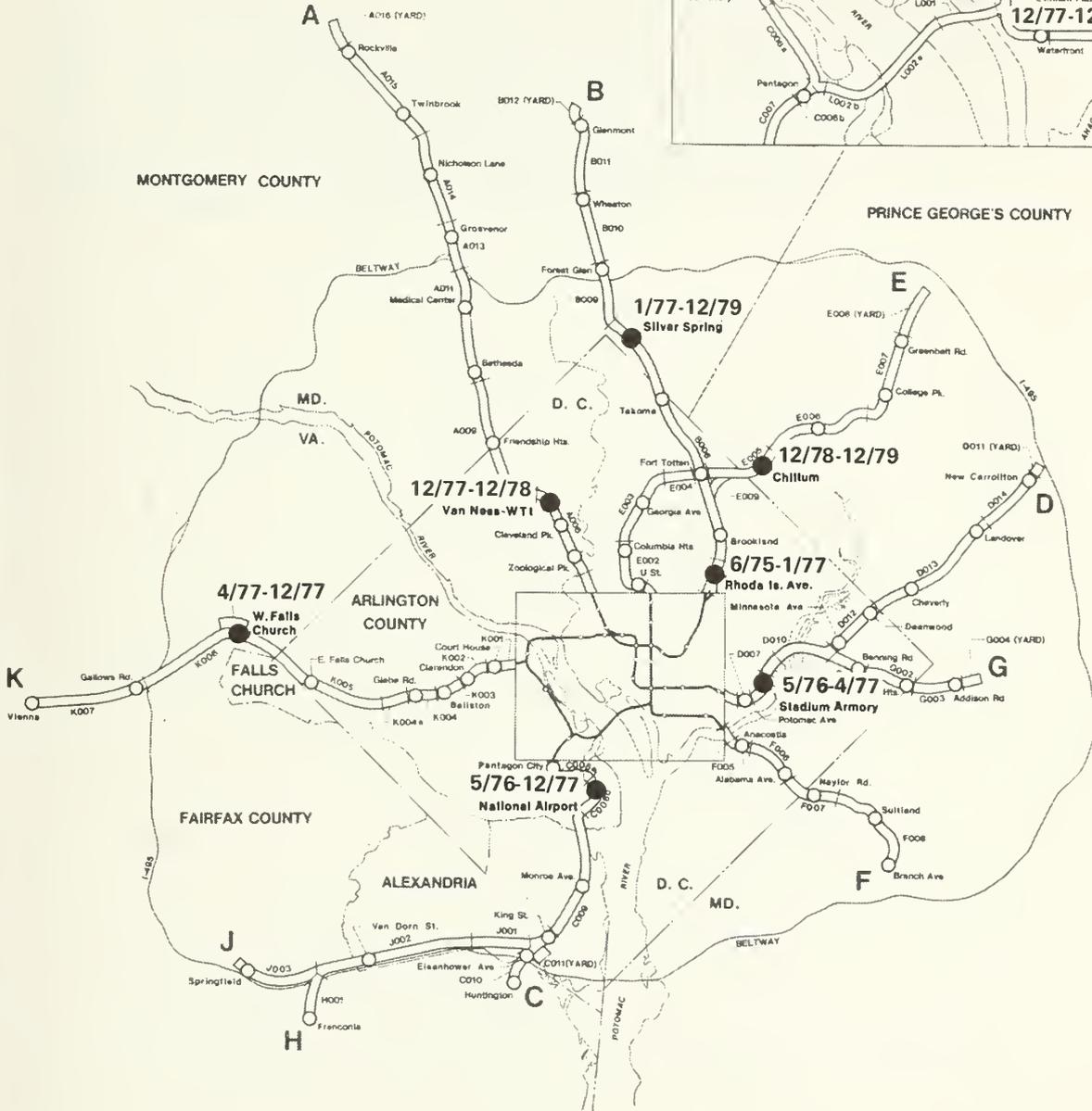
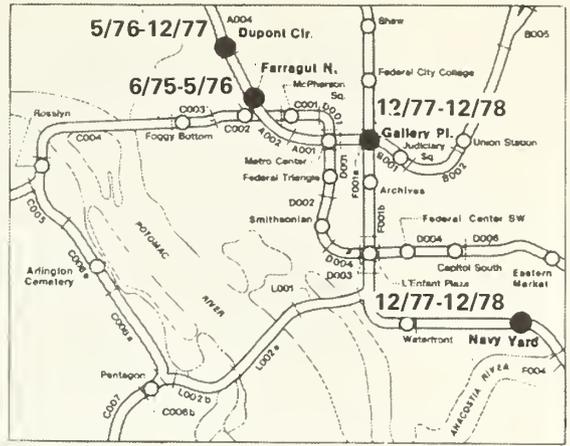
It is anticipated that bus service to existing facilities will be improved. Further, it is intended that fringe facilities be monitored periodically so that service can be adjusted to meet expressed and latent demand and so that fringe parking lots can be added or eliminated, where possible, to reflect patron needs.



 Under construction

**SEGMENTS UNDER CONSTRUCTION
APRIL 1974**





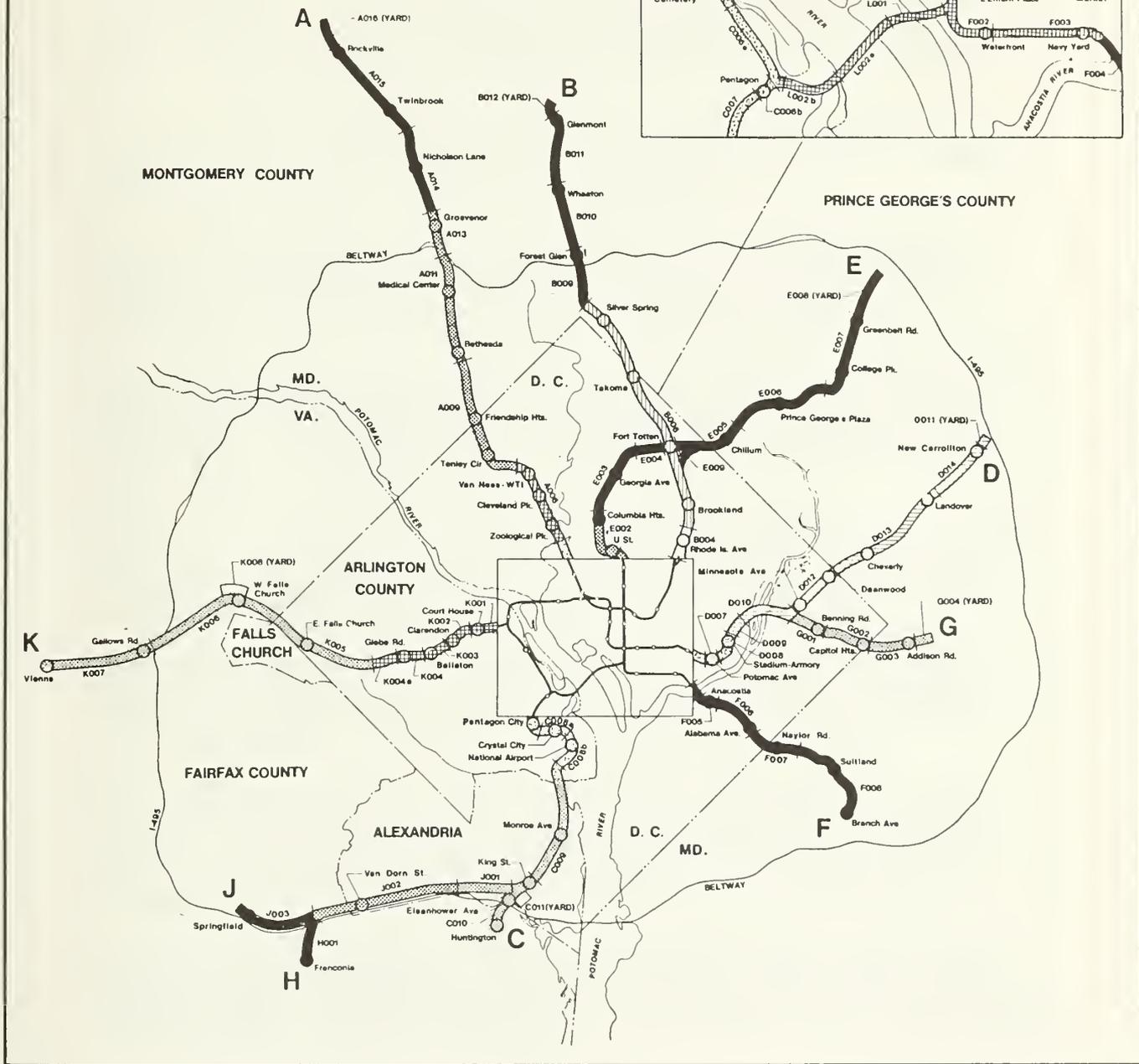
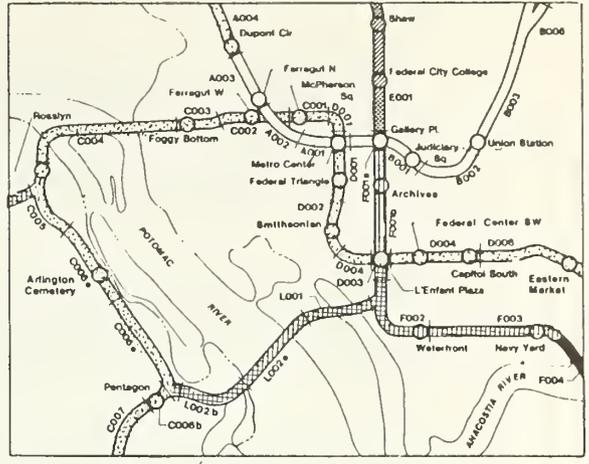
-  Interim terminal
-  Date of interim status

INTERIM TERMINALS



PHASING AND CONSTRUCTION

The engineering firm of DeLew, Cather and Company has prepared the design and construction schedule for Metro with the approval of the Authority. The original schedule presented to the Authority and approved in 1972 has been modified to reflect unexpected delays. The revised schedule according to which design and construction are progressing accompanies this section. As of April 1974, 31 Metro stations and 28.4 miles of line are under construction. Another 34 stations and 41.6 miles of line are under final design. Construction is underway from Silver Spring to Yuma Street on the Glenmount/Rockville Routes; the Stadium/Armory complex to National Airport on the New Carrollton/Huntington Routes; Gallery Place to L'Enfant Plaza on the Branch/Greenbelt Routes and between the Glebe Road and East Falls Church stations on the Vienna Route. (See the accompanying map.)



	June 1975		July 1978
	May 1976		March 1979
	July 1977		January 1980
	November 1977		July 1981

CONSTRUCTION SCHEDULE

NEW



POST CONSTRUCTION FUNDING

In February 1969 W.C. Gilman and Company, Inc. and Alan M. Voorhees & Associates, Inc. transmitted to WMATA the fare, revenue and patronage report "Traffic, Revenue and Operating Costs". This report was updated in February 1971 and is currently being updated. The purpose of the report is two-fold:

"To determine, through evaluation of reasonable alternatives, which method of bus-rail coordination and which fare structure would provide the equitable and practical plan of operation that is needed.

"To develop a detailed forecast of ridership costs and revenues for use in system design and in securing a final financial plan for the Regional System."¹

The report concentrates on forecasting 1990 patronage, transit revenues, and the resultant net revenues using assumptions concerning population and employment growth, the transit fare structure and operating costs.

The report describes the future transit and highway systems that are assumed to exist in the region by 1990. "The development of travel-time estimates for this system are discussed. Further, a fare system for the combined bus-rail transit system is described.

"These data along with revised population, employment, and income projections are used to determine the total regional travel, the modal split, and total transit patronage, allocated among rail, bus, and combination trips.

"The products of patronage and fare forecasts yield estimates of future-year transit farebox revenues. Parking fees and revenues from charter, advertising and concessions are added to produce gross-revenue estimates.

"The costs of operating the system are separated into bus and rail categories and further analyzed by costing the various inputs necessary to both types of transit operation. The components are aggregated into a gross-cost figure.

"In conclusion, operating and maintenance costs and gross revenues are compared to obtain estimates of future year combined bus and rail system² net revenues before deductions for equipment depreciation."

¹W.C. Gilman and Co., Inc., Alan M. Voorhees & Assoc., Inc. "Traffic, Revenue and Operating Costs", Revised February 1971, p.1.

²Ibid, p.3.

SAFETY AND SECURITY

Safety During Construction of Metro

The prevention of accidents in the course of completing the Metro System is of primary importance to everyone connected with WMATA. A safety program has been established and adopted by WMATA to coordinate all available means of eliminating or controlling hazards and risks associated with the completion of the Rapid Rail Transit System.

Every contractor employed by WMATA must be familiar with the Federal Occupational Safety and Health Act (OSHA) as it pertains to his work responsibility, and must implement it as federal law requires. In addition, construction contracts require compliance with safety standards established by local jurisdictional authorities where those requirements are more stringent than those established by OSHA.

To insure maximum compliance on safety matters WMATA and its consultants have established a Coordinated Safety Program and Reporting Procedure. The following description of this procedure and of the WMATA safety record is taken from a Statement before the Committee on the District of Columbia of the House of Representatives delivered April 9, 1974 by Herbert E. Harris II, Vice Chairman, Board of Directors, Washington Metropolitan Area Transit Authority.

Each individual construction site is under the supervision of a separate Resident Engineer and his staff of Inspectors. Each Resident Engineer works directly as an Authorized Representative of the Contracting Officer. Each Resident Engineer and his Inspectors has the requirement to insure that the construction work is accomplished in compliance with good safety standards.

To assist and monitor safety responsibility carried by the Resident Engineer and their Inspectors, WMATA's General Construction Consultant, Bechtel Associates, has two Safety Supervisors who are in constant touch with their field projects on matters pertaining to safety. These activities are directly under the control and supervision of the WMATA Contracting Officer and the Office of Construction. In a corollary function, the National Loss Control Service Corporation (NATLSCO), as a subsidiary of WMATA's overall insurance carrier, is under contract to the Authority to provide an independent inspection on Metro

construction job sites to assure the contractors are performing their work within approved safety standards. NATLSCO reports to the Authority through its insurance representative, Metro Insurance Administrators (MIA). MIA also employs two safety specialists, who monitor NATLSCO's activities to assure excellent quality of WMATA's inspection services. NATLSCO and MIA working together also to provide various collateral safety services including such things as Industrial Hygiene Surveys, Educational Aids, Safety Lectures, and Special Reports on Sensitive Safety Matters.

To assure coordination of the various elements of WMATA's safety organization, a Coordinated Safety Committee has been established made up of one representative from each of the following: Metro Insurance Administrators, NATLSCO, Bechtel and the WMATA Construction Office. This Safety Committee meets weekly and reports its recommendations directly to the Contracting Officer. A Safety Advisory Committee has also been established. This Committee is comprised of all of the members of the Coordinated Safety Committee plus three representatives from the building trade unions and three members from Contractors working on Metro construction. This Committee meets regularly on a monthly basis and provides its recommendations also directly to the Contracting Officer. One of the main functions of the Safety Advisory Committee is to provide guidance and assistance to the various unions in the conduct of their individual safety training program.

Regularly on a monthly basis the General Manager of the Authority convenes a meeting of his "Safety Trust." This Committee is comprised of the Secretary Treasurer of the Authority, the Contracting Officer, the Authority's Safety Supervisor, and representatives of the Office of Construction, Bechtel, MIA, and NATLSCO. These sessions are for the purpose of reviewing safety accomplishments and progress during the last month.

Safety enforcement is also a function of the construction contract. Each Contractor is required by contract specifications to provide a Safety Superintendent approved by the Contracting Officer before any meaningful work is undertaken. Once approved by the Contracting Officer the Contractor's Safety Superintendent cannot be fired nor replaced except with the concurrence of the Contracting Officer. Through field inspections and his staff and inspections by NATLSCO, Bechtel, and Authority personnel,

the efforts and effectiveness of each Contractor's Safety Superintendent are evaluated. Reports prepared by Inspectors become a matter of daily review. Problem areas are given priority for assistance.

At the present time safety enforcement on Authority construction projects is a full-time occupation for the following individuals:

Contractor Safety Superintendents	50
Full-time First-Aid Attendants or Paramedics	21
NATLSCO Inspectors	7
MIA Safety Supervisors	2
Bechtel Safety Superintendents	2
WMATA Safety Supervisor	<u>1</u>
TOTAL	83

In addition, 50 Resident Engineers and 186 Inspectors have the responsibility to enforce contract safety provisions as one of their collateral responsibilities.

As another aspect of its safety responsibilities, WMATA realizes that a long-range effective safety program must recognize the importance of individual training. With a constant turnover of the personnel making up the Authority's 6,000 workman force, individual training becomes increasingly important. To help with this problem the NATLSCO Inspectors have been conducting a 10-hour OSHA training course for contractor personnel on a rotating basis. Additional training is provided through the conduct of weekly tool box safety meetings which are a requirement of each contract. The Authority conducts a monthly safety meeting attended by the Contractor Safety Superintendents and Resident Engineer personnel. At these monthly meetings new safety concepts and training matters are discussed and long-standing basic safety principles are reemphasized. Contractors are encouraged to conduct indoctrination training for newly hired personnel.

To provide a means for every workman to have a voice in safety, a phone line has been established to the Office of MIA that is available to all employees 24 hours a day. The number is published prominently on all job sites. Workers who wish to call attention to safety deficiencies or lodge complaints, may do so anonymously and without fear of reprisal. The initiator of the call may have the satisfaction of knowing the results of his action if he will call

back at a later time to inquire. In addition a hot line has been established 24 hours a day for any individual wishing to report an emergency situation or a matter of imminent danger. A report coming in on this hot line is immediately passed to members of the Coordinated Safety Committee who are available night or day to initiate safety measures to correct any hazardous situations which may be reported. Any situation which may constitute a safety threat to a member of the construction work force or to the general public or to property may result in a stop order to the Contractor on work being conducted in that vicinity. The Contracting Officer or a Resident Engineer acting as the Contracting Officer's Representative has the authority to shut down any job completely or in part any time that unsafe conditions may constitute a threat to the safety of personnel or to the damage of property.

The following statistical information indicates the relative effectiveness of the Authority's safety program. The incidence rate is an expression of the number of lost time accidents for each 200,000 man-hours worked. The incidence rate for the authority construction program through February of this year is 6.9.

The U.S. Department of Labor's last official figure for much less hazardous work on heavy construction Nation-wide is 6.8 for 1971. It is understood that the Department of Labor is soon to publish a new incidence rate for 1972, and preliminary information indicates the rate may be lowered. However, it is necessary to point out that the information gathered by the Department of Labor is on a voluntary, random sampling basis and covers work much less hazardous than subway construction. The BART project at San Francisco for its underground construction has an incidence rate of 8.5. A 14-mile water tunnel project being built in New York has an incidence rate of 9.2. The incidence rate during the year 1973 for a 4-1/2 mile sewer tunnel project being constructed in Manhattan was 13.2. Through March 1974 WMATA has utilized 21,803,448 manhours, on 50 contracts. At present there are approximately 6,000 construction employees. Metro construction has entailed considerably fewer lost workday accidents than other comparable work projects.

Aside from the safety program described in the foregoing pages, WMATA and the various railroad companies have concerned themselves with safety hazards resulting from the

interaction of railroads and Metro in circumstances where any part of Metro facilities is in close proximity to any railroad facility. The Board of Railway Safety Consultants has been established to deal with this concern. The Board consists of representatives from the Authority, the railroad companies, and the engineering consultant firm of DeLeuw, Cather and Company.

Metro System Safety Program

The engineering firm of DeLeuw, Cather is responsible for carrying out the system safety program designed for Metro which is intended to identify and eliminate safety hazards to Metro design and operations. The evaluation of degrees of hazard has been established based on accepted system safety practices and specifically from MIL-STD-882, the basic system safety engineering specification.

The "System" aspect of system safety deals with more than the vehicle as an entity. It encompasses support equipment and facilities, the interaction of people with the system, and components of the vehicle. "The accident prevention scope involves planning and control on an entire life cycle basis; from conception of a system through its operational phase."¹

Using an approach whose objective is to maximize the identification and elimination of safety hazards to design and operations, the Metro System Safety Program is divisible into three essential areas: (1) The review of criteria documents and drawings which form the basis for system safety guidelines. (2) Design reviews including the review of proposed change orders. (3) Formal analyses and reports on specific "safety critical" items previously identified by a Qualitative Gross Hazard Analysis of the system. On Metro, these "safety critical" items mostly involve electro-mechanical subsystems and their interfaces such as the tunnel ventilation system and pneumatic controls, the AC power distribution system, the train manual control system, the emergency telephone and recording system, etc. The analyses format employed is designed to determine the functional relationships of subsystems and components and consider all modes of failure and their effects on safety. These analyses consider design characteristics, system operations procedures, potential personnel errors and judgment and component failures and malfunctions. Safety reports prepared and submitted

¹Thomas A. Simcox "Hazard Mode and Effect Analysis in Systems Safety Engineering."

to WMATA include recommendations based on the safety hazards identified and categorized in accordance with MIL-STD-882.¹

In conjunction with the above the Systems Group of DeLeuw, Cather is establishing rules and regulations for operational safety that shall be the standard operational procedures to which WMATA employees will adhere. These procedures will be established before the first train rolls.

Safety and Security in Operational Stage of Metro

Large sums and extensive expertise have been involved in devising safety and security measures for Metro operations so as to prevent and minimize aggressive acts by persons and to maximize egress, assistance and rescue possibilities in case of emergency. The large number of WMATA's safety and security measures necessitates a sample of some of the most important measures:

Alarms: The Metro system is zoned. An alarm from any source within the system is transmitted to Operations Control Central (the Command Center) where an audible alarm within the Center is triggered. The triggering alarm is read on a cathode ray television tube which immediately indicates the location of the alarm.

Heat or smoke detection: In all critical areas (e.g., stations, sub-stations such as power stations, air conditioning system, etc.) there are three types of fire sensors to detect a change in atmosphere due to heat or smoke. When a sensor is triggered an alarm is fed to the Command Center where the location of the problem is pinpointed and the nearest fire fighting and rescue authorities are immediately alerted. Planning sessions between the WMATA staff and fire officials of Metropolitan area jurisdictions within the transit zone are in process.

Ventilation and access to tunnels in emergency: Vent shafts, located at each end of a station, and fan shafts, located midway between two stations, are equipped with stairways or ladders for emergency access and egress as well as for maintenance use. Shaft gratings, located at the top of fan and vent shafts, can be opened from the outside (via a tool which all train attendants, maintenance personnel, police and rescue units will carry) or from the inside (without such a tool) to enable access or escape. Under normal circumstances tunnels are ventilated by the piston action of the

¹DeLeuw, Cather "Metro System Safety Program".

trains. In an emergency the vent or fan shaft louvers can be controlled so that the fans, located in vent and fan shafts, can be run in supply or exhaust mode so as to draw and exhaust air through a tunnel, thereby removing smoke or other objectionable odors from public areas. Reversible station fans are also provided. These fans are normally used to assist the station air conditioning but can also be used for smoke control in conjunction with the tunnel fans. The ventilation fans in the stations and in the vent and fan shafts can be turned on and off or reversed by the kiosk attendant or by remote control from the Command Center.

Communications: The transit radio system will have five frequencies: one for yard operations, two for train control, one for maintenance and one for security. Each train attendant, maintenance person and police person will have a radio. One or two base stations will be installed above ground to radiate radio waves. Underground there is a continuous antenna - the lossy line - and base stations every 2 miles which allow the transit radio system to be operative throughout the tunnel sections. Security and safety personnel are presently resolving the problem of emergency communication from underground areas to rescue or police base headquarters above ground.

On each train the train attendant has a direct communication line with the Command Center.

Each train car will have six two-way speaker stations whereby, in case of need, conversation can be held between passengers and train attendant. When necessary, Operations Control Central can communicate directly with train passengers.

A telephone is located at every 800 foot interval of track.

Emergency power: There are two independent electrical services to each distribution point plus limited load auxiliary battery standby power.

Automatic Train Control System: The Automatic Train Control System will be made up of three subsystems responsible for (1) Automatic Train Supervision; (2) Automatic Train Operation; and (3) Automatic Train Protection. In case of emergency the train attendant can operate the train manually.

In an emergency the third rail can be de-energized by utilizing a switch located every 800 feet or the Command Center can de-energize the third rail by remote control.

Were the train doors not to open automatically they can be opened via controls on the outside of the train or via emergency controls available to passengers inside the train.

A manual of Procedures for Providing Local Public Safety Services to Citizens Utilizing the Metro Rapid Rail System is being prepared.

Security: To develop and supervise its security program WMATA has established an Office of Security. An important aspect of the security program is the Metro Police Force which will patrol the trains and Metro facilities. Legislation to authorize WMATA to establish and maintain a regular police force, specifying the powers, duties and jurisdiction of this police force has been passed by the States of Maryland and Virginia and approved by the District of Columbia. The bill is presently being processed into Congress and when passed the WMATA Compact will be amended to incorporate this bill. It is projected that the Compact will be amended by mid-summer 1974.

The Metro Police Force will be in addition to existing area police agencies which will retain basic responsibility for local law enforcement and coordinate their resources with Metro Police, when necessary, to maintain transit system security.

As a crime deterrent all stations will be lighted to a level of 25 foot candles, and to extend surveillance capacity, electronic and television equipment will be installed at all Metro stations. A minimum of eight closed circuit TV channels will be located in each station and will be monitored by the kiosk attendant. The TV cameras will be focused on areas of the station most difficult to observe directly from the kiosk. Also reading back at the kiosk are alarms of any kind. The kiosk attendant has a direct communication line into Operations Control Central as well as with Metro Police.

Security provisions for station parking lots are presently under advisement.

INCREASING TRANSIT ACCESSIBILITY FOR THE AGED AND HANDICAPPED

WMATA has sought to incorporate the interests of the aged and the handicapped as an integral part of its planning and design philosophy so as to increase accessibility for the aged and the handicapped, thereby increasing their mobility and consequently their opportunities. Though all features of Metro are being designed with the user as the most important consideration, there are some features that should be noted as particularly beneficial to the elderly and the handicapped, fifty percent¹ and eighty percent of whom respectively rely on transit.¹

Entrances to stations will be clearly visible and easily identifiable.

A station attendant will be available to render assistance whenever necessary.

Flush mounted lights located in the granite platform edge will blink on and off 30 seconds before a train arrives. This feature should greatly benefit those who are hard of hearing. There will be audio announcements of train approaches and destinations as well as light signals.

The platform edge of the station is of a different texture than the remainder of the platform. This design element in conjunction with the audio announcements of train approaches and their destinations should assist the blind using the System.

A standing passenger has several alternatives available which enable him to retain his balance. There are hand-holds located on the backs of all seats. Stanchions are placed at regular intervals throughout each car. The ceiling hand-holds run the length of each car and are lower than in most transit systems as a result of low car ceilings.

Though fares have not yet been established, a policy of lower fares for senior citizens has been adopted.

General circulation into and out of stations will be via escalators thereby eliminating the physical strain of climbing and descending stairs. In addition to escalators, there will be an elevator at one entrance of each station for use

¹Preliminary Application of the Washington Metropolitan Area Transit Authority for a Mass Transportation Capital Improvement Grant under the Urban Mass Transportation Act of 1964, as amended, February 7, 1974, p. c-2.

by the physically disabled. It should be noted that a significant proportion of the aged are also physically disabled as this term is defined by the Authority: Physically disabled persons, for Metro purposes, are persons who consider themselves physically disabled; are five years of age or older; are able to get around outside the home to some degree but are unable to use an escalator.

The Authority's resolution directing the design and installation of elevators was in response to the Public Buildings Facilities Act as amended, P.L. 91-205, 42 U.S.C.A. 4151, which requires WMATA to install facilities which will accommodate the handicapped in all stations of the rapid rail transit system. It is estimated that the cost of constructing the elevators throughout the system will be \$65 million. Under the Federal Aid Highway Act of 1973, P.L. 93-87, Congress has authorized the appropriation of funds to pay 80% of the estimated cost of constructing these facilities. An 80/20 cost sharing ratio involves a \$13 million non-Federal share. The definitive distribution of these costs will be established late in the 1974 calendar year. In the interim, the WMATA Board has issued a resolution (September 27, 1973) which provides Congress with assurance that the non-Federal share will be forthcoming.

The WMATA staff is presently working out the details of how one can use the elevators with the least amount of red tape and the details involved in integrating elevator use with the fare system.

In addition to installing an elevator at every station, the determination has been made by the Authority to adhere to the American Standard Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped. As a result of this decision, in addition to features such as the visual and audible signals and the texture change at the platform edge described above, controls of frequent or essential use, such as the two-way speaker system referred to in this section, will be placed within the reach of individuals in wheelchairs. Public telephones will also be designed so as to be accessible to those in wheelchairs.

In further consideration of the handicapped, each car of a train has double opening doors to allow the easy entrance of a wheelchair and inside the car there is ample room for wheelchairs around the door area.

The parking lots are also being designed with the disabled in mind. The parking spaces which are closest to the station entrances will be larger than other spaces and will be set aside and identified for use by individuals with physical disabilities. There will be ramps from parking lot to station entrance or to the elevator so as to eliminate all stairs and curbs for those in wheelchairs.

Metro buses will also be equipped to assist the elderly and handicapped. "Step faces will be painted white and grab handles and lights will be installed in the step wells. Adequate grab rails will be provided within the bus and improved destination signs will be provided on the front, side and rear of the vehicles. The provision of a public address system on the new buses will provide a great aid to the elderly who have difficulty hearing or seeing because of these manifestations of aging as well as others handicapped with ear or eye conditions."¹

The Authority will publish and distribute a manual to the handicapped which will introduce and explain the Metro system.

In addition to the foregoing a study is presently proposed to develop an overall plan and program for the Washington Metropolitan Area for meeting the transportation needs of elderly and handicapped persons.

"Target or user groups to be considered in this study include non-handicapped elderly, handicapped elderly and handicapped non-elderly. This study is thus intended to result in a program for these user groups which will:

1. Have physical, economic and operating characteristics that will permit transit 'access' by the elderly and handicapped, and
2. Provide access to social, recreational, work, medical shopping and other services and activities.

The study will be jointly conducted by COG and WMATA. Involvement and assistance will be sought from area social agencies and similar organizations concerned with the transportation needs of the elderly and handicapped.

Study costs are estimated at \$140,000 in FY 74.

¹Ibid. p.M-2.

It is anticipated an application will be made to UMTA for a Technical Studies Grant to cover 80% of the study costs with local sources providing 20%."1

As it should be evident, the Authority and its consultants are planning and designing the Metro system so as to permit maximum ease of use by both the aged and the handicapped.

Among the specific studies prepared by WMATA, concerning transit accessibility for the aged and handicapped is the Impact Analysis of Access for the Handicapped at Dupont Circle Station prepared by Deleuw, Cather and Company in December, 1974 for WMATA.

¹National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, "Short-Range Transit Development Program for the Washington Metropolitan Area", March 1974, pp. 40-41.

APPENDIX E: LOCALIZED IMPACTS; REPORTS AVAILABLE FROM WMATA;
REPORTS PREPARED BY CONSULTANTS TO WMATA; ALL
EIS STUDIES COMPLETED; REGIONAL STUDIES DEALING
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Station, January, 1974.

Agencies that could Assist Local Groups in Assessing Impacts

Federal Agencies

ADVISORY COUNCIL ON HISTORIC
PRESERVATION

Office of Architecture & Environ-
mental Preservation
Advisory Council on Historic
Preservation
Suite 430
1522 K Street, N.W.
Washington, D.C. 20005
(202) 254-3974

COUNCIL ON ENVIRONMENTAL QUALITY
Council on Environmental Quality

722 Jackson Place, N.W.
Washington, D.C.
(202) 382-1415

FEDERAL HIGHWAY ADMINISTRATION

400 7th Street, S.W.
Washington, D.C. 20590
(202) 426-0677

FEDERAL RAILROAD ADMINISTRATION

400 7th Street, S.W.
Washington, D.C. 20590
(202) 426-0860

GENERAL SERVICES ADMINISTRATION

F Street between 18th & 19th, N.W.
Washington, D.C.
(202) 343-1100

OFFICE OF ECONOMIC OPPORTUNITY

Office of the Director
Office of Economic Opportunity
1200 19th Street, N.W.
Washington, D.C. 20506
(202) 254-6000

SOIL CONSERVATION SERVICE

Office of the Secretary
U.S. Department of Agriculture
Washington, D.C. 20250
(202) 447-3965

U.S. ARMY CORPS OF ENGINEERS
Executive Director of Civil Works
Office of the Chief of Engineers
U.S. Army Corps of Engineers
Washington, D.C. 20314
(202) 693-7168

U.S. Department of Agriculture -
Soil Conservation Service -
County Listings:

Fairfax County
3945 Chain Bridge Road
Fairfax, Virginia 22030
(301) 591-6660

Montgomery County
6110 Executive Blvd.
Rockville, Maryland 20852
(301) 770-0416

Prince George's County
15209 Main Street
Upper Marlboro, Maryland 20870
(301) 627-3438

U.S. DEPT. OF HEALTH, EDUC. & WELFARE
Regional Environmental Officer
U.S. Dept. of Health, Educ. & Welfare
P. O. Box 13716
Philadelphia, Penna. 19101
(215) 597-6493

or

Office of Environmental Affairs
Office of the Assistant Secretary
for Administration and Management
Dept. of Health, Educ. & Welfare
Washington, D.C. 20202
(202) 963-4456

(The Office of Env. Affairs should
be contacted for information on
HEW's environmental statements
concerning legislation, regulations,
national program proposals or major
policy issues and for all requests
for HEW comment on impact statements
of other agencies.)

U.S. DEPT. OF HOUSING & URBAN DEVEL.

Director

Office of Community & Environmental
Standards

Dept. of Housing & Urban Devel.

Room 7206

Washington, D.C. 20410

(202) 755-5980

(The above should be contacted with regard to environmental impacts of legislation, policy statements, program regulations and procedures and precedent-making project decisions.)

or

Regional Administrator, III

Environmental Clearance Officer

U.S. Dept. of Housing & Urban Devel.

Curtis Building

6th and Walnut Streets

Philadelphia, Penna. 19106

(215) 597-2560

U.S. DEPT. OF THE INTERIOR-

GEOLOGICAL SURVEY

National Headquarters Building

Sunrise Valley Drive

Reston, Virginia 22070

(703) 860-6167

U.S. DEPT. OF TRANSPORTATION

Director

Office of Environmental Quality

Office of the Assistant Secretary

for Environment, Safety and

Consumer Affairs

Dept. of Transportation

Washington, D.C. 20590

(202) 426-4357

(The above should be contacted for information on DOT's environmental statements concerning legislation, regulations, national program proposals, or other major policy issues.)

or

Urban Mass Transportation Admin.
Office of Program Operations
Urban Mass Transportation Admin.
400 7th Street, S.W.
Washington, D.C. 20590
(202) 426-4020

U.S. ENVIRONMENTAL PROTECTION AGENCY
Regional Administrator, III
U.S. Environmental Protection Agency
Curtis Building
6th and Walnut Streets
Philadelphia, Pennsylvania 19106
(215) 597-9801

or

Director
Office of Federal Activities
Environmental Protection Agency
401 M. Street, S.W.
Washington, D.C. 20460
(202) 755-0777

(The above should be contacted
for environmental statements
concerning legislation, regulations,
national program proposals or other
major policy issues.)

U.S. NATIONAL PARK SERVICE
Director
Office of Environmental Project Review
Dept. of the Interior
Interior Building
Washington, D.C. 20240
(202) 343-3891

State Agencies

Maryland Bureau of Air Quality Control
610 N. Howard
Baltimore, Maryland 21201
(301) 383-2779

Maryland Dept. of Transportation
Metropolitan Washington Regional
Planning Office
The Metropolitan Building
Suite 904
8720 Georgia Avenue
Silver Spring, Maryland 20910
(301) 587-4550

Maryland Dept. of Transportation
Office of the Secretary
P. O. Box 8755
Baltimore-Washington International
Airport
Glen Burnie, Maryland 21240
(301) 768-9520

Maryland State Dept. of Natural
Resources
Regional Service Center
517 Main Street
Laurel, Maryland 20810
(301) 792-7863

or

Regional Service Center
103 N. Main Street
Bel Air, Maryland 21014
(301) 879-2494

Maryland State Geological Survey
Johns Hopkins University
Baltimore, Maryland 21218
(301) 235-0771

Maryland State Planning Dept.
301 West Preston Street
Baltimore, Maryland 21201
(301) 383-2450

Commonwealth of Virginia
Dept. of Highways
Environmental Quality Control
1221 East Broad Street
Richmond, Virginia 23219
(804) 770-4305

Commonwealth of Virginia
Division of State Planning and
Community Affairs
1010 James Madison Building
109 Governor Street
Richmond, Virginia 23219
(804) 770-4851

Virginia State Air Pollution
Control Board
7115 Leesburg Pike
Falls Church, Virginia 22046
(703) 534-0067

Regional Agencies

Maryland-National Capital Park
and Planning Commission
Regional Headquarters Building
8787 Georgia Avenue
Silver Spring, Maryland 20907
(301) 589-1480

Maryland-National Capital Park
and Planning Commission
Interagency Task Force on
Friendship Heights
1325 G Street, N.W.
Washington, D.C. 20576
(202) 382-1161

Metropolitan Washington Council of
Governments
1225 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 223-6800

National Capital Planning Commission
1325 G Street, N.W.
Washington, D.C. 20576
(202) 382-1160

Northern Virginia Planning
District Commission
7309 Arlington Boulevard
Suite 300
Falls Church, Virginia 22042
(703) 573-2210

Northern Va. Transp. Commission
2009 North 14th Street
Arlington, Virginia 22201
(703) 524-3322

Washington Metropolitan Area
Transit Authority
600 5th Street, N.W.
Washington, D.C. 20001
(202) 637-1234

Washington Metropolitan Area
Transit Commission
1625 "I" Street, N.W.
Room 316
Washington, D.C. 20006
(202) 737-6711

Washington Suburban Transit Comm.
8720 Georgia Avenue
Silver Spring, Maryland 20910
(301) 587-8770

County Agencies

Arlington County
County Courthouse
1400 N. Court Road
Arlington, Virginia 22201
(703) 558-0200

Arlington County
Dept. of Environmental Affairs
Planning Division
2049 15th Street, North
Arlington, Virginia 22201
(703) 558-2711

County of Fairfax
Massey Building
4100 Chain Bridge Road
Fairfax, Virginia 22030
(703) 691-2000

Montgomery County
Environmental Protection Division
(301) 770-5293

Montgomery County Council
County Office Building
Rockville, Maryland 20850
(301) 279-1000

Montgomery County Planning Board
Maryland National Capital Park
and Planning Commission
8787 Georgia Avenue
Silver Spring, Maryland
(202) 589-1480

Prince George's County
Dept. of Public Works & Trans.
8400 D'Arey Road
Forestville, Maryland 20028
(301) 350-3000

Prince George's County
County Courthouse
Upper Marlboro, Maryland 20870
(301) 627-3000

Prince George's County Planning Board
Maryland-National Capital Park
and Planning Commission
6600 Kenilworth Avenue
Riverdale, Maryland
(202) 277-2200

City Agencies

City of Alexandria
Dept. of Planning & Commun. Devel.
City Hall
125 N. Royal
Alexandria, Virginia 22313

City of Alexandria
Planning & Commun. Development
320 King Street
Room 201
Alexandria, Virginia 22314
(703) 750-6291

City of Arlington
Planning & Development Dept.
2100 N. 14th Street
3d Floor
Arlington, Virginia 22201
(703) 558-2291

City of Bowie
City Building
12205 Tulip Grive Drive
Bowie, Maryland 20715
(301) 262-7900

City of College Park
City Administrator
Administrative Building
4500 Knox Road
College Park, Maryland 20740
(301) 864-8877

District of Columbia
Dept. of Health Administration
Bureau of Air & Water Quality Control
25 K Street, N.E.
Washington, D.C. 20001
(202) 629-2568

District of Columbia
Dept. of Highways & Traffic
415 12th Street, N.W.
Washington, D.C.
(202) 629-4412

District of Columbia
Office of Planning & Management
District Building
14th & E Streets, N.W.
Washington, D.C. 20004
(202) 629-5111

District of Columbia
Dept. of Highways and Traffic
Office of Planning and Programming
415 12th Street, N.W.
Washington, D.C.
(202) 629-3492

District of Columbia
Dept. of Recreation
3149 16th Street, N.W.
Washington, D.C. 20010
(202) 628-6000

District of Columbia
Office of Environmental Planning
415 12th Street, N.W.
Washington, D.C.
(202) 629-3105

City of Falls Church
City Hall
300 Park Avenue
Falls Church, Virginia 22046
(703) 532-0800

City of Fairfax
City Hall
Director of Planning
101 Armstrong
Fairfax, Virginia 22030
(703) 273-7900

City of Greenbelt
25 Crescent Road
Greenbelt, Maryland 20770
(301) 474-8000

City of Laurel
City Council
900 Montgomery
Laurel, Maryland
(301) 725-3000

REDEVELOPMENT LAND AGENCY
1325 G Street, N.W.
Washington, D.C.
(202) 382-6818

Rockville City Government
Planning Director
City Hall
111 South Perry
Rockville, Maryland 20850
(301) 424-8000

City of Takoma Park
Municipal Building
7500 Maple Avenue
Takoma Park, Maryland 20012
(301) 270-1700

Special Agencies

Environmental Committee
Save Takoma
Mr. John Herndon, Co-Chairman
616 Whittier Street, N.W.
Washington, D.C. 20012
(202) 829-3557

or

Mrs. Ruth E. Foster
6601 Piney Branch Road, N.W.
Washington, D.C. 20012

Environmental Improvement Commission
(Citizens' Commission)
Mr. Joseph Keyes, Jr., Chairman
4628 23rd Road, North
Arlington, Virginia 22207
(703) 528-1247

North Cleveland Park Citizens Assoc.
Mr. Jerome Yurow, President
3811 Warren St., N.W.
Washington, D.C.
(202) 686-1752

Park & Recreation Commission
(Citizens' Commission)
Ms. Sarah Anderson, Chairwoman
3111 1st Place, North
Arlington, Virginia 22201

Washington Ecology Center
2000 P Street, N.W.
Room 612
Washington, D.C. 20036
(202) 8333-1778

Ms. Patricia O. Macie
3808 Windom Place, N.W.
Washington, D.C. 20016
(Representing concerned residents
of Windom Place)
(202) 686-1173

Consultants

Alan M. Voorhees and Associates
7670 Old Spring House Road
McLean, Virginia
(703) 893-4310

Barton-Aschman Associates, Inc.
1771 W. Howard
Chicago, Illinois
(312) 338-3200
Washington Area Phone:
(202) 554-5338

DeLew, Cather & Co. (General
Engineering Consultants)
600 Fifth Street, N.W.
Washington, D.C. 20001
(202) 637-1613

Development Research Associates
245 Park Avenue
New York, New York
(212) 490-1215

or

1025 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 833-8440

Environmental Research & Tech., Inc.
429 Marrett Road
Lexington, Massachusetts 02173
(617) 861-1490

Harry Weese & Associates (General
Architectural Consultants)
600 Fifth Street, N.W.
Washington, D.C. 20001
(202) 637-1761

Larry Smith & Co., Inc.
(Real Estate Consultants)
5454 Wisconsin Avenue
Suite 610
Barlow Building
Washington, D.C. 20016
(202) 657-2030

Mueser, Rutledge, Wentworth &
Johnston (Consulting Engineers)
415 Madison Avenue
New York New York 10017
(212) EL 5-4800

Parsons, Brinckerhoff, Quade &
Douglas
111 John Street
New York, New York 10038
(212) 233-6300

Wilbur Smith & Associates
(Consulting Engineers)
1100 Connecticut Avenue, N.W.
Washington, D.C.
(202) 223-9557

Wilson & Ihrig (Acoustical Consultants)
5605 Ocean View Drive
P. O. Box 2900
Oakland, California 94618
(415) 658-8386

APPENDIX F: THE ORDINANCE STUDY

THE STATUS OF FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS
WHICH CONTROL IMPACTS AND ARE APPLICABLE TO THE PLANNING
AND CONSTRUCTION OF METRO

In 1966 the Congress of the United States declared as a national goal "the development of national transportation policies and programs conducive to the provision of fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith and with other national objectives, including the efficient utilization and conservation of the nation's resources." (49 U.S.C. 1951 (a)).

The construction of Metro by WMATA can be viewed as a large step toward fulfilling this goal.

Legally WMATA and WMATA contractors must satisfy the laws and regulations at every level of government as these apply to the planning and construction of Metro.¹

The matrix in this Appendix indicates the presence or absence of statutes, ordinances or regulations, at different levels of government, which control various impacts and which are applicable to the planning and construction of Metro. It should be noted that the absence of specific laws or regulations at one level of government does not necessarily imply an absence of controls to cover the situation at hand. Since Federal statutes and regulations apply to all levels of government, state statutes and regulations apply to counties and local jurisdictions within said state, and county ordinances and regulations usually apply to local jurisdictions, most impacts are controlled by the laws and regulations of one or several jurisdictions.

The existing laws and regulations in the Metro area which are applicable to the planning and construction of Metro vary in degree of control from one jurisdiction to another. However, it is not the intent of this appendix nor of the matrix to evaluate the comprehensiveness or effectiveness of the statutes, ordinances and regulations presented in the matrix, as each jurisdiction may amend its laws and regulations if such are found inadequate to control Metro impacts. For example, Montgomery County recently determined that its existing zoning ordinance did not satisfactorily control potential development which could result from increased access due to Metro. The County therefore amended its zoning ordinance to include two new zones

¹Washington Metropolitan Area Transit Authority Compact:
Article XVI, Sections 74 and 75.

designated "Transit Station-Residential Zone" and "Transit Station-Mixed Zone" in order to promote the optimum use of transit facilities by assuring the orderly development of land in Transit Station Areas".¹

The purpose of this appendix and the accompanying matrix is to present an overview of the region's laws and regulations which would assist in the assessment of critical area location. More detailed analysis from a local or neighborhood point of view is most appropriate in the individual station and segment environmental impact statements which WMATA will prepare.

It should also be noted that the matrix does not include utility system interruption and/or relocation as there are no laws or regulations which apply to Metro. In cases where utility disruption of any type is involved, WMATA or its contractors must either negotiate with individual utility companies, or, in the case of water and sewer, WMATA or its contractors must obtain municipal permits.

The length and variety of statutes, ordinances and regulations which control the impacts included in the matrix necessitates a broad brush approach to the issues contained in representative laws and regulations. For more detailed information, the individual statutes, ordinances or regulations should be consulted.

EROSION AND SEDIMENT CONTROL

General standards, guidelines and criteria for the control of soil erosion, sediment disposition and runoff resulting from land disturbing activities do exist for the Metro region. Grading, filling or excavating ordinarily necessitates a permit which is issued only when it has been shown that sediment and erosion control measures are being employed in accordance with a plan approved by the jurisdiction in question.

FLOODPLAIN AND STEEP SLOPE CONTROLS

Floodplain and steep slope control measures are often incorporated into the erosion and sediment control laws, standards, guidelines and criteria. Site work or grading of land for any purpose, including the removal of top soil, requires a permit which is issued upon compliance

¹Montgomery County, Ordinance No. 7-57.

with floodplain and steep slope control measures. In some areas "floodplain encroachment lines" may be established within which construction or land filling is prohibited. Steep slopes are usually defined as slopes over fifteen percent grade, which are characterized by increased runoff, erosion and sediment hazards. Construction methods required to reduce potential impacts on steep slopes and in floodplain areas vary by jurisdiction.

REGULATION OF SPOILS DISPOSAL

In spite of the varied nature of spoils disposal regulations, the following controls are pervasive for the region. Spoils disposal is prohibited in wetlands and whenever the dumping of spoils would pollute ground water. Strong standards exist for the dumping of spoils of any type into navigable waters or their tributaries. Spoils disposal is not permitted where such would create an unreasonable hazard to persons or property. Furthermore, spoils must be removed and disposed of by hauling to an authorized disposal area or sanitary land fill. Dumping on sites not under permit is not permitted. Aside from the foregoing, regulations exist for the transportation of spoils whose purpose is to minimize airborne dusts and spills on paved roads.

DUST CONTROL

WMATA contractors must take certain reasonable precautions to prevent particulate matter from becoming airborne. Included among these measures are the following: (1) The use, where possible, of water or suitable chemicals for the control of dust during construction operations. (2) Applying water or suitable chemicals on roads, material stockpiles or other surfaces which can create airborne dusts. (3) Installation and use of hoods, fans and fabric filters to enclose and vent the handling of dusty materials. (4) Equipment for conveying or transporting materials likely to become airborne must be covered, or treated in an equally effective manner. (5) Earth or other material must be promptly removed from a paved street, where such has been transported thereto or accidentally deposited.

In areas where no dust regulations exist per se, the jurisdiction in question will often stipulate dust control measures as a prerequisite for obtaining various permits.

TRAFFIC CONTROL OF CONSTRUCTION VEHICLES

Laws or regulations pertaining to the traffic control of construction vehicles are found in the municipal codes, local or state highway and traffic regulations and/or among general police regulations. Their purpose is to insure that contractors conduct work in such manner and in such sequence as will promote its expeditious completion with the least interference to traffic. Contractors must have due regard to the location of any detour and the provisions for handling traffic. In general, contractors should not open any work to the prejudice or detriment of work already started.

REGULATION OF TREE COVER REMOVAL

Existing laws and regulations generally stipulate that authorization is necessary whenever trees on public lands or public right-of-ways are to be removed or injured. Recognizing the importance of trees as a natural resource, Fairfax County has extended its regulations to cover the removal of trees from private property. Tree cover regulations are, for the most part, intended to establish standards limiting the removal of and insuring the replacement of trees sufficient to safeguard the ecological and aesthetic environment and to dissuade the unnecessary clearing and disturbing of land so as to preserve, insofar as is practicable, the natural and existing growth of vegetation.

NOISE CONTROL

Noise control regulations are general in nature except as these deal with noise due to construction activity. WMATA, by comparison, is concerning itself with groundborne noise and vibration, passby noise and land use noise criteria as well as the control of noise during construction.

REGULATION OF WILDLIFE HABITAT DISTURBANCE

Parkland use must be evaluated according to Section 4(f) of the 1966 DOT Act¹ which directs that approval not be given by the DOT secretary for "any program or project which requires the use of any publicly owned land for a public park, recreation area or wildlife or waterfowl refuge of national, state or local significance as determined by the Federal, state or local officials having

¹49 U.S.C. Sec. 1653(f).

jurisdiction thereof, or any land from an historical site of national, state or local significance as so determined by such local officials unless:

- (1) There is no feasible and prudent alternative to the use of such land;
- (2) Such a program includes all possible planning to minimize harm to such park, recreation site, wildlife and water fowl refuge or historic site resulting from such use."

Until a National Land Use Act is passed, the protection of private parklands or sanctuaries and the wildlife therein can best be effectuated via local land use regulations. The major long-term threat to these private lands is from development over which WMATA has no legal control (see Transit Impact Zoning, etc.).

SOILS ENGINEERING CONTROL

Soils engineering requirements exist primarily in building codes which require that under specified circumstances the building official must obtain a soils investigation report which correlates surface and subsurface conditions with the proposed grading, site and building plans. Under other than specified circumstances the building official may often require a soils investigation report depending upon slopes, anticipated characteristics of the soil, drainage characteristics and the like.

TRANSIT IMPACT ZONING, ZONING ORDINANCES, PROVISIONS FOR PLANNED UNIT DEVELOPMENT OR SIMILAR MULTI-USE CLUSTER DEVELOPMENTS, SUBDIVISION REGULATIONS

The above involve land use planning over which WMATA has no legal control, though WMATA may, upon request by a jurisdiction, informally review the jurisdiction's proposed or existing land use plans. The majority of land use ordinances and regulations within the Metro region either have been recently enacted or have been amended to the present, thereby representing the respective jurisdictions' recent responses to foreseeable development including Metro impacts. Since land use controls are re-evaluated on a continuing basis, any further development adjacent to Metro alignment can be controlled so as to help attain growth where it is desirable and control growth where it is not desirable. Transit impact zoning recently enacted by several jurisdictions reflects such re-evaluation.

FEDERAL, STATE & LOCAL LAWS & REGULATIONS CONTROLLING IMPACTS AND APPLICABLE TO THE PLANNING & CONSTRUCTION OF METRO	Erosion & Sediment Control	Floodplain Control	Steep Slope Control	Regulation of Spoils Disposal	Dust Control	Traffic Control of Construction Vehicles	Regulation of Tree Cover Removal	Noise Control	Regulation of Wildlife Habitat Disturbance	Soils Engineering Control	Transit Impact Zoning	Zoning Ordinance	PUD (Planned Unit Devt.) or Planned Community Regulations	Subdivisions Regulations
FEDERAL LEVEL	●	●		●	○	■	●	●	●		■	■	■	■
DISTRICT OF COLUMBIA	●	● ³	●	●	●	●	●	●	●		○	●	●	●
MARYLAND	●	●	●	●		●	●	○	●	●	■	■	■	■
MONTGOMERY COUNTY	●	●	●	●		●	●		○ ⁶	●	●	●	●	●
Rockville	●	●	●		●	●	●		○	●	○	●	●	●
PRINCE GEORGE'S COUNTY	●	●	●	●		●	●	○	○ ⁶	●	●	●	●	●
College Park ¹	●	●	●	●	●	●	●	○	○ ⁶	●	●	●	●	●
Greenbelt ¹	●	●	●	●		●	●	○	○ ⁶	●	●	●	●	●
Takoma Park ²	●	●	●	●		●	●	●	○ ⁶	●	●	●	●	●
VIRGINIA	●	○	○		●	●	●		●	●	■	■	■	■
ARLINGTON COUNTY	●	●	●	●	●	●	●	●	●	●	○	●	●	●
FAIRFAX COUNTY	●	●			●		●	●	● ⁴		○	●	●	●
Falls Church	●	○		●	●		●	●		●	○	●	●	●
ALEXANDRIA	●	●	●			●	●		● ⁵	●	○	●		●

Legend:
 ● In effect
 ○ Under advisement or proposed
 ■ Not applicable

FOOTNOTES:
 1. The ordinances & regulations of Prince George's Co. are promulgated under the authority of the State of Maryland. Each city may supplement these within certain limits.
 2. Takoma Park lies in both Montgomery Co. & Prince George's Co., Md. The ordinances & regulations of the respective counties are paramount as they relate to Takoma Park. The city may supplement these within certain limits.
 3. Washington, D.C. has no statutes or regulations pertaining to floodplains per se. However, according to the D.C. Dept. of Environmental Services, a permit is required from the Corps of Engineers for any activity that may alter a floodplain. Such activity will be disturbed by construction activity.
 4. Aside from county hunting regulations, Fairfax Co. abides by state & federal statutes & regulations as these pertain to wildlife disturbance.
 5. Local wildlife regulations do not apply in this instance, since only federal parkland is disturbed by Metro.
 6. Maryland Natl. Capital Park & Planning Commission to issue Guidelines by July 1, 1974, in compliance with Section 451 of the Maryland Environmental Policy Act (41 An. Code of Md-451) & Section IV(C)(3) of the Maryland Environmental Policy Act Guidelines.

LAWS AND REGULATIONS



Among the sources that have been consulted are the following:

U.S. Code
U.S. Code Annotated
Federal Register
Code of Federal Regulations
U.S. Department of the Interior-National Park Service
Washington Council of Governments
EPA

D.C. Department of Environmental Services
D.C. Corporation Counsel
D.C. Code
D.C. Public Service Commission

Maryland-National Capital Park and Planning Commission
Washington Suburban Sanitary Commission
Md. Department of Transportation
Md. Department of Natural Resources
Md. Water Resources Administration
Md. Public Service Commission
Md. Bureau of Air Quality Control
Md. Motor Vehicle Administration
Annotated Code of Maryland

Va. Council on the Environment
Va. State Corporation Commission
Va. Commission of Game and Inland Fisheries
Va. Department of Conservation and Economic Development
Va. Department of Highways
Va. Code

PEPCO
C&P Telephone Co.
Washington Gas Light Co.
Va. Electric & Power Co.

Montgomery County Planning Board
Montgomery County Environmental Protection Division
Montgomery County Division of Construction Permits
Montgomery County Department of Transportation
Montgomery County Code

Prince George's County Building Inspector
Prince George's County Code and Zoning Ordinance
Prince George's County-County Attorney's Office

Arlington County Department of Transportation
Arlington County Attorney
Arlington County Department of Environmental Affairs
Arlington County Manager's Office
Arlington County Code and Zoning Ordinance

Fairfax County Board of Supervisors
Fairfax County Park Authority
Fairfax County Code and Zoning Ordinance

Alexandria - City Attorney's Office
Alexandria Department of Recreation and Cultural Activities
Alexandria Code and Zoning Ordinance

Falls Church City Attorney
Falls Church Code and Zoning Ordinance

College Park City Administrator
College Park Code

Greenbelt - City Manager's Office
Greenbelt Code

Rockville City Clerk
Rockville Department of Building and Inspection
Rockville Transportation Director
Laws of Rockville

Takoma Park City Administrator
Takoma Park Code

Selected bibliography of statutes, ordinances and regulations which control impacts and are applicable to the planning and construction of Metro as of 2/74. (The following should not be interpreted as exhaustive.)

Federal

Erosion and Sediment Control:	16 U.S.C.A. Sec. 1001 16 U.S.C.A. Sec. 1301
Floodplain Control:	16 U.S.C.A. Sec. 1001
Regulation of Spoils Disposal:	33 U.S.C. Sec. 1165a P.L. 91-224 Executive Order 11507 Executive Order 11474 33 U.S.C.A. Sec. 419 36 U.S.C.A. Sec. 403(Notes) 33 U.S.C.A. Sec. 407
Regulation of Tree Cover Removal:	49 U.S.C. Sec. 1610 49 U.S.C. Sec. 1651(b) (2) 49 U.S.C. Sec. 1653(f) 16 U.S.C. Sec. 1853 36 CFR Sec. 50.10

Noise Control:	42 U.S.C.A. Sec. 4902 et seq.
Regulation of Wildlife Habitat Disturbance:	49 U.S.C. Sec. 1610 49 U.S.C. Sec. 1651(b)(2) 49 U.S.C. Sec. 1653(f) 16 U.S.C. Sec. 661 et seq. 33 U.S.C.A. Sec. 403 (case decision) 16 U.S.C.A. Sec. 1301 36 CRF Sec. 50.18, Sec. 50.47

District of Columbia

Erosion and Sediment Control:	Health Regulations, Amendment 13
Floodplain Control:	(See footnote in matrix. Information obtained from D.C. Dept. of Environmental Services)
Steep Slopes Control:	Health Regulations, Amendment 13
Regulation of Spoils Disposal:	Police Regulations
Dust Control:	Health Regulations Police Regulations
Traffic Control of Construction Vehicles:	Highways and Traffic Regulations Police Regulations
Regulation of Tree Cover Removal:	Police Regulations
Noise Control:	Police Regulations
Regulation of Wildlife Habitat Disturbance:	Federal references
Zoning Ordinance:	Zoning Regulations (amended through 2/29/72)
Planned Unit Development:	in Zoning Regulations
Subdivision Regulations:	Subdivision Regulations (Revised May 16, 1967)

State of Maryland

Erosion and Sediment
Control:

Wetlands Law, 66c An. Code
of Md. Secs. 718-731
Md. State Dept. of Natural
Resources, Rules and
Regulations 8.05.03.01-
Sediment Control
Water Resources Law, 96A An.
Code of Md. Secs. 1-126
66c An. Code of Md. Secs.
388-394
Maryland Environmental Policy
Act, 41 An. Code of Md. Secs.
447-451
Maryland Environmental Policy
Act Guidelines

Floodplain Control:

Water Resources Law, 96A An.
Code of Md. Secs. 1-126
Md. State Dept. of Natural
Resources, Rules and Regula-
tions 08.05.03.01-08.05.03.07
Md. Environmental Policy Act,
41 An. Code of Md. Secs.
447-451
Md. Environmental Policy Act
Guidelines

Steep Slope Control:

Maryland Environmental Policy
Act, 41 An. Code of Md. Secs.
447-451
Maryland Environmental Policy
Act Guidelines

Regulations of
Spoils Disposal:

Wetlands Law, 66c An. Code of
Md. Secs. 718-731
Water Resources Law, 96A An.
Code of Md. Secs. 1-126
Md. State Dept. of Natural
Resources, Rules and Regu-
lations 08.05.04.01-08.05.04.11
Md. State Dept. of Natural
Resources: Order Establishing
Wetland Boundaries and Rules
and Regulations
Maryland Environmental Policy
Act, 41 An. Code of Md. Secs.
447-451
Maryland Environmental Policy
Act Guidelines

Traffic Control of
Construction Vehicles:

Md. DOT "Manual on Uniform
Traffic Control Devices
for Streets and Highways"

Regulation of Tree
Cover Removal:

Roadside Tree Laws, Md. An.
Code, 1951, Sec. 355; 1939,
art. 39A, Sec. 16; 1924,
Sec. 16; 1914, ch.824.
Md. An. Code, 1951, Sec. 359;
1939, art. 39A, Sec. 20;
1924, Sec. 20; 1914, ch. 824.
Md. An. Code, 1951, Sec. 361;
1939, art. 39A, Sec. 22; 1924,
Sec. 22; 1914, ch.824.
Md. An. Code, 1951, Sec. 362;
1939, art. 39A, Sec. 23; 1924,
Sec. 23; 1914, ch.824; 1916,
ch.548.
66c An. Code of Md. Secs. 365-
368
Maryland Environmental Policy
Act, 41 An. Code of Md. Secs.
447-451
Maryland Environmental Policy
Act Guidelines

Regulations of Wildlife
Habitat Disturbance:

66c An. Code of Md. Secs. 388-
394
Maryland Environmental Policy
Act, 41 An. Code of Maryland
Secs. 447-451
Maryland Environmental Policy
Act Guidelines

Soils Engineering
Control:

Water Resources Law, 96A
Md. An. Code Secs. 1-126
Wetlands Law, 66c Md. An.
Code Secs. 718-731

Montgomery County, Md.

Erosion and Sediment
Control:

Excavation, Grading and
Sediment Control Law
Montgomery County Dept. of
Environmental Protection:
Procedure and Requirements
for Submission and Pro-
cessing of Grading,
Erosion and Sediment
Control Plans and Storm
Drainage Management Plans

Floodplain Control:	Indirectly covered by Excavation, Grading and Sediment Control Law Maryland-Washington Metropolitan District Laws Regarding Flood Control
Steep Slope Control:	Excavation, Grading and Sediment Control Law
Regulation of Spoils Disposal:	Excavation, Grading and Sediment Control Law Montgomery County Department of Environmental Protection: Procedure and Requirements for Submission and Processing of Grading, Erosion and Sediment Control Plans and Storm Drainage Management Plans
Traffic Control of Construction Vehicles:	Motor Vehicles and Traffic Laws; Streets and Roads Laws Necessary permits must be obtained from Division of Traffic
Regulation of Tree Cover Removal:	Trees in parks under the jurisdiction of the Maryland National Capital Park and Planning Commission are regulated by the laws of the Maryland-Washington Regional District whose concern is park acquisition and maintenance
Soils Engineering Control:	Building Code
Transit Impact Zoning:	Zoning Ordinance (amended through 1973)
Zoning Ordinance:	Zoning Ordinance (amended through 1973)
Planned Unit Development:	in Zoning Ordinance
Subdivision Regulations:	Subdivision of Land Laws in Montgomery County Code (1972)

Rockville, Montgomery Cty., Maryland

Erosion & Sediment Control:	Building Code
Floodplain Control:	Building Code Subdivision Regulations
Steep Slope Control:	Building Code
Dust Control:	Air Pollution Control Laws
Traffic Control of Construction Vehicles:	Traffic Ordinance
Regulation of Tree Cover Removal:	Public Nuisances, Morals and Conduct Laws Subdivision Regulations
Soils Engineering Control:	Building Code
Zoning Ordinance:	Zoning Ordinance (amended through 1973)
Subdivision Regulations:	Subdivision Regulations under Rockville Charter (amended through 1973)

Prince George's County

Erosion and Sediment Control:	Building Code-Article 22: Grading, Drainage and Erosion Control
Floodplain Control:	Building Code-Article 22: Grading, Drainage and Erosion Control
Steep Slope Control:	Building Code-Article 22: Grading, Drainage and Erosion Control
Regulation of Spoils Disposal:	Building Code-Article 22: Grading, Drainage and Erosion Control Prince George's Soil Conservation District's Standards and Specifications

Traffic Control of
Construction Vehicles:

Department of Public Works:
Traffic Regulations

Regulation of Tree
Cover Removal:

Building Code-Article 22:
Grading, Drainage and
Erosion Control
Trees in Parks under the juris-
diction of the Maryland-
National Capital Park and
Planning Commission are
regulated by the Laws of
the Maryland-Washington
Regional District whose con-
cern is park acquisition and
maintenance

Soils Engineering:

Building Code

Transit Impact Zoning:

Zoning Ordinance (amended
through 1973)

Zoning Ordinance:

Zoning Ordinance (amended
through 1973)

Planned Community Zone:

in Zoning Ordinance

Subdivision Regulations:

Subdivision Regulations in Code
of Prince George's County
(amended through 1973)

College Park, Prince George's Co., Maryland

See Prince George's County since the ordinances and regulations
of Prince George's County are paramount as they relate to
College Park. College Park has supplemented these in a manner
which affects Metro. See the following:

Dust Control:

Air Pollution Control Laws
(College Park Code)

Greenbelt, Prince George's Co., Maryland

See Prince George's County since the ordinances and regulations
of Prince George's County are paramount as they relate to
Greenbelt. Greenbelt has not supplemented these in a manner
which affects Metro.

Takoma Park, Montgomery and Prince George's Cos., Maryland

See Montgomery County and Prince George's County since the ordinances and regulations of the respective counties are paramount as they relate to Takoma Park. The City has supplemented these in a manner which affects Metro. See the following:

Traffic Control of
Construction Vehicles:

Traffic Regulations (Takoma
Park Code)

Noise Control:

Noise Control Regulations
(Takoma Park Code)

State of Virginia

Erosion and Sediment
Control:

Erosion and Sediment Control
Law, 21 Code of Va. Secs.
21-89.1--21-89.15
(Specific Guidelines to be
issued shortly)
Va. Dept. of Highways Special
Provisions for Temporary
Erosion and Siltation Control

Regulation of
Spoils Disposal:

Va. Dept. of Highways Special
Provisions for Temporary
Erosion and Siltation Control

Dust Control:

Va. State Air Pollution Control
Board Regulations, Sec. IV.
Va. State Dept. of Highways
Regulations, Sec. 513

Traffic Control of
Construction Vehicles:

Va. State Dept. of Highways
Regulations, Secs. 104.04, 108.05

Regulation of Tree
Cover Removal:

Environmental Coordination Act
of 1973, 10 Code of Va. Secs.
10-17.31--10-17.65
18.1 Code of Va. Sec. 18.1-178

Regulation of Wildlife Habitat Disturbance:	Environmental Coordination Act of 1973, 10 Code of Va. Secs. 10-17.31--10-17.65
Soils Engineering Control:	Erosion and Sediment Control Law, 21 Code of Va. Secs. 21-89.1-- 21-89.15 BOCA Basic Building Code
<u>Washington County, Va.</u>	
Erosion and Sediment Control:	Arlington Co. Code, Secs. 26.4, 17.6 Arlington Dept. of Tran. Street and Storm Sewer Specifications, Division VII, Temporary Ero- sion Control, Secs. 701.01 - 701.06 Zoning Ordinance, Sec. 32
Floodplain Control:	Zoning Ordinance, Sec. 32 Subdivision Ordinance, Sec. 23-4
Steep Slope Control:	Subdivision Ordinance, Sec. 23-4
Regulation of Spoils Disposal:	Arlington Co. Code, Secs. 17.6, 26.4
Dust Control:	Air Pollution Control Ordinance
Traffic Control of Construction Vehicles:	Arlington Co. Code, Chapter 22
Regulation of Tree Cover Removal:	Arlington Dept. of Trans. Street and Storm Water Specifications, Division VII, Temporary Ero- sion Control, Sec. 701.03 Arlington Co. Code, Chapter 22
Noise Control:	Arlington Co. Code, Chapter 15
Regulation of Wildlife Habitat Disturbance:	Administrative Regulation 4.2

Soils Engineering Control:	Building Code
Zoning Ordinance:	Zoning Ordinance (amended through 1973)
Subdivision Regulations:	Arlington Co. Code, Chapter 23, (The Code is presently being revised)
 <u>Fairfax County, Va.</u>	
Erosion and Sediment Control:	Fairfax Co. Code, Secs. 17-2.1, 17-7(a), 23-2.1, 30-11.7 Amendments to the Fairfax Co. Policies and Guidelines for the Preparation of Subdivision Plans and Site Development Plans Relating to the Control of Erosion and Sedimentation (Nov. 25, 1970)
Floodplain Control:	Fairfax Co. Code, Sec. 1-8
Dust Control:	Fairfax Co. Code, Sec. 1A
Regulation of Tree Cover Removal:	Fairfax Co. Code, Sec. 30-17 "Tree Planting and Preservation", Sec. 17-2.1
Noise Control:	Fairfax Co. Code, Sec. 17.4
Zoning Ordinance:	Zoning Ordinance (Nov. 1973)
Planned Development Zone:	in Zoning Ordinance
Subdivision Regulations:	Subdivision Regulations in Fairfax Co. Code (updated through 1972)
 <u>Falls Church, Fairfax Co., Va.</u>	
Erosion and Sediment Control:	Falls Church Code, Chapter 34, Sec. 34-10
Regulation of Spoils Disposal:	Falls Church Code, Chapter 24, Sec. 24.59, chapter 33, Sec. 33-14

Dust Control:	Falls Church Code, Chapter 3, Sec. 3-9
Regulation of Tree Cover Removal:	Resolution 74-20, adopted 3/25/74
Noise Control:	Falls Church Code, Chapter 23, Secs. 23-11, 23-13
Soils Engineering Control:	Falls Church Code, Chapter 6
Zoning Ordinance:	Zoning Ordinance (amended through 1974)
Planned Unit Development:	in Zoning Ordinance
Subdivision Regulations:	Falls Church Code, Chapter 34
<u>City of Alexandria, Va.</u>	
Erosion and Sediment Control:	Ordinance No. 1747
Floodplain Control:	Ordinance Nos. 1735, 1638, 1719
Steep Slope Control:	Ordinance No. 1747
Traffic Control of Construction Vehicles:	Code of Alexandria, "Motor Vehicles and Traffic"
Regulation of Tree Cover Removal:	Ordinance Nos. 1831, 1920, 1747
Soils Engineering Control:	Ordinance No. 1747
Zoning Ordinance:	Zoning Ordinance (amended through 1973)
Subdivision Regulations:	"Subdivisions" in Code of Alexandria (amended to 1973)

APPENDIX G: HISTORIC SITES

I. General Description of the Proposed Undertaking

The proposed action is for the construction and operation of a regional rapid transit system with eleven routes and 97.7 miles of service traversing the District of Columbia and radiating outward to suburban communities in Maryland and Virginia.

The purpose of the Metro System is to provide rapid transit service to the Washington metropolitan area, thereby meeting WMATA's responsibilities as defined in the February 20, 1967 Interstate Compact which created WMATA and called for it to plan, develop, finance and cause to be operated, improved transit facilities and to coordinate the operation of the public and privately-owned or controlled transit facilities into a unified regional transit system.

In total, the eleven routes include 38 miles of service and 43 stations in the District; 30 miles and 22 stations in Maryland, and 30 miles and 21 stations in Virginia. In the highly developed parts of the region (particularly the areas concerning National Register properties), the routes are underground. Forty-nine of the 98 miles in the system are in subway, and 53 of the 86 stations are underground. Of the 42 miles of surface construction, 30 are along existing railroad rights-of-way or in medians of highways. Only 8 miles are on aerial structure; mostly on-grade separations and bridges.

A more detailed description of the proposed action is provided in the draft Environmental Impact Statement for the Metro System; a copy of which is enclosed with this report.

II. Properties on the National Register of Historic Places Affected by the Proposed Undertaking and the Significant Features of Each

<u>Property</u>	<u>Location</u>	<u>Metro Section Involved</u>
Adas Israel Synagogue	3rd & G Streets,NW	Metro Operations Center Building (OCCB)
Arts Club of Washington	2017 I Street,NW	C-3
Carnegie Library	Mount Vernon Square	E-1
Church of the Epiphany	1317 G Street,NW	A-1

<u>Property</u>	<u>Location</u>	<u>Metro Section Involved</u>
Christian Heurich Memorial Mansion	1307 New Hampshire Avenue	E-3
City Hall (District Courthouse)	4th & E Streets,NW	B-1
Congressional Cemetery	1801 E Street,SE	D-8
Decatur House	748 Jackson Place	A-2
Freer Art Gallery	12th & Jefferson Drive,SW	D-2
LaFayette Square Historic District	LaFayette Square	A-2
The National Archives	Constitution Avenue between 12th and 9th Streets	F-1
National Savings & Trust Co.	New York Avenue & 15th Street	A-2
National Zoological Park	3000 block, Connec- ticut Ave.	A-6
Old Patent Office	F Street between 7th & 9th Sts.,NW	B-1, F-1
Old Post Office and Clock Tower	Pennsylvania Avenue between 11th & 12th Streets,NW	D-1
Pennsylvania Avenue Historic Site	Pennsylvania Avenue	D-1, D-2, F-1
Pension Building	F & G Streets between 4th & 5th Sts.,NW	B-1, OCCB
Renwick Gallery	1661 Pennsylvania Avenue,NW	A-2
Riggs National Bank	SW Corner 9th & S Streets,NW	F-1
Riggs National Bank	1503-05 Pennsylvania Avenue,NW	A-2
St. John's Church	16th & H Streets,NW	A-2
Smithsonian Buildings	Jefferson Drive at 10th Street,SW	D-2
Tariff Commission Building	E & F Streets between 7th & 8th Sts,NW	F-1
Union Station and Plaza	Massachusetts & Delaware Aves.,NW	B-3
U.S. Dept. of the Treasury	1500 Pennsylvania Avenue,NW	A-2
Wadsworth House	1801 Massachusetts Avenue,NW	A-2
Washington Club	15 DuPont Circle,NW	A-4
Washington Navy Yard Historic District	Washington Navy Yard	F-3

The significant features of each property are discussed in their nomination papers. Copies for each property are included here.

There are some properties that could be affected by the project that are not presently on the National Register; but have been recognized by the Joint Committee on Landmarks of the National Capital. Category I and II landmarks have been recommended by the Joint Committee for listing on the National Register of Historic Places. Category III landmarks may be recommended to the National Register following further documentation.

The following report is the Joint Committee's list of landmarks, highlighted to show properties that could be affected by the undertaking. (It should be noted that in identifying the affected National Register properties and the landmarks, anything on a block adjacent to a construction site was mentioned. Although many of these are out of the project limits, they could possibly be affected by construction activities in their area).

III. Evaluation of the Effect of the Undertaking Upon the Register Properties

Generally, the subway will improve access to all of the National Register properties and landmarks by providing an efficient, safe and inexpensive transportation alternative to the automobile. The young and aged, handicapped, tourists, and low and middle income families will all benefit from the greater ease of movement into and out of downtown Washington and throughout the region.

Metro will probably cut by one million the daily car trips forecast for 1980. The drop to levels below the 1968 average will mean a 20 percent reduction in automotive pollutants released into the atmosphere and a decrease in highway runoff containing lead and hydrocarbons into streams.

Also, the development planned around the Metro stations is expected to contribute significantly to the revitalization of the downtown area (where all of the affected National Register properties are located).

The specific sections involving National Register properties are discussed here:

Section A-1

Cut-and-cover construction below G Street has caused some minor short term disruption to pedestrian and vehicular traffic and increased noise levels in the vicinity of the Epiphany Church at 1317 G Street, NW, a National Register property and Category I landmark; and the Colorado Building, a Category III landmark at the corner of Fourteenth and G Streets. All construction has been limited to the street area here and neither property was affected.

Section A-2

Section A-2, which runs northwest from a point below G Street, NW, midway between Fourteenth and Fifteenth Streets to cross LaFayette Park diagonally and end below the northwest corner of Farragut Square, could affect several Register properties.

Most of the properties will only be affected by traffic rerouting and increased noise levels in this, the LaFayette Square Historic District. The Decatur House, the National Savings and Trust Company, the Renwick Gallery and St. John's Church, all National Register properties; plus the Riggs National Bank, the American Security and Trust Company, the Dolly Madison House, the Blair-Lee House, the Benjamin Ogle Tayloe House and the St. John's Parish House, all Category II landmarks, and the Folger Building and the Playhouse Theater, Category III landmarks, are all out of the project limits and should not be directly affected by the undertaking since most of the construction will be in earth tunnel.

The United States Treasury Department complex has experienced minor short term disruption during construction with some slight settling occurring in its courtyard, but will be restored to its original condition.

At 1615 H Street, NW, the United States Chamber of Commerce (1925), a Category III landmark, may have a short term pedestrian and traffic problem at the building's entrance due to construction activities.

Impact on LaFayette Square will be minimal as the method of construction here is earth tunnel. The few trees lost for the fan shaft in the northwest corner of the park in the sidewalks will be relocated and/or replaced as approved by the National Parks Service. The settling that has occurred in the park will be fixed to restore the park to as near its original condition as possible.

Section A-3

Located along cut-and-cover construction, the Mayflower Hotel (1924), a Category III landmark at Connecticut Avenue and DeSales Street, NW, will experience short term disruption in front of the hotel, with construction of a vent shaft in the sidewalk. Although part of an adjacent building will be taken, no permanent impact on the hotel is foreseen. The Category III buildings along Jefferson Place should not be affected.

Section A-4

Construction of this section involves the southern half of Rock Creek Park, a Category I landmark in the area of Taft Bridge at Connecticut Avenue, NW. Much of this immediate area is being utilized as a staging/storage area. It will also serve as the removal point for rock spoil produced by tunnel construction along the A Route within the immediate vicinity. Within this section of the A Route, any other site selected for spoil removal probably would have necessitated the taking of houses.

Although the staging/spoil removal site represents a significant intrusion, the park will be restored as closely as possible to its condition prior to construction operations. Use of the park area for staging and spoil removal operations will require the removal of forest trees and ground cover. Erosion and sedimentation control measures will be implemented to prevent erosion from spoil storage and bank erosion of Rock Creek, due to the increased runoff and construction activity adjacent to the Creek channel. Further, the creek valley's value as a wildlife habitat and corridor and as a visual resource will be disrupted by removal of forest cover and increases in construction noise.

Metro has constructed a bicycle/hiking path through the staging area to maintain the continuity of the park. This compensates to some degree for reductions in public access to this portion of the park during Metro construction.

Two specific areas of impact near the bridge are the stables and a substation site. New and temporary stables have been built in an alternate location, designated by the National Parks Service. Once construction is complete, the old stables may also be used again. Substation construction will take a minor amount of parkland near Belmont Road; mature deciduous trees on the site will be lost, adding to the visual/physical impact upon the park.

Also affected by this section is the DuPont Circle area. However, rock tunnel construction below Connecticut Avenue has preserved the specimen trees and parks of the area; and the Washington Club at 15 DuPont Circle and the Wadsworth House at 1801 Massachusetts Avenue. (Both National Register properties) should not be affected.

The alignment avoids the Taft Bridge.

Section A-6

A chiller plant is planned to be located within a heavily-wooded slope between the National Zoological Park (National Register) entrance road and the property line of the Kennedy-Warren Apartments. The plant will be partially below-grade and hidden in the woods of the Zoo's buffer zone. The site was considered after a review of several alternatives that were found less desirable. The plant will be in a location compatible with the Zoo Master Plan; and all plans for the plant are being coordinated with and subject to the approval of the Smithsonian Institution. A copy of the Environmental Impact Statement for the plant is included in the Appendix.

Section B-1

Section B-1 passes close to several historically significant buildings. St. Mary's Catholic Church and St. Patrick's Church (Category III buildings) are both out of the project limits but may experience short term, minor circulation changes from construction in the area. Also, several Category III buildings will be demolished in the 700 block of Seventh Street, NW, for the construction of an entrance to the Gallery Place Station. These buildings would have had to be moved for the E-1 Section anyway, and a more detailed discussion for the action is provided under the discussion of that section.

Although the National Portrait Gallery (Old Patent Office), a Category I landmark and National Register property, was underpinned, some settlement has occurred near the north end of the building and some cracking resulted. However, the damage will be repaired (see Appendix).

The Pension Building and the old City Hall (both National Register properties) were avoided by the alignment and should not be directly affected.

Section B-3

Construction of the National Visitor's Center at Union Station has required the demolition and removal of the west end of the Concourse. The National Visitor's Center plans, however, were coordinated with an approved by the Advisory Council (see Appendix).

The City Post Office, a Category III landmark at Massachusetts Avenue and North Capital Street, NE, may have its mail conveyor relocated; but alterations to the building are not planned.

The Government Printing Office (Category III) should not be altered by the Metro alignment. However, the D.C. Department of Highways has decided to build a bridge over the railroad yard instead of renovating the H Street Underpass near the Government Printing Office. The bridge project was not a necessary result of the Metro project; and is out of our authority.

Section C-2

The alignment avoided taking the Nineteenth Street Baptist Church, a Category III landmark. Since Metro will run under Eye Street adjacent to it instead of running through the block, the church will require only minimal underpinning.

Section C-3

The Arts Club of Washington, a National Register property; and the Category III house at 2030 Eye Street, NW, may experience some minor short term disruption to pedestrian and vehicular traffic and increased noise levels during the construction of this section, but their distance from the construction site should insure that there will be no direct adverse affects on the properties.

Section C-6

No part of the C Route passes through the Arlington National Cemetery. The section adjacent to it is on-grade on the opposite side of Jefferson Davis Highway. The relief is such that Metro operations should be unobtrusive. In fact, improved transit facilities should alleviate the existing and ever-growing problems caused by excessive vehicular traffic to the cemetery.

Section D-1

The Old Post Office and Clock Tower, National Register properties, are located to the side of Metro's alignment; no direct impact is anticipated and no underpinning will be required. However, there is a possibility that they will be taken down for the extension of the IRS Building.

Located near the Federal Triangle Station, the Post Office Park is comprised predominately of dogwood with some holly, maple, oak and magnolia. Because it will be an entrance access site, there will be major temporary effect on vegetation. Existing immature plantings will be replaced.

Franklin Square, a Category II landmark area, will not be affected by the project. The old Evening Star Building and the Woodward & Lothrop Main Building; Category III buildings, also will not be affected by the project.

Section D-2

The most extensive and significant impact on the National Register and Category I landmark, the Capitol Mall, is on the vegetation. Cut-and-cover construction will necessitate removal of many mature trees, but replanting on completion will restore the Mall to the extent possible to its original condition. The Capitol Mall was studied for a possible tunnel alternative, but this alternative was found to conflict with the existing tunnel under Twelfth Street. The present D alignment will affect the character of the Mall with the taking of mature trees, but it can, over time, be restored to its original condition. Restoration and landscaping of the Mall is scheduled for completion by November 1, 1974. Special specifications for restoration include plantings of 8 inch Princeton elms in sufficient quantity on an inch-for-inch basis, to replace a smaller number of more mature elms now slated to be taken for Metro construction.

The alignment for this section avoids affecting the Smithsonian Buildings along Jefferson Drive and the Freer Gallery of Art; however, some parking and traffic disruption along Jefferson Drive may be an effect of construction in the area. The United States Department of Agriculture Building, a Category III building, will have to be underpinned; and although the section comes within 15 feet of the southeast corner of the Smithsonian Museum of History and Technology, the building will be protected to avoid damage. The museum courtyard will be restored to as near its original condition as possible.

All the plans and specifications for work on this section have been coordinated with and approved by the National Parks Service, the Smithsonian Institution and the Department of Agriculture.

Section D-3

St. Dominic's Church, a Category III landmark, will have some disruption to its landscaping on Seventh Street; however, it will be restored to its original condition promptly after construction.

Section D-6

The temporary home for Veteran's of All Wars (Old Naval Hospital), a Category II landmark, will not be affected by the project although there may be some traffic disruption in the vicinity.

Section D-8

Since this section will run in tunnel, there will be no direct impact on the Congressional Cemetery.

Section E-1

The 700 block of Seventh Street, NW, has been designated by the NCPC Joint Committee on Landmarks as a "special block" containing 19 Category III buildings of historical interest. The construction of Gallery Place Station will require the demolition or the partial demolition and underpinning of seven of these listed buildings on the east side of the block, along with the other unlisted properties. A total of seventeen buildings are involved. The underpinning alternative would mean removing the historic fronts, shoring, underpinning the remaining structures and replacing the fronts, 8-1/2 feet back from their original position.

The present alignment of E Route and Gallery Place Station off-center under Seventh Street was established to avoid impact on the National Portrait Gallery (Category I and National Register landmark). As a result, the 90-foot wide Gallery Place Station is being placed four feet east of the centerline of the 85-foot Seventh Street right-of-way. Due to this alignment, only the east side of the block would be affected. The west side of the block contains twelve Category III buildings, which will be preserved.

Alternatives other than demolition of the east side of the block or partial demolition, underpinning and reconstruction of the fronts, were precluded by the early

construction schedule of the Gallery Place Station, as part of the B and E Route transfer point and the Basic System.

The alignment and preliminary design of the E Route at Gallery Place Station, preceded the designation of the nineteen building fronts on the 700 block of Seventh Street as Category III landmarks.

Environmental impacts of the two alternatives considered have been identified by WMATA's staff as follows:

- . Destruction of the seven structures and their building fronts which have been declared to be Category III landmarks;
- . Probable permanent relocation of the existing small businesses on the east side of Seventh Street;
- . Elimination of the need to deck over the east side of Seventh Street from G to H Streets;
- . Availability of a detour of northbound Seventh Street, to the east of the construction; and
- . The availability of an offsite staging area would be provided for the construction contractors.

The environmental impacts of the alternative of partial demolition and restoration of the fronts would be:

- . Reconstruction of seven building fronts designated as Category III landmarks;
- . Restoration of replicas of the fronts;
- . Permanent or temporary relocation of the small businesses on the east side of Seventh Street;
- . An impact on the operation of the small businesses during the period of construction;
- . The necessity for decking over the east side of Seventh Street; and,
- . Placing the staging area away from the construction site.

The Public Library (1899-1902), a National Register and Category I landmark located on Mount Vernon Square, is now the Federal City College Library. No adverse effects are expected here as the section is in tunnel well below Seventh Street.

Section E-3

An alternative alignment currently being studied for this section may involve the Christian Heurich Memorial Mansion, a National Register property. If this alternative is chosen, plans will be developed to avoid impact on the property.

Section F-1

Section F-1 will tunnel below Seventh Street past the Archives Building and the Tariff Commission Building (National Register properties), the National Gallery of Art (Category II), and the National Bank of Washington (Category III). Although there may be some disruptions to traffic in the area, staying the public right-of-way will avoid adverse affects on the properties.

Section F-1 also passes close to the Old Patent Office and will require underpinning of the building. Because of the cracking in the building at the B-1 Section, extreme care will be taken to avoid a similar situation in the Section's construction.

Riggs National Bank, a National Register property on the southwest corner of Ninth Street and F Street, NW, is out of the project limits and will not be affected.

Section F-3

Plans for this section are not fully developed; but a number of Category II structures in the Washington Navy Yard could be effected. However, the section will be in earth tunnel and all precautions will be taken to minimize affects of construction.

The Operations Control Center Building (OCCB)

Construction of the Metro Operations Control Center Building in the block bounded by Fifth and Sixth and F and G Streets, NW, required the relocation of the old Adas Israel Synagogue to Third and G Streets, NW. The building has been relocated intact.

The OCCB is intended as a strong statement of contemporary design which will provide a counterpoint to the classic Italian renaissance style of the Pension Building which it faces.

The front of the Metro headquarters will be set back 40 feet from Fifth Street as required by zoning, thus creating the opportunity for a landscaped plaza. Paving will recall the warm red-brown of the Pension Building and provide contrast to the white facade and bronze-tinted glass of the Operations Control Center Building.

IV. Steps Taken or Proposed to Take Into Account or Minimize the Effect of the Proposed Undertaking and Alternatives Considered

In the planning and design of the Metro System, WMATA has attempted to avoid the use of park land, historic places or archaeological sites for transit or related facilities. In those cases, however, where no feasible alternative to such use could be provided, WMATA's policy has been to minimize any potential adverse impact on the area.

Construction activities, of necessity, result in temporary inconveniences, one of which is the disturbance of the appearance of an area. The visual aspect of construction activities is the most pronounced in areas of cut-and-cover. Dust, noise and traffic congestion result even if minimized by WMATA contract requirements. However, this is a negative impact of short duration. Rock or earth tunneling results in less disruption along the alignment, but concentrates activities at access points.

Except for the OCCB, all of the foregoing sections affecting National Register properties are in tunnel and do not introduce any permanent visual elements that are out of character with the properties and their settings. Subway station entrances will be discreet, marked by a square pylon with the Metro symbol; also, landscape work is being coordinated with the National Parks Service.

The only effect on most of the properties will be temporary changes in circulation. Although traffic will be disrupted occasionally, the practice is to close some of the lanes of a street for a limited period of time, while maintaining traffic flow in other lanes on the same street. Particular attention is given to maintaining bus routes and stops during construction. Pedestrian traffic on sidewalks and access to buildings is also generally maintained. Any temporary closing of a street, sidewalk or other access, requires approval from the D.C. Department of Highways and Traffic's Bureau of Traffic Engineering and Operations. Overall, the long term gains in relieved traffic congestion and reduced parking requirements can be expected to outweigh the short-term circulation problems caused by Metro construction.

V. Views of SLO and Support and Opposition of Units of Government and Public and Private Organizations to the Proposed Undertaking

Support of the project has been widespread, the President and Congress approved it, and on November 5, 1968, votes

in five jurisdictions dramatically endorsed Metro by voting over 71 percent for bond issues to finance the project. Although some groups have objected to certain aspects of the system (the location of some facilities, alignments, etc.), everyone recognizes the need for the project.

The underpinning involved for the preservation of the Old Patent Office required the demolition or partial demolition of seven Category III buildings along the east side of the 700 block of Seventh Street, NW. The businessmen there raised a number of legal issues including NEPA and the effect on the properties (which are not on the National Register). The alignment and preliminary design of the station preceded the designation of the buildings as Category III landmarks, and were arranged to avoid the Portrait Gallery (a National Register property). To the best of our knowledge, no one has ever opposed the project on the grounds of adverse effects on National Register property.

VI. Economic, Social and Other Effects of the Undertaking

A detailed analysis of the economic, social and other effects of the project as well as alternatives, is included in the draft NEPA Statement.

ROUTE A

<u>Symbol</u>	<u>Name</u>	<u>Address</u>
Aa	Epiphany Church	1317 G Street, N.W., Washington, D.C.
Ab	Colorado Building	14th & G Streets, N.W., Washington, D.C.
Ac	Riggs National Bank	1503-05 Pennsylvania Avenue, N.W. Washington, D.C.
Ad	U.S. Treasury Department	1500 Pennsylvania Avenue Washington, D.C.
Ae	U.S. Chamber of Commerce	1615 H Street, N.W., Washington, D.C.
Af	Mayflower Hotel	1127 Connecticut Avenue, N.W., Washington, D.C.
Ag	Taft Bridge	Connecticut Avenue at Rock Creek Park, Washington, D.C.
Ah	Rose Hill Quarry	Albemarle Street & Connecticut Avenue, Washington, D.C.
Ai	Temple Hill Baptist Church	4821 St. Barnabas Road, Temple Hills, Maryland
Aj	Rockville Station of B&O	Rockville, Maryland
Ak	Decatur House	748 Jackson Place, N.W., Washington, D.C.
Al	National Savings and Trust Company	New York Avenue & 15th Street, N.W. Washington, D.C.
Am	Renwick Gallery	N.E. Corner of 17th Street & Penn- sylvania Ave.NW, Washington, D.C.
An	St. John's Church	16th & H Streets, N.W., Washington, D.C.
Ao	Dolly Madison House	H Street & Madison Place, N.W., Washington, D.C.
Ap	Blair Lee House	1651-53 Pennsylvania Ave., NW, Washington, D.C.
Aq	Benjamin Ogle Tayloe House	21 Madison Place, N.W., Washington, D.C.

ROUTE A (Con't.)

<u>Symbol</u>	<u>Name</u>	<u>Address</u>
Ar	St. John's Parish House	1525 H Street, N.W. Washington, D.C.
As	Folger Building	723-72 15th Street, N.W., Washington, D.C.
At	Playhouse Theater	727 15th Street, N.W., Washington, D.C.
Au	Rock Creek Park	Washington, D.C.
Av	Washington Club	15 Dupont Circle, N.W., Washington, D.C.
Aw	Wadsworth House	1801 Massachusetts Avenue, N.W., Washington, D.C.
Ax	National Zoological Park	(Main Entrance) 3000 block of Connecticut Avenue, N.W., Washington, D.C.
Ay	Lafayette Square	Between 15th & 17th Streets on east and west and H Street & State Place - Treasury Place on north & south in N.W. Washington

ROUTE B.

Ba	Adas Israel Synagogue	619 6th Street, N.W. Washington, D.C.
Bb	Pension Building	4th, 5th, F and G Streets, N.W. Washington, D.C.
Bc	City Post Office	Massachusetts Avenue & N. Capital Street, N.E., Washinton, D.C.
Bd	Cady-Lee House (formerly Benj. Gilbert Hse.)	7064 Eastern Avenue Washington, D.C.
Be	Jesup Blair House	Georgia Avenue at District Line in Montgomery County, Maryland
Bf	Montgomery Community College	7600 Takoma Avenue, Takoma Park, Maryland
Bg	Silver Spring	Silver Spring, Maryland
Bh	St. Patrick's	10th & G Streets, N.W., Washington, D.C.

ROUTE B (Con't.)

<u>Symbol</u>	<u>Name</u>	<u>Address</u>
Bi	National Portrait Gallery	8th & F Streets, N.W., Washington, D.C.
Bj	Old City Hall	Judiciary Square, D & E, 4th & 5th Streets, N.W., Washington, D.C.
Bk	Government Printing Office	N. Capital, between G & H Streets, N.W., Washington, D.C.
Bl	Union Station	Intersection of Massachusetts and Delaware Avenues, N.W., Washington

ROUTE C

Ca	19th Street Baptist Church	19th & I Streets, N.W., Washington, D.C.
Cb	Arlington National Cemetery	Arlington County, Virginia
Cc	George Washington Masonic Temple	Route 236 & Callahan Drive, Alexandria, Virginia
Cd	Arts Club of Washington	2017 I Street, N.W., Washington, D.C.

ROUTE D

Da	Woodward & Lothrop	11th & 12th, F & G Streets, N.W. Washington, D.C.
Db	Old Post Office & Clock Tower	Pennsylvania Avenue & 12th Street, N.W., Washington, D.C.
Dc	Smithsonian Institute/Freer Gallery	12th & Jefferson Drive, S.W., Washington, D.C.
Dd	Congressional Cemetery	1801 E Street, S.E., Washington, D.C.
De	Archaeological Site of Indian Campsite	Near Benning Road Bridge on east- ern side of Anacostia River
Df	Franklin Square	13th, 14th, I & K Streets, N.W., Washington, D.C.
Dg	Capitol Mall	Washington, D.C.

ROUTE D (Con't.)

<u>Symbol</u>	<u>Name</u>	<u>Address</u>
Dh	Department of Agriculture	Mall between 12th & 14th Streets, S.W., Washington, D.C.
Di	St. Dominic's Church	630 E Street, S.W., Washington, D.C.
Dj	Old Naval Hospital	9th Street & Pennsylvania Avenue, S.E., Washington, D.C.

ROUTE E

Ea	Special Block	700 Block of 7th Street, N.W. Washington, D.C.
Eb	Public Library	Mt. Vernon Square, 8th & K Streets, N.W., Washington, D.C.
Ec	Site of Potential Archaeological Interest	Area of Sligo Run and Northwest Branch, Maryland.
Ed	Deakins Hall & Cemetery	16404 Queen's Chapel Road, Hyattsville, Maryland
Ee	College Park Airport	Northeast Quadrant of Calvert Road, B&O R.R. tracks, College Park, Md.
Ef	Christian Heurich Memorial Mansion	1307 New Hampshire Avenue, N.W., Washington, D.C.

ROUTE F

Fa	Wheat Row	1315-21 4th Street, S.W. Washington, D.C.
Fb	Archaeological Sites of Indian Campsites	Area of 11th Street or Anacostia Bridge on District side, and in Anacostia Park on eastern side of River
Fc	National Archives	Constitution Avenue, between 7th and 9th Streets, N.W., Washington

ROUTE K

Ka	Original Cornerstone	814 West Street, Falls Church, Virginia
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ROUTE K (Con't.)

<u>Symbol</u>	<u>Name</u>	<u>Address</u>
Kb	Hollywood Farms	7217 Leesburg Pike, Falls Church, Virginia
Kc	Highland Views	Gordons Road west of Hollywood Farms
Kd	The Mount	East side of Idlewood Road between Barbour Road and Dunford Drive, Falls Hill, Fairfax County, Virginia

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

600 Fifth Street, N.W., Washington, D. C. 20001

(202) 637-1234

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Mr. Lorenzo W. Jacobs, Jr.
State Historic Preservation Officer
Office of Housing & Community Development
District Bldg., Room 112A
14th & E Streets, N. W.
Washington, D. C. 20004

Re: Compliance with the Requirements of
Section 106 of National Historic
Preservation Act and Executive Order
11593 for Metro Greenbelt (E) Route,
Section E-1

Dear Mr. Jacobs:

Submitted herewith for your evaluation and approval is a report prepared in accordance with Section 800.4 of the "Procedures for the Protection of Historic and Cultural Properties" for compliance with the requirements of Section 106 of National Historic Preservation Act and Executive Order 11593 for the construction of Metro Section E-1 of the Greenbelt (E) Route.

Section E-1 of the Greenbelt Route begins at the intersection of 7th & H Streets, N. W., and terminates at Vermont Avenue near 10th Street, N. W., Washington, D. C., and is entirely underground.

The impact upon historic properties is of a temporary nature along this route and is due to the cut-and-cover construction for the location of ancillary facilities and the relocation of utilities. The portions of pavements, sidewalks and curbs disturbed during construction will be restored, and there will be no effect or change in the appearance of the historic properties.

Your concurrence in our finding of no effect is requested.

Very truly yours,

Roy T. Dodge



Attachment
as stated

NOV 4 1974

Mrs. Nancy Taylor
National Capital Planning Commission
1325 G Street, N. W.
Washington, D. C. 20576

Re: National Historic Preservation Act

Dear Mrs. Taylor:

This will confirm the arrangement for a meeting, which you are requested to attend, on November 13, 1974, 1:30 P.M., Room No. 4F06, 4th Floor, Metro Building, 600 Fifth Street, N. W., Washington, D. C., to discuss the procedure to be followed by WMATA to coordinate its planning and construction in order to comply with Section 106 of the National Historic Preservation Act and Executive Order #11593.

Your cooperation in regard to this matter is appreciated.

Very truly yours,
Original signed by
Vernon K. Garrett, Jr.

Vernon K. Garrett, Jr.
Director
Office of Engineering

11/1/74
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REPORT
OF THE IMPACT,
OF
WMATA PROJECT E-1
ON
LANDMARKS AND U. S. RESERVATIONS

December 6, 1974

IMPACT OF WMATA PROJECT E-1.
ON LANDMARKS AND U.S. RESERVATIONS

1. INTRODUCTION:

The Greenbelt (E) Route is a part of Metro Adopted Regional System 1968. The alignment of the Greenbelt Route runs through the northeast and northwest sections of the District of Columbia into Prince George's County to a point north of Prince George's Plaza. The Route is divided into eight sections, E-1 through E-8. This report describes the proposed undertaking of Section E-1 and its impact, if any, on the properties of historic and cultural importance.

2. GENERAL DESCRIPTION OF PROPOSED UNDERTAKING:

The length of Section E-1 is one and a third miles long, entirely underground. It is comprised of three sections of twin-tube, bored tunnels; two stations; and a number of ancillary structures. The route can be described briefly as beginning at H and 7th Streets, N. W.; running northward under 7th Street to T Street and then turning west, first into Florida Avenue and then U Street and terminating at Vermont Avenue.

For construction purposes, the project has been divided into two contract sections - a southerly structural contract E-1a, about 0.8 miles long, and a northerly structural contract E-1b, about 0.5 miles long. Major aspects of the project are indicated on the two Horizontal and Vertical Control drawings that front the set of attached plans.

3. LOCATION OF LANDMARKS OF THE NATIONAL CAPITAL EFFECTED BY THE PROPOSED UNDERTAKING:

Locations of landmarks neighboring the E-1 section have been obtained from a map of "Landmarks of the National Capital, Designated by the Joint Committee on Landmarks of the National Capital as of August 28, 1973." U. S. reservations neighboring the project have been obtained from District of Columbia tax maps. A tabulation of landmarks and U. S. reservations which are sufficiently close to the project so that the impact of the project on them should be considered, follows:

Category I Landmarks

Squares, Circles, Vistas and Major Elements created by the plan of the Federal City.

- a. Mount Vernon Square (U. S. Reservation 8)
- b. Massachusetts Avenue, K Street and New York Avenue
(at 7th Street)
- c. Rhode Island Avenue (at 7th Street)

- d. Florida Avenue (7th Street to 9th Street)
- e. Vermont Avenue (at U Street)

Category III Landmarks

O Street Market (at O Street and 7th Street)

U. S. Reservations

- a. U. S. Reservations 71 and 176 (at K Street and 7th Street)
- b. U. S. Reservation 170 (at Vermont Avenue and U Street)

4. DETERMINATION OF THE EFFECT OF THE UNDERTAKING:

Project paving and restoration drawings are attached for those areas along the project within which landmarks and U. S. reservations are located. In general, project tunneling has no effect on landmarks or U. S. reservations. It is the cut-and-cover structure and utility relocation areas, where excavations are made from the surface, that impacts are more likely, and these areas have been colored according to the legend on the first paving and restoration sheet.

- a. Mount Vernon Square Area: The first area of concern, proceeding northward from the beginning of the project at H Street, is in the Mount Vernon Square area with Category I Landmarks of Mount Vernon Square, Massachusetts Avenue, K Street and New York Avenue and U. S. Reservations 71 and 176. An underground cut-and-cover fan shaft is to be constructed in the intersection of K Street and 7th Street, which in turn necessitates some utility relocations outside the limits of the fan shaft structure.

No construction work is proposed within the property lines of Mount Vernon Square or the U. S. Reservations 71 and 176. Construction is confined within the street lines (public right-of-way) of 7th Street and K Street. No trees will be removed.

All pavement and sidewalks will be restored so that the general appearance after METRO construction will be the same as before, except for the addition of flush ventilation grates in the sidewalk along K Street, the locations of which have been approved by the D. C. Department of Highways and Traffic.

- b. O Street Market: The second area of concern is the O Street Market, a Category III Landmark at O Street and 7th Street. It is expected that the subway, in bored tunnel as it passes the Market building, will have no impact on the building. No construction from the surface or underpinning of the building is proposed.

At the northerly end of the O Street Market property near P Street where there is now open, unused land, METRO construction will include an underground, cut-and-cover fan shaft and related utility relocations. This construction is confined within the street lines of 7th Street and will not encroach on the O Street Market property.

All pavement and sidewalks will be restored following subway construction, except for the addition of flush ventilation grates in the sidewalk along 7th Street, the locations of which have been approved by the D. C. Department of Highways and Traffic. Two six-inch elms in back of the curb on the opposite side of 7th Street from the O Street Market property will be removed during construction. They will be replaced by trees of the size and type and at the location specified by the D. C. Department of Highways and Traffic.

- c. Rhode Island Avenue: A Category I Landmark and the third area of concern is Rhode Island Avenue at 7th Street. At this location, underground cut-and-cover construction in 7th Street for a ventilation shaft and ancillary rooms of the Shaw Station temporarily affects 200 feet of Rhode Island Avenue. Major utility relocations are also required.

Pavement and sidewalk areas that are disturbed will be replaced. Road medians and traffic islands will be restored, except that two flush ventilation grates will be constructed where shown at locations approved by the D. C. Department of Highways and Traffic. Trees in the median that must be removed will be replaced by trees of the size and type and at locations specified by the D. C. Department of Highways and Traffic.

- d. Florida Avenue: The fourth area of concern is Florida Avenue from 7th Street to 9th Street, which is a Category I Landmark. Tunneling construction which passes under Florida Avenue between 8th and 9th Streets is not expected to have any impact on Florida Avenue. At the intersection of 8th Street and Florida Avenue, an underground cut-and-cover fan shaft will be constructed in the pavement and sidewalk areas, and between 7th and 9th Streets, extensive utility relocations are required in pavement and sidewalk areas. No trees are required to be removed along Florida Avenue. As METRO construction is completed sidewalks and pavements will be restored.

- e. Vermont Avenue Area: The last area of concern is Vermont Avenue at U Street, a Category I Landmark, and U. S. Reservation 170. Tunneling construction, which passes under Vermont Avenue and ends near U. S. Reservation 170, is not expected to have any impact. Utility relocations at the surface will be confined to pavement and sidewalks along Vermont Avenue, which will be restored as METRO construction is completed.

5. STEPS TAKEN TO MINIMIZE THE EFFECT OF THE UNDERTAKING:

- a. Mount Vernon Square Area: All pavement and sidewalks will be restored so that the general appearance after METRO construction will be the

same as before, except for the addition of flush ventilation grates in the sidewalk along K Street, the locations of which have been approved by the D. C. Department of Highways and Traffic. The bored tunnels on both sides of the fan shaft will have no effect on the landmarks or U. S. reservations. There will be no change in the appearance of the Mount Vernon Square due to METRO construction.

- b. 0 Street Market: All pavement and sidewalks will be restored following subway construction, except for the addition of flush ventilation grates in the sidewalk along 7th Street, the locations of which have been approved by the D. C. Department of Highways and Traffic. Two six-inch elms in back of the curb on the opposite side of 7th Street from the 0 Street Market property will be removed during construction. They will be replaced by trees of the size, type and at the location specified by the D. C. Department of Highways and Traffic. In the 0 Street Market area there will be no effect or change in the appearance of the area due to METRO construction.
- c. Rhode Island Avenue: Pavement and sidewalk areas that are disturbed will be replaced. Road medians and traffic islands will be restored, except that two flush ventilation grates will be constructed, where shown at locations approved by the D. C. Department of Highways and Traffic. Trees in the median that must be removed will be replaced by trees of the size and type and at locations specified by the D. C. Department of Highways and Traffic. For Rhode Island Avenue there will be no effect or change in the appearance of the area due to METRO construction.
- d. Florida Avenue: As METRO construction is completed, sidewalks and pavement will be restored. There will be no effect or change in appearance of Florida Avenue due to subway construction.
- e. Vermont Avenue Area: The sidewalks and pavements dislocated during construction will be restored and there will be no effect or change in appearance of Vermont Avenue or U. S. Reservation 170 due to METRO construction.

6. FINDING OF NO EFFECT:

- a. For the WMATA E-1 project, tunneling operations will not impact any landmark or U. S. reservation along the route.
- b. Construction of cut-and-cover structures and of utility relocations will not be within or impact any U. S. reservation or the Mount Vernon Square area outside the street lines.
- c. Construction of cut-and-cover structures and of utility relocations in Category I roadways will require the removal of pavement, sidewalk, some grassed areas and a few trees. Pavement, sidewalk, and grassed areas

will be restored, and new trees will be planted as directed by the D. C. Department of Highways and Traffic to replace those removed.

- d. The appearance of landmarks will be changed by METRO construction only by the addition of several flush ventilation grates in sidewalks at the back of the curb, and in a roadway median and a traffic island.
- e. No effect on landmarks or U. S. reservations or change in their appearance will result from the construction of WMATA's E-1 project.

December 6, 1973

General Jackson Graham
General Manager
Washington Metropolitan Area Transit
Authority
950 S. L'Enfant Plaza, S.W.
Washington, D.C. 20024

Dear Gen. Graham:

The Advisory Council on Historic Preservation informed the Office of the Secretary of Transportation on April 27, 1973, that construction of the Washington METRO system would affect several properties listed on the National Register of Historic Places. A copy of that letter is enclosed. A consultation was requested at that time. To date, the Advisory Council has not received a reply from the Department of Transportation.

It has recently come to the attention of the Advisory Council that METRO is now taking steps to comply with guidelines and procedures of the National Environmental Policy Act. As a part of this process, the Advisory Council requests that you report on the construction activities of METRO with respect to requirements for historical preservation.

Where National Register properties are or will be affected by METRO activities, the environmental statement must contain an account of steps taken in compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470(f)) and a comprehensive discussion of the contemplated effects on the National Register property. A copy of procedures for compliance with Section 106 are enclosed.

The Advisory Council will be glad to answer questions on these procedures and stands ready to enter into consultations pursuant to compliance with Section 106. Please contact Mr. Ernest Holz of the Advisory Council staff (202-254-3974) if there are questions or to arrange consultations.

Sincerely yours,

SIGNED

Ann Webster Smith
Director, Office of Compliance

Enclosures

cc:

S. K. Stevens

HPO-DC

FLO-Gen Davis, Mr. Convisser, & Dan Joseph

DD-Dickenson

PH-Utley

File: DC-NR: US Treas. et al (106/DOT METRO) DDG-Holz/cls 12/6/73



GOVERNMENT OF THE DISTRICT OF COLUMBIA
WASHINGTON, D. C. 20004

OFFICE OF HOUSING ~~PLANNING~~ and
Community Development

JAN 8 1975

Mr. Roy T. Dodge
Chief of Design
and Construction
Washington Metropolitan
Area Transit Authority
600 Fifth Street, N.W.
Washington, D.C. 20001

Dear Mr. Dodge:

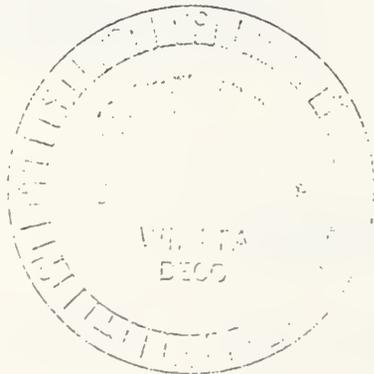
I am writing in response to your letter of December 4, 1974, requesting my review of Section E-1 of the Greenbelt Route of the Metro system. This review is in accordance with procedures for the protection of historic and cultural properties established by the Advisory Council on Historic Preservation (39 F.R. 3366).

After reviewing the extensive documentation which you enclosed with your letter, I believe that construction of this section of the system will temporarily affect some historic properties, but I concur in your determination that this project will have no permanent effect on any recognized historic properties in the District of Columbia.

Thank you for consulting me in this historic preservation matter.

Sincerely yours,

LORENZO W. JACOBS, JR.
State Historic Preservation Officer
for the District of Columbia



Advisory Council
On Historic Preservation

1522 K Street N.W. Suite 430
Washington D.C. 20005

Mr. Vernon K. Garrett, Jr.
Director, Office of Engineering
Washington Metropolitan Area Transit Authority
950 South L'Enfant Plaza, S.W.
Washington, D.C. 20024

March 14, 1975

Dear Mr. Garrett:

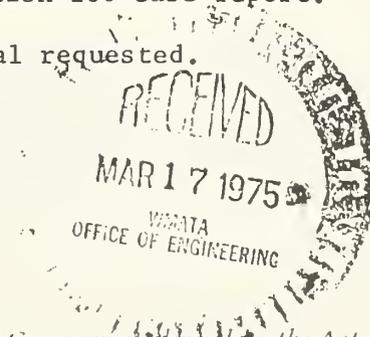
This concerns the status of the Washington Metropolitan Area Transit Authority's compliance with Section 106 of the National Historic Preservation Act of 1966.

On February 27, 1973, the Advisory Council received the draft environmental statement on the Washington Metropolitan Area System prepared by the Washington Metropolitan Area Transit Authority (WMATA) in cooperation with the Department of Transportation (DOT). The Council's comments, forwarded to DOT on April 27, 1973, directed WMATA to Section 106 of the National Historic Preservation Act of 1966, and requested four specific steps to be taken in compliance with Section 106. A copy of the Council's April 27, 1973, letter is enclosed.

Again on December 6, 1973, by letter to Jackson Graham, General Manager of WMATA, the Advisory Council requested an account of steps taken in compliance with Section 106 and a comprehensive discussion of the contemplated effects of the proposed Metro System on properties included in or determined by the Secretary of the Interior to be eligible for inclusion in the National Register of Historic Places.

Representatives of the Advisory Council and WMATA finally met on November 13, 1974, to discuss procedures to be followed by WMATA in compliance with Section 106. Pursuant to Section 800.4 ("Agency Procedures") of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R., Part 800, copy enclosed). WMATA agreed to provide the Advisory Council with a survey of National Register and eligible National Register properties to be effected. We were advised that this survey, to be forwarded to the Council in the form of an addendum to the draft environmental statement prepared by Ian McHarg & Associates in Philadelphia, would serve as a Section 106 case report.

To date, the Council has not received the material requested.

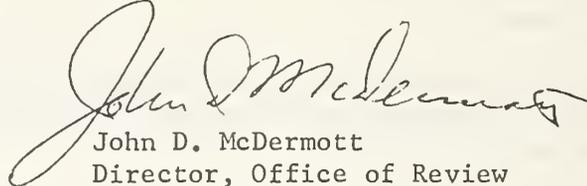


The Council is an independent unit of the Executive Branch of the Federal Government established by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

Until the requirements of Section 106 are met, the Council considers the draft environmental statement to be incomplete in its treatment of historical, archeological, architectural and cultural resources. To remedy this deficiency, the Council will provide substantive comments on the undertaking's effect on National Register properties through the Section 106 process.

We would appreciate your attention to this situation, and will look forward to hearing from you at your earliest convenience. For additional information or assistance in this matter, please contact Ellen R. Ramsey of the Council staff (202-254-3380).

Sincerely yours,

A handwritten signature in cursive script, appearing to read "John D. McDermott".

John D. McDermott
Director, Office of Review
and Compliance

Enclosures

Mr. John D. McDermott, Director
Office of Review and Compliance
Advisory Council on Historic
Preservation
1522 K Street, N. W.
Suite 430
Washington, D. C. 20005

APR 3 1975

Re: Compliance with Section 106 of
the National Historic Preservation
Act of 1966

Dear Mr. McDermott:

This is in response to your March 14, 1975 letter concerning the status of the Washington Metropolitan Area Transit Authority's (WMATA) compliance with Section 106 of the National Historic Act (NHA) of 1966.

The WMATA Approved Regional System's Final Environmental Impact Study (EIS) will contain information on the properties of National Register likely to be affected by WMATA projects. This Study will be completed by June 15, 1975 because it is awaiting Air Quality and Conservation of Energy Information from Council of Government Study likely to be available by May 15, 1975. We will then send you a copy of the Final EIS Report for your review and comments.

As stated in your March 14, 1975 letter, representatives of the Advisory Council on Historic Preservation (ACHP), WMATA and District of Columbia agreed on November 13, 1974 on the procedural and documentational format to be followed by WMATA for the compliance with Section 106 of the NHA.

Usually, when we establish the specific effect of a WMATA section, during the process of final design, on the National Register's existing or eligible properties, we contact ACHP for their coordination and concurrence. A recent letter from Mr. Jacobs of ACHP (copy attached) will illustrate the point.

The exact nature of effect is not possible to determine during the process of EIS or the development of the General Plans (GP). We will continue approaching ACHP during the final design for any WMATA project unit that will have an effect on the properties of National Register.

Please let us know if we can be of any assistance in regard to this matter.

Very truly yours,

Original signed by
Vernon K. Garrett, Jr.
Vernon K. Garrett, Jr.
Director
Office of Engineering

Attachment
as stated

ENGG: SINHA/eca/4/2/75

Advisory Council
On Historic Preservation

1522 K Street N.W. Suite 430
Washington D.C. 20005

April 10, 1975



Mr. Vernon K. Garrett, Jr.
Director, Office of Engineering
Washington Area Metropolitan
Transit Authority
600 Fifth Street, N.W.
Washington, D.C. 20001

Dear Mr. Garrett:

This is in response to your letter of April 3, 1975 concerning Washington Metropolitan Area Transit Authority's (WMATA's) compliance with Section 106 of the National Historic Preservation Act of 1966. Specifically, the Advisory Council would like to clarify what appears to be a misunderstanding regarding the Council's "Procedures for the Protection of Historic and Cultural Properties," 36 CFR, Part 800, copy enclosed.

First, the Council notes your assurance that "the WMATA Approved Regional System's Final Environmental Impact Statement (EIS) will contain information on the (National Register properties) likely to be affected by WMATA projects." However, this does not satisfy WMATA's independent responsibilities under Section 106 of the National Historic Preservation Act or Executive Order 11593, "Protection and Enhancement of the Cultural Environment," May 13, 1971. In a case such as this, where both NEPA and the National Historic Preservation Act or Executive Order 11593 are applicable, the Council on Environmental Quality, in its Guidelines for Preparation of Environmental Impact Statements (40 CFR, Part 1500) directs that compliance with Section 102 (2)(C) of NEPA be combined with other statutory obligations - such as the Historic Preservation Act and Executive Order 11593 - to yield a single document which meets all applicable requirements. Section 800.2 of the Council's procedures specifies the means for achieving this coordination. Therefore, insofar as the Advisory Council's review of the forthcoming Final EIS on this project is concerned, WMATA should be aware that until the requirements of the Council's procedures are met and evidence of that compliance included in the EIS, the Council will consider the EIS incomplete in its treatment of historical, archeological, architectural, and cultural resources.

Second, the Council notes WMATA's intent to "establish the specific effect of a WMATA section during the process of final design...." Section 800.4 of the Council's procedures requires that:

"At the earliest stage of planning or consideration of a proposed undertaking, including comprehensive or area wide planning in which provision may be made for an undertaking, or an undertaking may be proposed" compliance with the Council's procedures be initiated.

Clearly, this responsibility would not be met through the process of submitting proposed sections or lines to the Advisory Council only after such proposals have reached their final design stage, and have become functionally related to the entire proposed WMATA system.

The Council will provide substantive comments on this proposal's effect on National Register properties or properties which may be eligible for inclusion in the National Register through the Council's review process. The Council's intent, of course, is to avoid or satisfactorily mitigate any adverse effects to the properties in question. In addition, the Council hopes to work with WMATA to avoid last minute concerns arising from WMATA construction, such as those recently raised relative to the U.S. Tarriff Commission Building, the National Portrait Gallery, and the Copenhagen Building in Washington, D.C. Please contact Ellen R. Ramsey of the Advisory Council staff (202-254-3380) to assist you in completing the Section 106 process as expeditiously as possible.

Sincerely yours,

A handwritten signature in black ink, appearing to read "John D. McDermott". The signature is written in a cursive style with a large initial "J".

John D. McDermott
Director, Office of Review
and Compliance

Enclosure

Mr. John D. McDermott
Director, Office of Review
and Compliance
Advisory Council on Historic
Preservation
1522 K Street, N. W.
Suite 430
Washington, D. C. 20005

MAY 6 1975

Re: Compliance with Section 106
of the National Historic
Preservation Act of 1966

Dear Mr. McDermott:

In response to your April 10, 1975 letter concerning compliance with Section 106, National Historic Preservation Act of 1966, by WMATA, attached is a copy of a letter dated April 27, 1973 from Mr. Ken Tapman, Compliance Officer to Mr. Martin Convisser, Office of the Secretary of Transportation. A copy of the "Report to the Advisory Council on Historic Preservation", mailed to the Council in response to Mr. Tapman's letter, is also attached.

These attachments are sent in compliance with the request of Ms. Ellen R. Ramsey of the Advisory Council staff.

Historic and Cultural Properties are continuously updated. We will include the recent listing of such Properties in our Final Environmental Impact Study expected to be completed in June 1975.

The specific effect of a WMATA section on Historic Properties can only be determined during the final design stage. We will continue to coordinate our final design efforts with the Advisory Council on Historic Preservation.

In addition, while we are following the procedure formulated at the November 1974 meeting of representatives from the Advisory Council, HCPC and D. C., for the compliance with Section 106 of the National Historic Preservation Act of 1966, we will be agreeable to meet with your representative again, if you feel it is necessary.

Your cooperation in completing the Section 106 process is appreciated.

Very truly yours,

Original signed by
George W. Keyes
Vernon K. Garrett, Jr.
Director
Office of Engineering

Attachments
as stated

ENGG: Sinha/pg/May 5, 75



GOVERNMENT OF THE DISTRICT OF COLUMBIA
WASHINGTON, D. C. 20004

OFFICE OF HOUSING AND
COMMUNITY DEVELOPMENT

MAY 7 1975

Mr. Roy T. Dodge
Chief of Design and
Construction
Washington Metropolitan Area
Transit Authority
600 Fifth Street, N.W.
Washington, D.C. 20001

Dear Mr. Dodge:

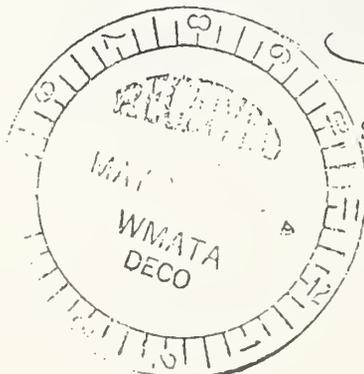
I am writing in response to your letter of April 29, 1975, requesting my review of Section G-1 of the Addison Route of the Metro system. This review is in accordance with procedures for the protection of historic and cultural properties established by the Advisory Council on Historic Preservation (39 F.R. 3366).

After reviewing the documentation which you enclosed with your letter, I believe that construction of this section of the system will temporarily affect Fort Mahan Park, a Category II Landmark of the National Capital which, as part of the Fort Circle Parks System, has been recommended for nomination to the National Register by the Joint Committee on Landmarks. However, I concur in your determination that this project will have no permanent effect on Fort Mahan Park or on any other recognized historic properties in the District of Columbia. You may wish to investigate further your potential responsibilities under Executive Order 11593 with respect to the identification of properties potentially eligible for listing in the National Register.

Thank you for consulting me in this historic preservation matter.

Sincerely yours,

LORENZO W. JACOBS, JR.
State Historic Preservation Officer
for the District of Columbia



Essential Air Quality
and Energy Data To Analyze The
Local And Regional Impacts
Of The WMATA Rapid Rail System

Submitted To:

WASHINGTON METROPOLITAN AREA
TRANSIT AUTHORITY
600 Fifth Street, N.W.
Washington, D.C. 20001

June 6, 1975

Prepared by the

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

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I. INTRODUCTION

This report, prepared under contract No. 6Z9131, utilizes existing Washington Metropolitan land use, transportation, energy and air quality data, methodologies and models to estimate particular impacts of the development of a 98-mile METRO system. The METRO Draft Environmental Impact Statement originally investigated the energy and air quality impacts of the regional rapid rail system. Comments on the draft EIS indicated more detailed information was required in these areas. The Washington Metropolitan Area Transit Authority (WMATA) contracted with the Metropolitan Washington Council of Governments to produce this data because of COG's recognized capability in producing estimates of future travel and resultant air quality.

This study is integrally related to the station-by-station EIS's which are studying the micro-level or immediate vicinity impacts of the development of METRO. The regional study investigates the overall impact of the system in reducing dependency on the automobile. The station impact studies will ensure that over-concentration of METRO, METRO parking, and METRO-induced growth will not cause localized violations of air quality while the regional system attempts to solve regional air quality problems. This concept is more completely described in Section IV.

To assess the impact of METRO, a series of models, compiled and calibrated by COG staff, were run with and without the METRO system. The differences in vehicle miles traveled, air quality and energy consumption were then the result of the operation of the METRO system. The with and without

tests were made for two future years: 1992 and 1980. The former was chosen because it is the current target year for the regional Long Range Transportation Plan (LRP) and hence, the various model parameters have been quantified for that condition. The 1980 year was chosen to provide an interim year between 1975 and 1992. 1980 is appropriate because the current Short Range Transportation Program (SRP) addresses improvements up to that target year, and it is also reasonably close to the target year for attainment of air quality standards.

This report is divided into three major sections which contain data and results on the transportation, air quality and energy impact analysis. A summary of the data study is provided at the beginning of the report.

II. SUMMARY

The overall impact of METRO on the region will be to reduce motor vehicle miles traveled, improve speeds, reduce air pollution emissions, improve air quality and significantly reduce the percentage of the population exposed to air quality levels exceeding the air quality standards, reduce gasoline and diesel fuel consumption, increase consumption of fossil fuels used in electricity generation, and overall, slightly increase energy consumption on a Btu-equivalent basis.

Four tests of the METRO system were made: with and without METRO for 1980 and 1992. For each year the land use, highway configurations and emission characteristics remain the same, so the only change is the existence or non-existence of the METRO system and associated feeder bus system. There are, of course, significant differences in many of these factors between the years 1980 and 1992. However, the assumptions of future systems and characteristics are consistent with ongoing transportation and air quality planning.

Figure 1 compares the Vehicle Miles Traveled (VMT), average vehicle speeds, hydrocarbon and carbon monoxide emissions and energy resources for the four test cases.

Comparison of the years, 1980 and 1992, is not relevant to this project, but a few comments are appropriate to explain the rather significant changes. With or without METRO the 1992 travel is significantly greater than the 1980. However, due to the anticipated changes in the emissions of new vehicles as a result of the federal new car emission control program, the emissions of hydrocarbons and carbon monoxide are significantly lower

FIGURE 1

COMPARISON OF METRO ALTERNATIVES

	1980		1992	
	without	with	without	with
VMT (millions/day) ^{1/}	44.3	42.7	66.5	64.2
Speed (average miles/hour)	25.7	26.5	24.2	25.0
Hydrocarbons (tons/peak 3 hours)	24.6	22.8	6.91	6.59
Carbon Monoxide (tons/peak 8 hours)*	1170	1100	422	405
Energy Consumption per Year				
Gasoline (millions of gal.)	1062.1	1024.7	1284.3	1239.4
Diesel fuel (millions of gal.)	24.1	18.9	27.8	18.9
Residual Oil (millions of gal.)	--	34.1	--	32.0
Coal (thousands of tons)	--	267.2	--	156.9
Overall Btu Equivalent (x 10 ¹²)	139.3	145.8	168.2	170.2
*per peak period during an average day				

^{1/} 24 hour average, all purpose, Auto driver plus taxi trips.

by 1992.

The effect of METRO rail service on core-oriented work trips is significant. These work trips to downtown are most readily diverted to transit and related to urban air quality levels.

METRO rail service will lead to a 41% increase in transit work trips in 1980, and a 48% increase in transit work trips in 1992--both compared with no METRO for those years.

For work trips to the core in 1980, there would be a 32% increase, and in 1992 there would be a 40% increase in transit trips with METRO as compared to the no METRO alternative.

Viewed in another way, METRO construction would attract 69,000 transit work trips to the core in 1980, and 96,000 such trips in 1992--both over and above the non-METRO comparisons. Assuming average occupancy, peak period and highway lane capacities, the equivalent highway lanes to handle potential core work trips to METRO but not to existing transit would be 6 lanes of freeway or 13 lanes of arterial for 1980, and 8 freeway lanes and 18 arterial lanes in 1992.

It is important to note that population, employment and housing forecasts utilized in the four tests in this study were based on the so called EMPIRIC 6.2 (modified) forecasts which were approved by the local governments of the region for study purposes. These forecasts were not designed to maximize usage of the METRO rapid rail system. However, if local government policies in the future were to attempt to obtain maximum transit utilization through the location of population, employment and housing, it is anticipated that the air quality and energy impacts of METRO would be reduced to a more significant degree than is possible under existing planning policies.

In 1980 the deletion of the METRO system would result in less transit travel and more pollution emissions (See Figure 2). The increase in travel of 3.5% results in a 7.3% increase in hydrocarbons (HC) emissions and 6.0% in carbon monoxide (CO) emissions. The greater effect on air quality is due to the improvement in speeds for the vehicles which remain on the roads. In 1992 the effects are similar to the 1980 effects, in both direction and magnitude. Without METRO in 1992 the increases would be 3.5% for VMT, 4.6% for hydrocarbons and 4.0% for carbon monoxide. The emissions of trucks are also slightly increased if METRO is not built because the road speeds would be approximately 3.0% slower (see Figure 2). These reductions in HC emissions will have a significant impact on improving the region's photochemical oxidant problem.

For carbon monoxide the emissions calculations were entered in a dispersion model which calculates the concentrations of pollution at given receptor points throughout the region. The model disperses the pollution emissions from their points of origin due to the wind speed and direction, as well as the stability of the atmosphere. For the purposes of this report the calculated concentrations are the average air quality throughout a grid which is 2.5 km on a side. These concentrations, termed urban background, represent the accumulated effects of sources in the vicinity of the receptor. The precise estimate of air quality at a given receptor involves the addition of the natural background, the urban background and the contribution from very

FIGURE 2

PERCENT CHANGE IN FACTORS AS A RESULT OF DELETION OF METRO

	<u>1980</u>	<u>1992</u>
VMT	+3.5%	+3.5%
Speed	-3.1%	-3.3%
HC	+7.3%	+4.6%
CO	+6.0%	+4.0%
Energy	-4.5%	-1.1%

localized sources. Figure 3 is the urban background for carbon monoxide.

The CO urban background air quality for both years is reduced significantly when the METRO operations are compared to the no-METRO test. Figure 4 presents information on maximum concentration reductions, geographic areas of exposure reductions and percentage of households and employment affected. The 1992 maximum level is predicted to be reduced by about 10%. In addition, the geographical area which is at the threshold of the air quality standard violation (5-10 mg/m³) is reduced by approximately 35%. This area, while small geographically, contains over 20% of the households and employment in the region.

The reductions in both maximum levels and the size of the affected area for 1980 by the operation of METRO as compared to without METRO are greater than in 1992. Maximum urban background is reduced from 22 to 20 mg/m³--about 9%. The area affected by the air quality standard violation (10 mg/m³ or above) is reduced by about 45%. This area contains almost 40% of the region's households and employment. This represents a significant decrease in potential exposure of individuals to levels of air pollution exceeding the standard.

Figures 5, 6, 7, and 8 present the urban background of CO for 1980 and 1992 with and without METRO construction.

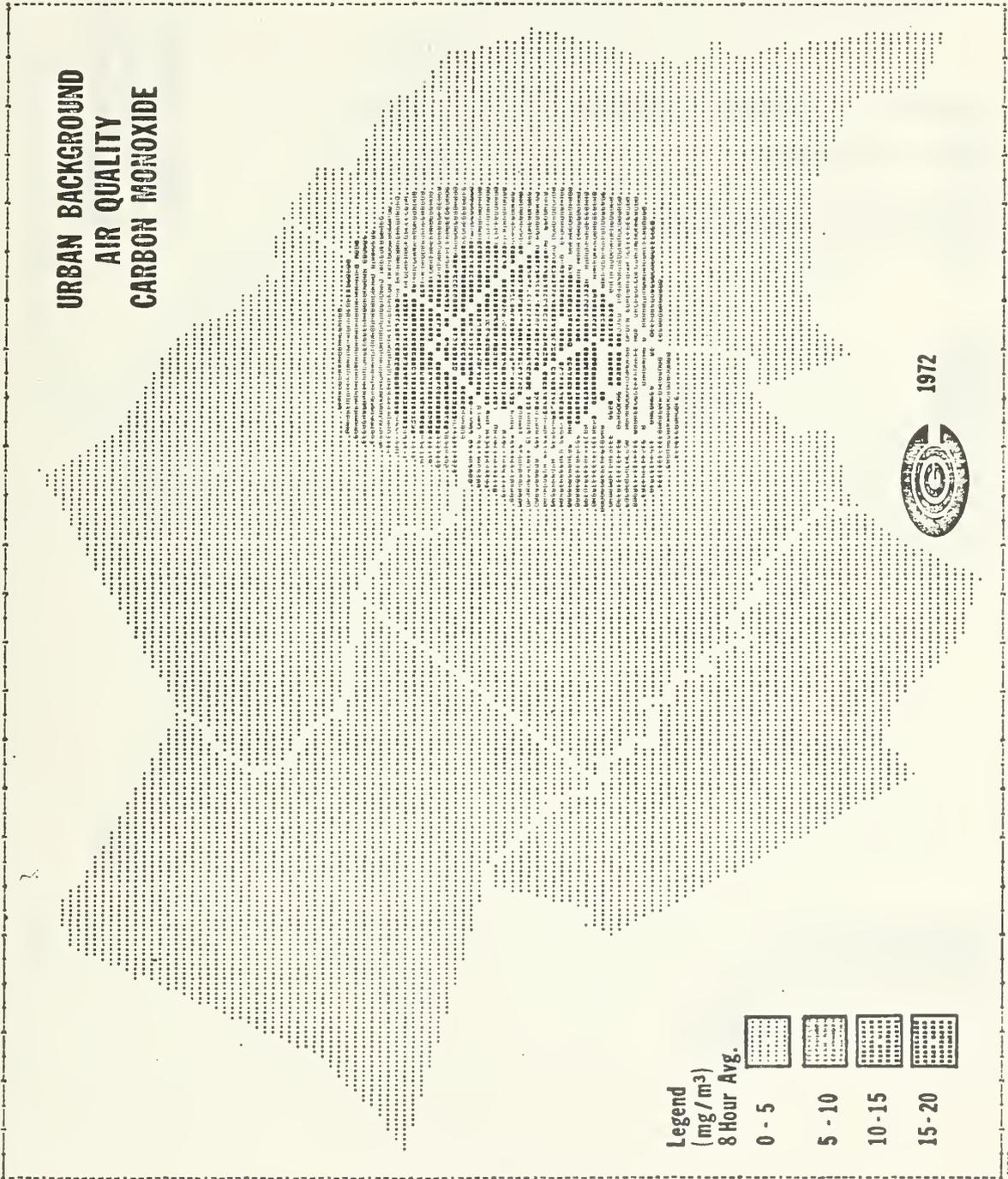
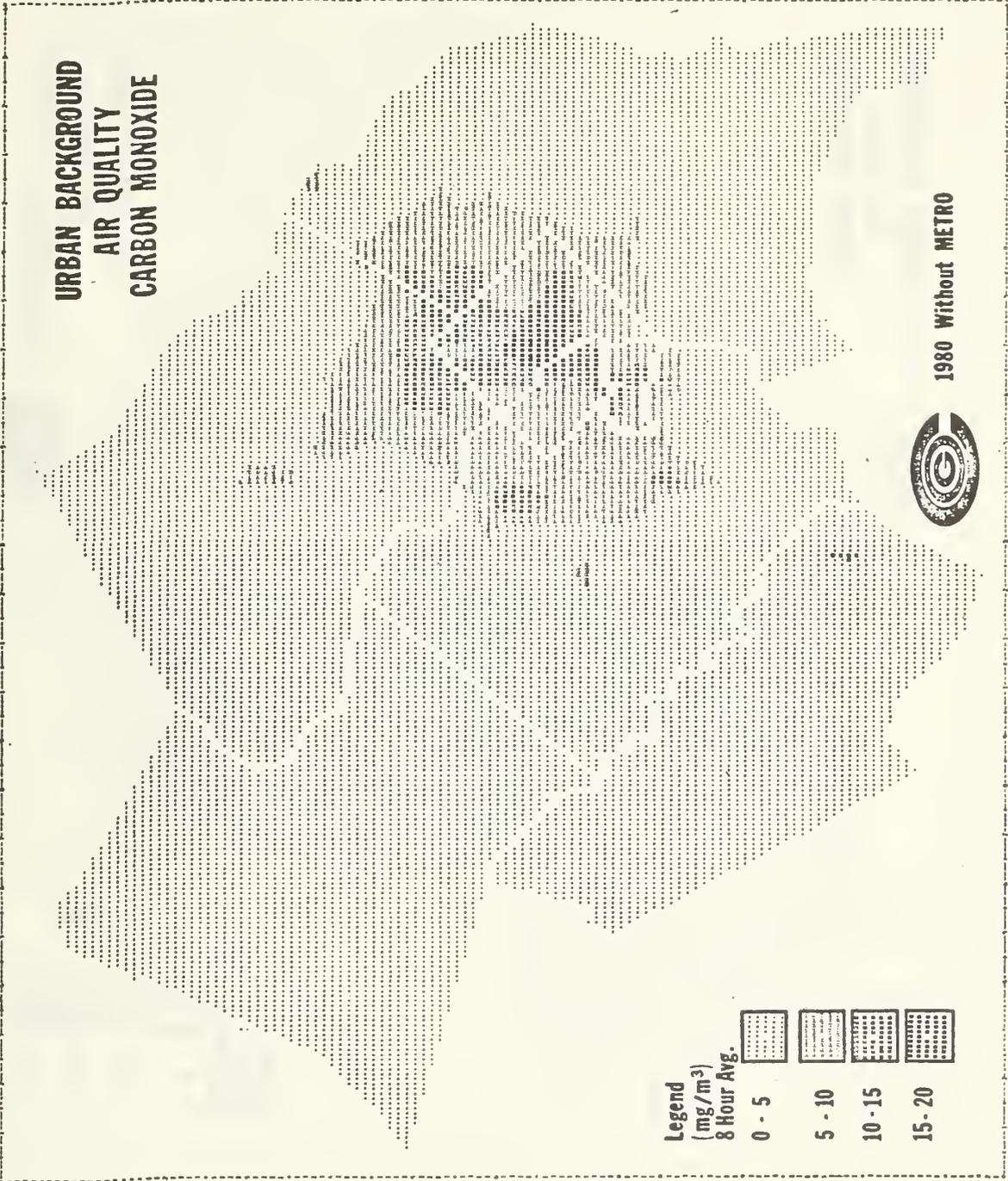


FIGURE 4

PERCENT REDUCTIONS IN CARBON MONOXIDE
AIR QUALITY WITH METRO OPERATION

	<u>1980</u>	<u>1992</u>
'Maximum CO Concentrations	-10%	- 9%
Area of Exposure	-35%	-45%
Households and Employment in Exposure Area	20%	40%

**URBAN BACKGROUND
AIR QUALITY
CARBON MONOXIDE**

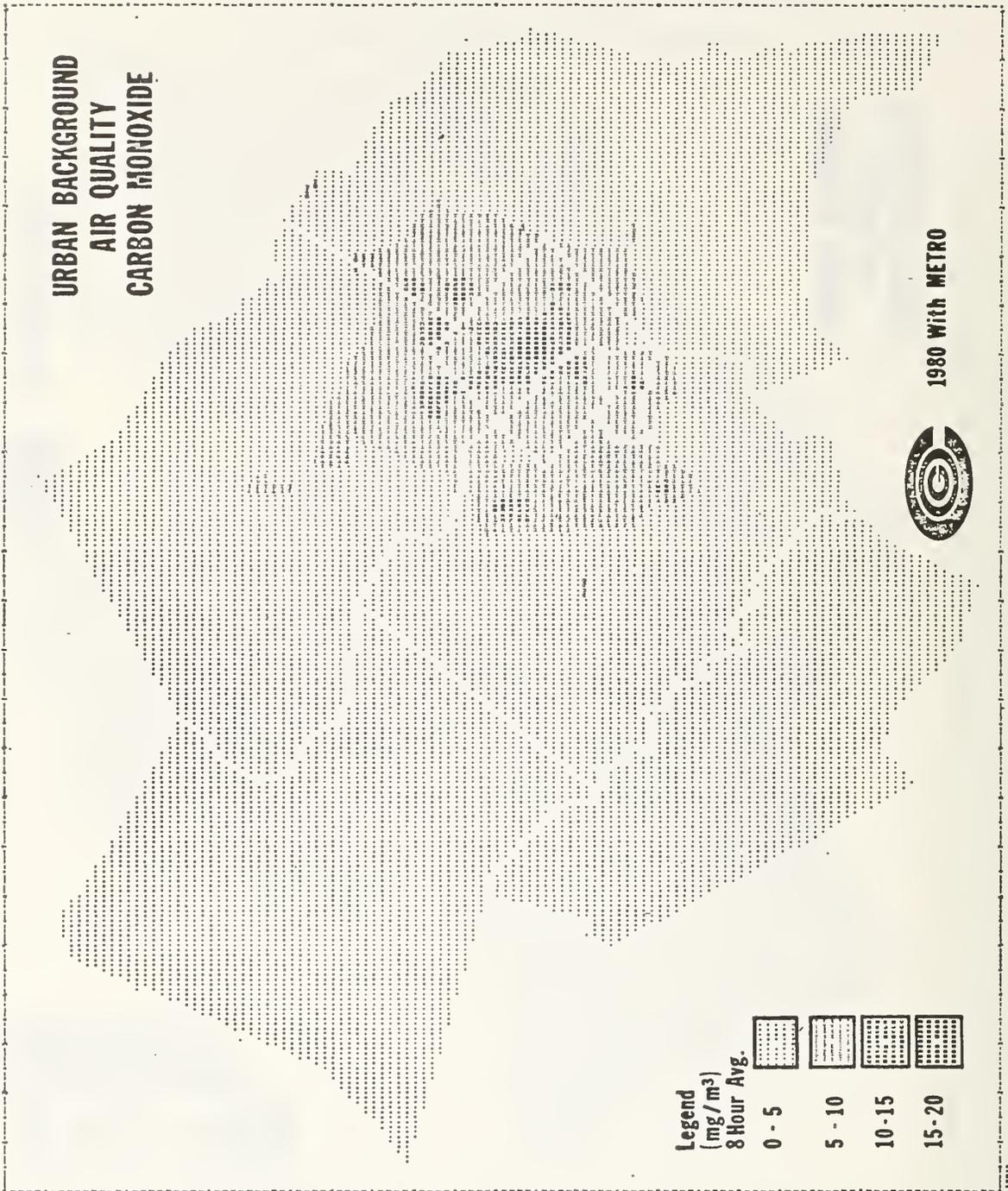


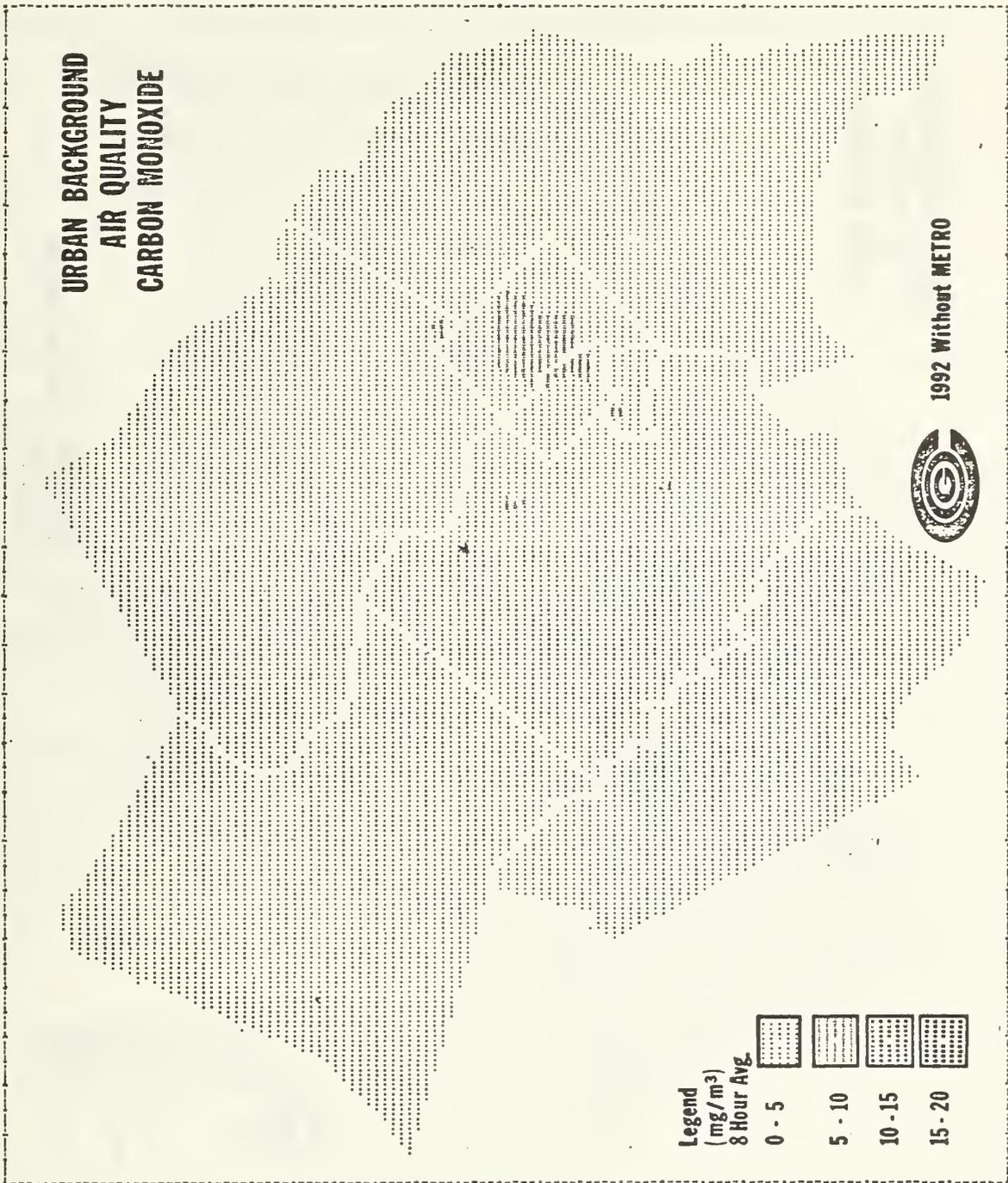
1980 Without METRO

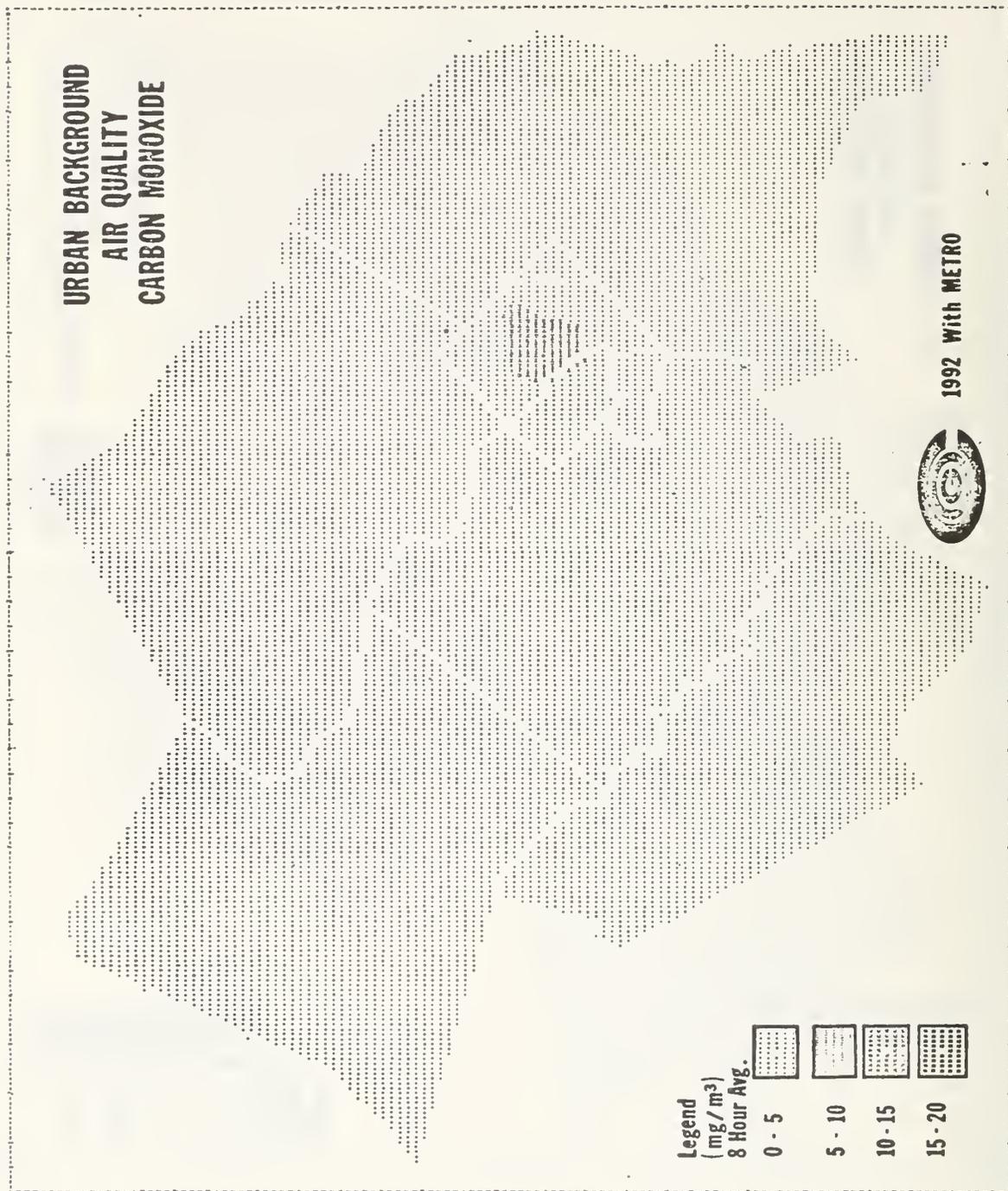
**Legend
(mg/m³)
8 Hour Avg.**

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20

FIGURE 6







The energy impacts of the Metrorail system were analyzed within the framework of the ground passenger transportation fuel demand sector, and fuel requirements were reduced to Btu equivalents to provide a basis of comparison between transportation modes and between fuel forms for the years 1980 and 1992.

The analysis shows that, assuming a completed Adopted Regional System for 1980 and 1990, total Btu's consumed will be 3.5 percent and 1.1 percent greater, respectively, with the Metrorail system than without the system, based on an assumed consumption of 1.2 billion kilowatt-hours by Metrorail in each of the forecast years.

The overall effect of the Metrorail system is to require the substitution of coal and oil used in production of electricity for gasoline and diesel fuel associated with the reduction of automobile and bus vehicle miles travelled. In effect, this represents the shift from a potentially scarce fuel (gasoline) for a more plentiful fuel (coal) in future years. In addition, the increase in use of nuclear generating facilities by PEPCO and VEPCO in future years will reduce the reliance on fossil-derived fuels for ground passenger transportation.

Systemwide Assumptions for Metrorail Evaluation

In this study, four basic travel demand estimates were developed to assess air quality impacts of Metrorail. These tests consider both short and long term impacts of the system. The transportation system assumptions used in calculating travel by mode and resulting emissions are presented below:

Test #1 -- Short-Range Assessment With METRO

Using 1980 regional activity allocation (population and employment), estimate travel if:

- Existing and committed (under contract) highways were in service and, the 98 Mile Adopted Regional Rail System (ARS) was in place¹

Test #2 -- Short-Range Assessment Without METRO

Using 1980 regional activity allocation (population and employment), estimate travel if:

- Existing and committed (under contract) highways were in service and transit operations were confined to route configurations and roadways as available in late 1974.¹

Test #3 -- Long-Range Assessment With METRO

Using 1992 regional activity allocation (population and employment), estimate travel if:

- The TPB Adopted Long-Range Transportation Plan (highway elements) were constructed and, the transit elements of the TPB adopted plan including METRO rail extensions to the 98 Mile ARS were in place.²

¹Assumes Phase III bus expansion program in service.

²Note that the "with" METRO rail test for 1992 includes proposed extensions to the ARS. While no 1992 test looked exclusively at the 98-mile system, previous work by COG/TPB indicates very small differences in mode usage and vehicle emission.

Test #4 -- Long-Range Assessment Without METRO

Using 1992 regional activity allocations (population and employment), estimate travel if:

--The TPB Adopted Long-Range Transportation Plan (highway elements) were constructed and, transit operations remained confined to levels of service provided in late 1974.

Basically, two of the four tests maintained current transit service levels while the two others assumed levels of transit service commensurate with short and long-range planning assumptions. The land use assumptions are those identified in the Alternative #6.2 (modified) allocations approved by COG and the TPB for planning purposes at the regional scale.

All of the transport assumptions and their calculated travel demand estimates, by mode, were evaluated in a consistent manner with approved TPB system evaluation methodology. Highway assumptions were developed cooperatively with state and local agencies. Base level of transit service was developed in computer format with data provided by WMATA Office of Planning staff. The major elements of the transit networks are shown in Figures 9 through 11 along with isochronal lines providing a comparative measure of level of service among the systems.

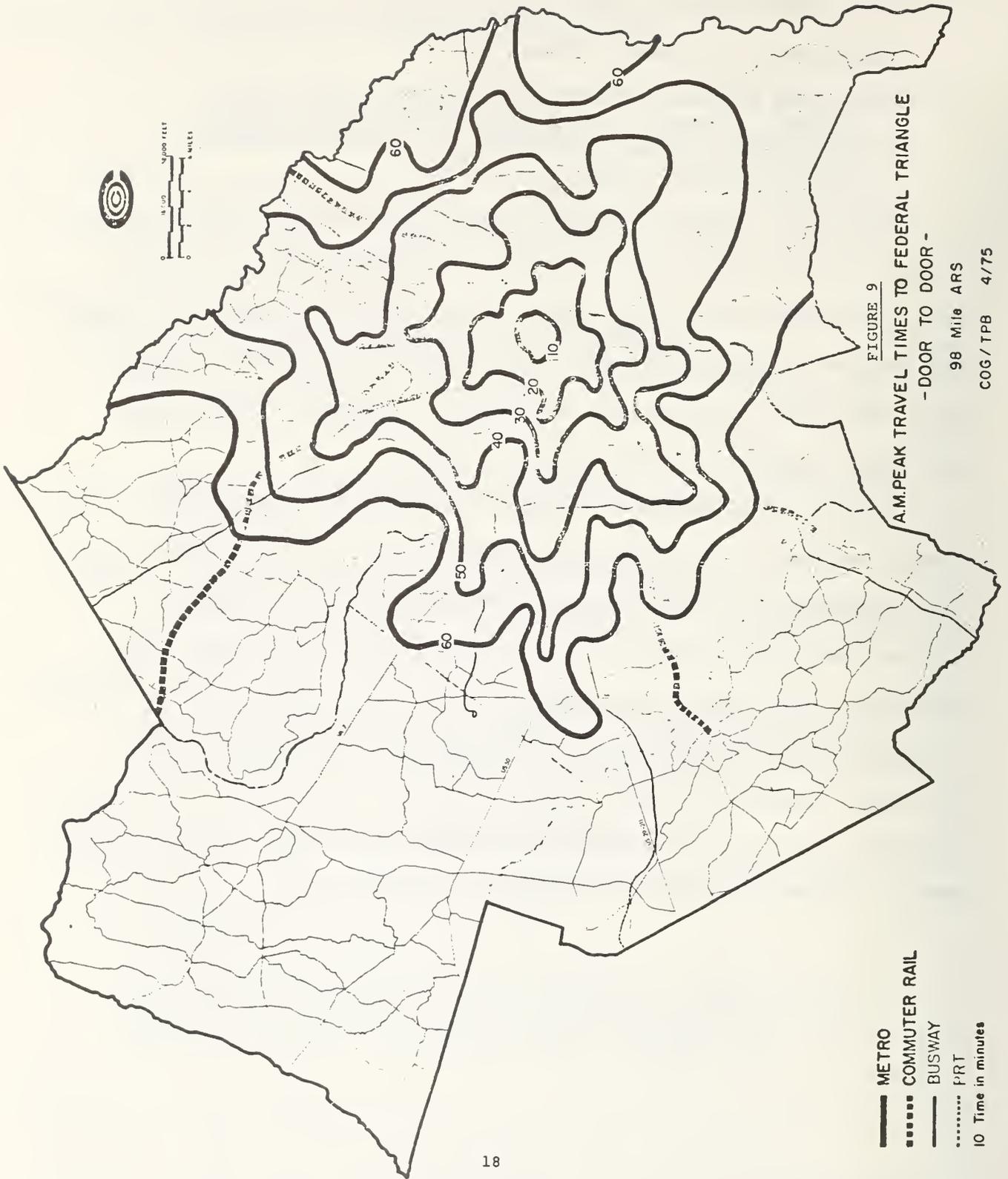


FIGURE 9
 A.M. PEAK TRAVEL TIMES TO FEDERAL TRIANGLE
 -DOOR TO DOOR -

98 Mile ARS
 COG / TPB 4/75

- METRO
- COMMUTER RAIL
- BUSWAY
- PRT
- 10 Time in minutes

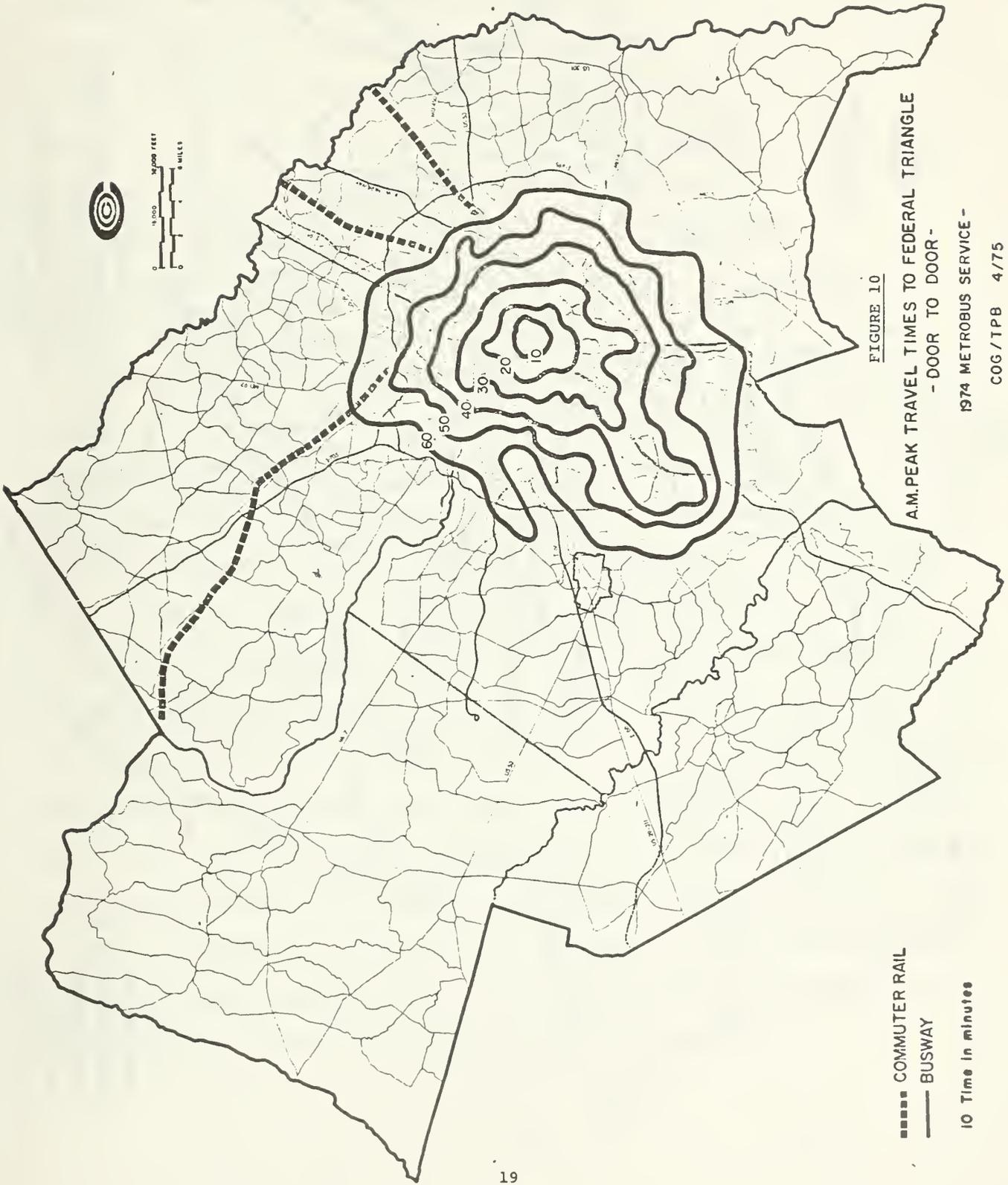


FIGURE 10
A.M. PEAK TRAVEL TIMES TO FEDERAL TRIANGLE
- DOOR TO DOOR -
1974 METROBUS SERVICE -

COG/TPB 4/75

----- COMMUTER RAIL
 _____ BUSWAY
 10 Time in minutes

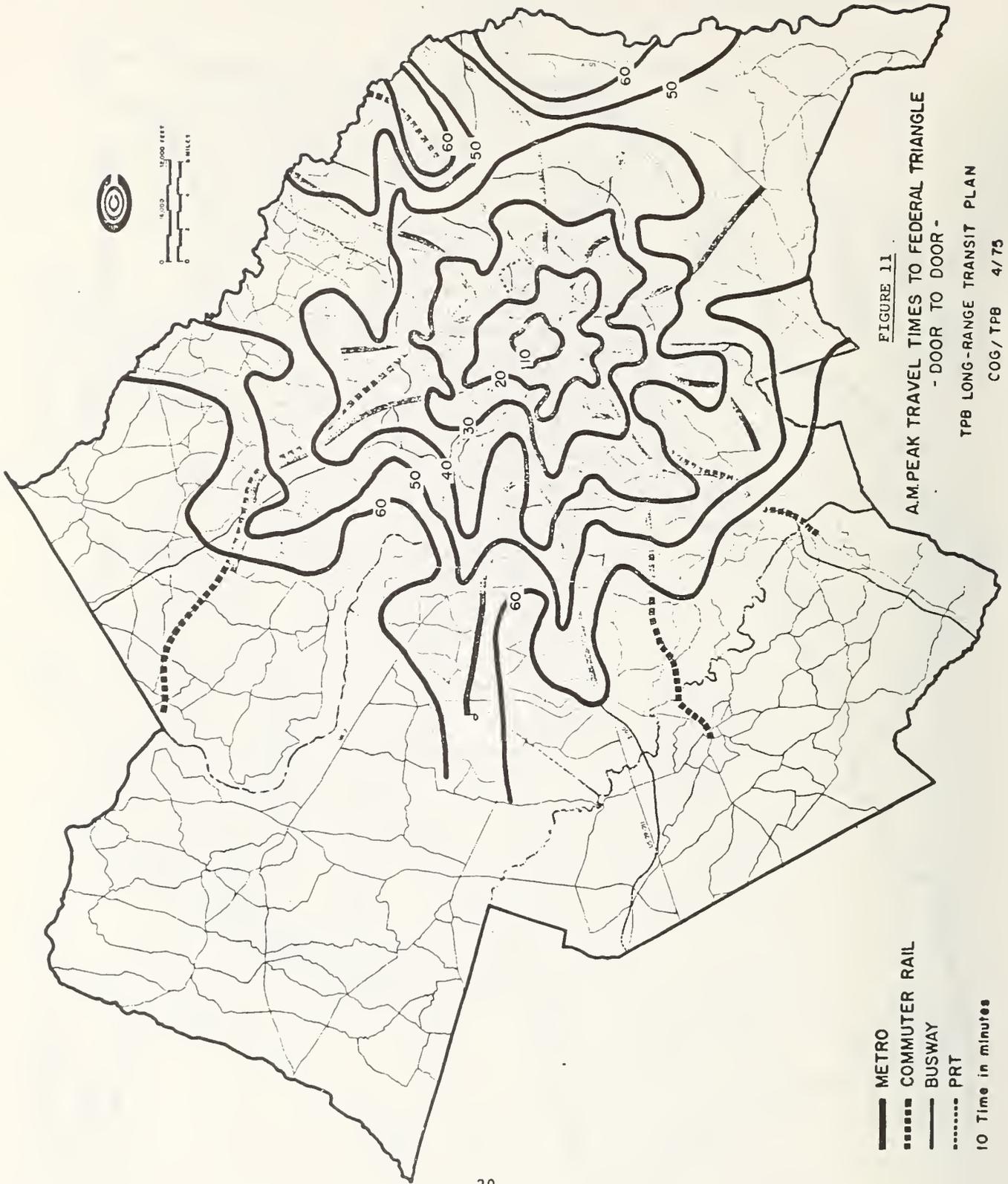


FIGURE 11
 A.M. PEAK TRAVEL TIMES TO FEDERAL TRIANGLE
 - DOOR TO DOOR -

TPB LONG-RANGE TRANSIT PLAN
 COG/TPB 4/75

- METRO
- - - - - COMMUTER RAIL
- BUSWAY
- · - · - PRT
- 10 Time in minutes

Travel Demand Forecasting Methodology

The methodology employed to develop travel estimates was similar to those techniques now being used by the Transportation Planning Board in testing long-range system alternatives. Through a sequence of mathematical models, trips were generated for specific land uses, distributed between origins and destinations, allocated to modes based on comparative measures of system performance and assigned to the linkages for modal estimates of travel and vehicle miles of travel (VMT) as in the case of highway demands.

Figure 12 depicts the process employed for developing estimates of future travel by mode required to calculate vehicle emissions for each test. Note that the transit estimates were for work trips only. However, total all-purpose vehicular travel, including trucks, was used to calculate emissions even though all these trips were not subjected to possible transit diversion in the travel forecasting estimates. Once the vehicular travel or VMT estimates were developed, they were then factored to specific time periods of the day to relate to air quality standards for particular pollutants. Adjustments were made in the auto and truck travel speeds on particular facilities based on estimated congestion levels developed in each test. This was done prior to calculating the emissions from the vehicle travel estimates. These estimates of travel included movements to and from external areas as well as those passing through the region by truck and auto.

Summary of Travel Demand Forecasts

Figure 13 provides a summary of the results of estimating modal split for work trips in each of the tests. The effects of the transit systems on CBD travel use are also shown. Note that even when the Metrobus service levels are held constant in the next five years, some increase in transit usage for work travel was projected. Transit captures a share of the CBD growth even though no significant improvements in service levels were provided. However, vehicular travel would still predominate in congested peak travel periods. It should be noted that due to limitations in the available transportation models, it is difficult to simulate passenger demand in equilibrium with an assumed level of service on a transit system.¹ Although the simulations for 1980 and 1992 indicate that the 1974 Metrobus service would continue to hold a relatively constant proportion of the commuter travel market, at some future point it would reach saturation unless additional buses were acquired or rescheduled to satisfy the demand.

Figure 14 depicts VMT estimates based on the travel demand forecasts previously discussed. Metrorail impacts are again mostly in the commuting hours, i.e., 6-9 AM. The auto driver work trips, normally exceeding the average likely trip length, are subject to extensive diversion to Metrorail.

¹ For energy calculations this equilibrium was assumed. See Chapter V.

FIGURE 13
Comparison of Work Trip Travel Forecasts

Trip Category	1980		1992		
	Test #1 Metrorail	Test #2 1974 Transit	Test #3 TPB Long-Range Transit Plan	Test #4 1974 Transit	Difference
<u>Home Based Regional Work Trips¹</u>					
--Person Trips	2,160,700	2,160,700	2,760,500	2,760,500	--
--Transit Trips	634,500	451,600	771,000	521,200	249,800
% Modal Split	29.4%	20.9%	27.9%	18.9%	9.0%
<u>Home Based Work Trips To and From Core Area²</u>					
--Person Trips	555,000	555,000	675,300	675,300	--
--Transit Trips	284,000	214,800	337,300	241,000	96,300
% Modal Split	51.3%	38.7%	49.9%	35.7%	14.2%
<u>Core Area Work Person Trips as % of Regional Total</u>	25.7%	25.7%	24.5%	24.5%	--
<u>Core Area Work Transit Trips as % of Regional Total</u>	44.8%	47.5%	43.7%	46.2%	2.5%

¹ Inside Cordon line -- Internal Trips Only

² D.C. Rings "0" and "1"; one-way trips

FIGURE 14

Comparison of Regional VMT Forecasts

VMT Category	1980		1992	
	Test #1 Metrorail	Test #2 1974 Transit	Test #3 TPB Long-Range Transit Plan	Test #4 1974 Transit
Regional Daily VMT (Autos, Taxis Only)	42,695,400	44,252,100	64,181,800	66,506,000
Regional 6-9:00 a.m. VMT (Autos, Taxis only)	7,036,200	7,615,800	10,583,600	11,578,700
Total Daily VMT For Region (All Vehicles)	48,093,800	49,667,000	72,132,200	74,554,100

The effect of Metrorail service on core-oriented work trips should be emphasized. These trips to downtown are most readily diverted to transit, and most related to urban air pollution levels. Trips in other areas of the region or at other times of the day are unlikely to be served by transit, and contribute proportionately less to pollution levels because of trip time and diffusion over larger areas.

As noted in Figure 13, METRO will lead to a 41% increase in transit work trips in 1980, and a 48% increase in transit work trips in 1992, both compared with no METRO for those years.

For work trips to the core, 1980 would see a 32% increase, and 1992 a 40% increase in transit trips with METRO as compared with the no build alternative.

Viewed in another light, METRO construction would attract approximately 69,000 transit work trips to the core in 1980, and 96,000 such trips in 1992, both over and above the non-METRO comparison. Assume for comparison an occupancy of 1.4 persons per vehicle, a peak-hour inbound to daily factor of 0.4, and per lane capacities on freeways of 1800 vehicles per hour and on arterials of 800 vehicles per hour. The equivalent highway lanes to handle core work trips potential to METRO but not to existing transit would be 6 lanes of freeway or 13 lanes of arterial for 1980, and 8 freeway lanes and 18 arterial lanes for 1992. (This, of course, assumes no residual highway capacity for those years).

IV. AIR QUALITY IMPACTS

The air quality impact analysis of the four tests--with and without METRO for 1980 and 1992--was performed in three steps:

(1) calculation of the emissions of the automobile-related pollutants, (2) application of a diffusion model to investigate concentrations of carbon monoxide (CO), and (3) assess the regional air quality impact.

EMISSION CALCULATION

Since, as pointed out earlier, land use patterns were held constant for all tests, the only variation in emissions would result from vehicular use under the highway and transit systems assumed for each test. Therefore, only emissions from autos and trucks were calculated.

The travel forecasts of trips and vehicle miles of travel (VMT) and average speeds for each test were input to the COG EMIS program (described in detail in Appendix A) which calculates auto hydrocarbons (HC) and carbon monoxide emissions for three phases of an auto trip:

1. Cold Start Emissions (HC, CO) -- those emissions which are emitted in the first few minutes of a trip when the car is operating less efficiently than when warmed up.
2. Running Emissions (HC, CO) -- those emissions which are emitted by a warmed-up, stabilized vehicle.
3. Hot Soak (HC only) -- the evaporation emissions which occur after engine shutdown and cooling off.

Emission factors, and speed and temperature corrections for each model year were obtained from latest EPA publications¹ and weighted to simulate the local vehicle age distribution. Calculations were made for each of the 134 planning districts shown in Figure 15. Cold start emissions were calculated from TPB district trip origins; running emissions from VMT by speed range; and hot soak emissions from TPB district trip destinations.

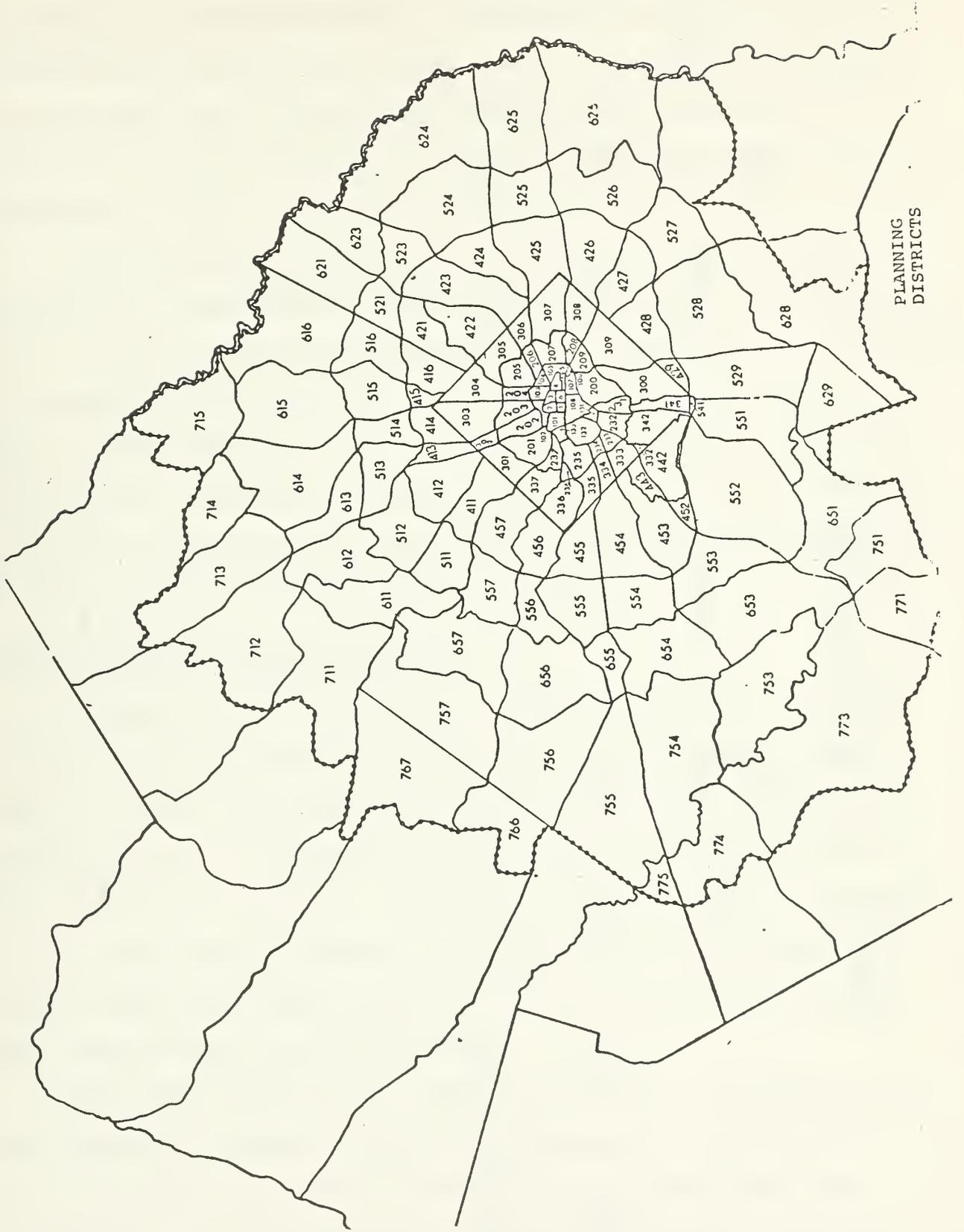
The time periods for HC emission calculations were 6 to 9 AM which is the same as that used in the state air quality implementation plans to achieve photochemical oxidant air quality standards. For CO the maximum one-hour standard of 40 mg/m³ and the maximum eight-hour standard of 10 mg/m³ were used. For impact analysis of the one- and eight-hour standards, CO emissions were calculated for the 8 to 9 AM and 2 to 10 PM time periods.

Summaries of auto and truck emissions by major jurisdictions are presented in Appendix B. Complete summary outputs for each of the 134 planning districts are presented in Appendix C. A comparison of emission differences between tests is summarized in Figure 16.

While the evaluation of the impact of the METRO rapid rail system is evidenced by a comparison of the tests with and without METRO in each study year, major differences between the two years also exist. These differences are a function of the major assumptions used in calculating emissions. Most importantly, the calculations assumed that the current regulations on new car

¹"Supplement No. 5 for Compilation of Air Pollutant Emission Factors," April, 1975.

FIGURE 15



PLANNING DISTRICTS

FIGURE 16

REGIONAL AUTO EMISSIONS
OF METRO ALTERNATIVES

	<u>1980</u>		<u>1992</u>	
	<u>without</u>	<u>with</u>	<u>without</u>	<u>with</u>
				<u>% decrease</u>
Hydrocarbons Tons /peak 3 hr. period	24.6	22.8	6.91	6.59
				4.6
Carbon Monoxide Tons /peak 8 hr. period	1170	1100	422	405
				4.0

emission standards will be met on schedule and that catalytic converters on new vehicles will be employed. Emissions from catalyst-equipped cars were assumed to be as sensitive to speed as 1972 model cars. It was also assumed that evaporative emissions (hot soak) will be reduced by 70% over current levels beginning in 1979.

Truck emissions were calculated according to EPA factors². Calculation of emissions by mode (cold start, etc.) is not possible due to a lack of data on truck emissions by trip phase. Distribution of VMT among truck types (light gasoline, heavy gasoline and heavy diesel trucks) was taken from "Characteristics of Heavy-duty Truck Travel in the National Capital Region" (COG, 1972). Emissions from heavy gasoline trucks were assumed to be reduced nationally by 55% for HC and 30% for CO beginning in 1979.

CARBON MONOXIDE DIFFUSION MODELING

In addition to the estimate of vehicular emissions of hydrocarbons and carbon monoxide in each test, an analysis of the impact on carbon monoxide air quality was conducted. Carbon monoxide is an air pollutant which may vary considerably from one area of a city to another. Therefore, it is necessary to determine not only the regional changes in CO emissions but the small area impacts across the region as well. An air pollution diffusion model was selected for this purpose.

This model simulates the diffusion of a gas emanating from an area over time, considering the wind speed and direction and the ability of the atmosphere to dilute the gas through diffusion (stability). The model has been successfully used in the region

²Ibid.

to simulate concentrations of other major non-reactive pollutants and has been verified against 1972 observed CO concentrations. (See Figure 17).

The CO air quality observed at a particular receptor consists of two components: (1) urban background; and (2) local source impact. The former is the impact of all sources in the general area of the receptor (0.5 to 5 miles) and represents the average air quality of the vicinity of the receptor excluding the impact of local sources of carbon monoxide. The second component is the impact of a roadway or intersection in the immediate vicinity of the receptor (500 feet or less). This local impact often has significant impact on the air quality of a receptor. To model the local impact, detailed data on highway loadings, roadway dimensions and configurations, adjacent building heights and micrometeorology are required. However, long-range forecasts are not available to this level of detail.

An analysis of the CO air quality impact in terms of the urban background was judged to be more consistent with this level of analysis. The urban background calculations indicate areas of CO concentration which could cause localized air quality standard violations of CO with the addition of local impacts.

Calculations of the urban background CO concentrations for each study year for tests with and without METRO were made for 1.5 mile grids for the peak hour. An air quality persistence factor of 0.6^3 was assumed for calculations of the maximum eight-hour average. This factor has been suggested for use by EPA in

³The persistence factor is the ratio of the maximum eight-hour concentration to the maximum one-hour concentration.

FIGURE 17

COMPARISON OF CARBON MONOXIDE
1972 OBSERVED AIR QUALITY AND
PREDICTED URBAN BACKGROUND

<u>Station</u>	<u>Observed Urban Background</u>	<u>mg/m³</u>	<u>Predicted Urban Background</u>
NIH	22		21
CAMP	37		30
SLIGO	21		16
HYATTSVILLE	12		14
SUITLAND	21		11
DC GENERAL HOSPITAL	25		19
ALEXANDRIA	15		15
SEVEN CORNERS	9		14
SHIRLINGTON	34		28

guidelines for indirect source review and confirmed for this region upon examination of 1973 one and eight-hour observed data for CO.

Figures 18 and 19 summarize the results of the CO diffusion model for 1980 and Figures 20 and 21 for 1992. Each map indicates areas of equal maximum eight-hour CO urban background for each test. The effects of a particular highway or intersection are not included in this modeling. Therefore, in most cases the measured level of CO at a street corner will be higher than the predicted urban background. Also, this model was run for 1973 auto and truck emissions and presented in Figure 3 in Section II.

AIR QUALITY IMPACT ASSESSMENT

In the metropolitan Washington region there are two major auto-related air pollution problems--photochemical oxidants and carbon monoxide. Photochemical oxidants, or smog as it is usually referred to, occurs as a major problem each summer. Since 1970, fourteen air pollution alerts have been called, each lasting from one to 10 days. Oxidants are a complex air pollutant. They are not emitted directly from tail-pipes or smoke stacks, but rather are formed in the atmosphere as the result of a complex chemical reaction. There are three principal ingredients necessary to create photochemical oxidants: (1) sunlight; (2) reactive hydrocarbons; and (3) oxides of nitrogen.

At the present time a technique or air quality model for predicting future concentrations of photochemical oxidants is not generally available. The present state of the art for predicting levels of oxidants over small areas and for specific time periods must be regarded in the research and development stage.

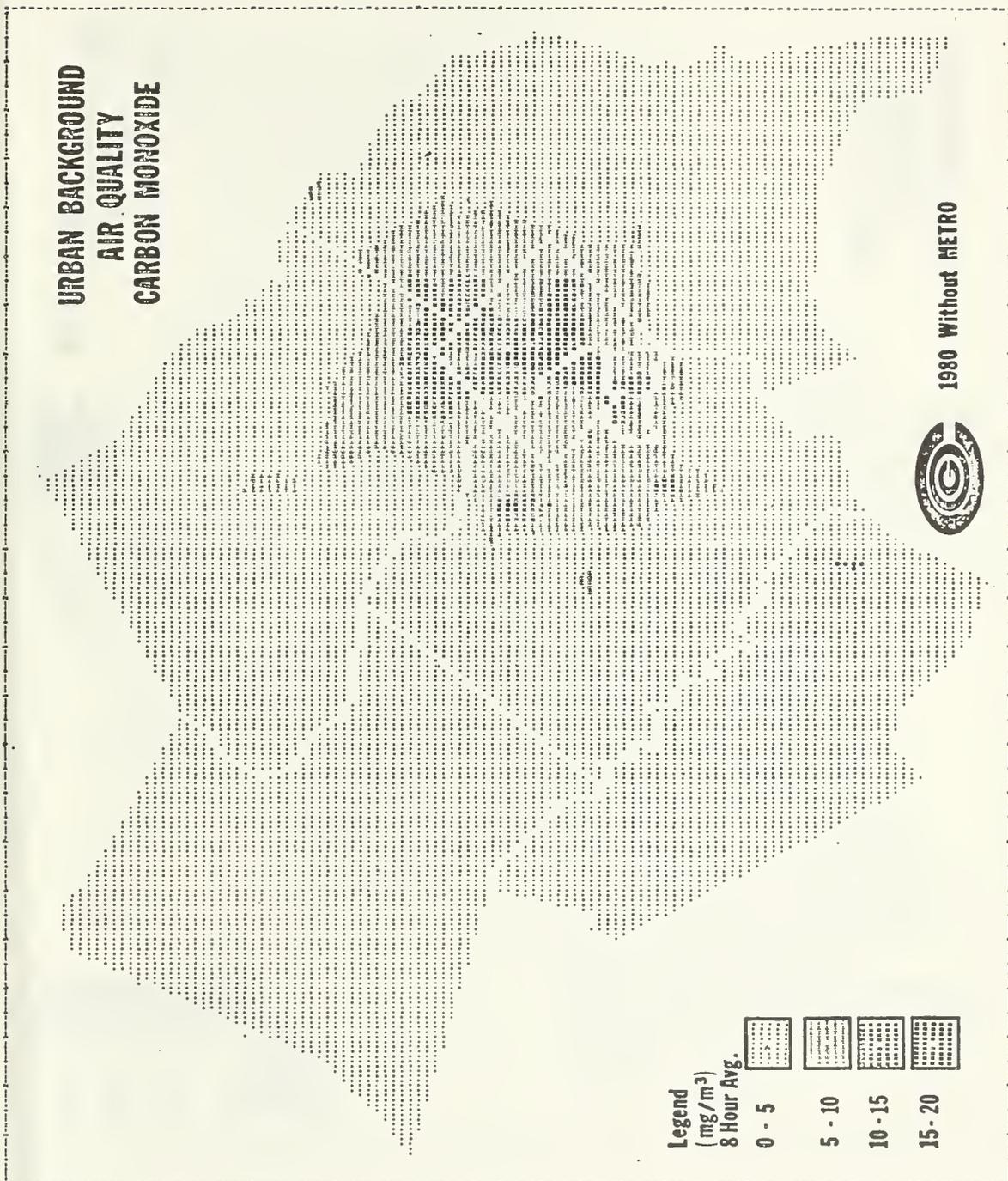


FIGURE 19

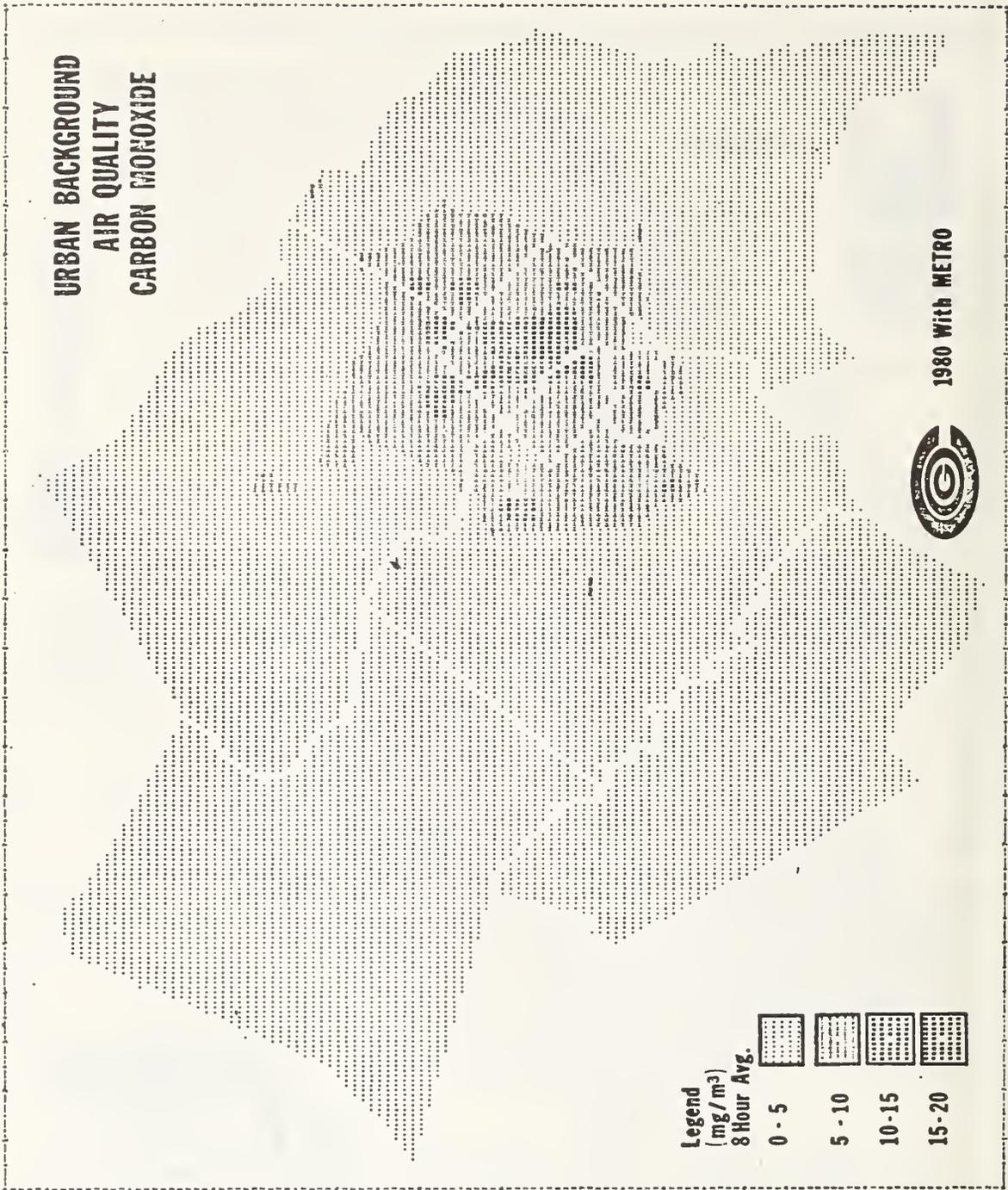


FIGURE 20

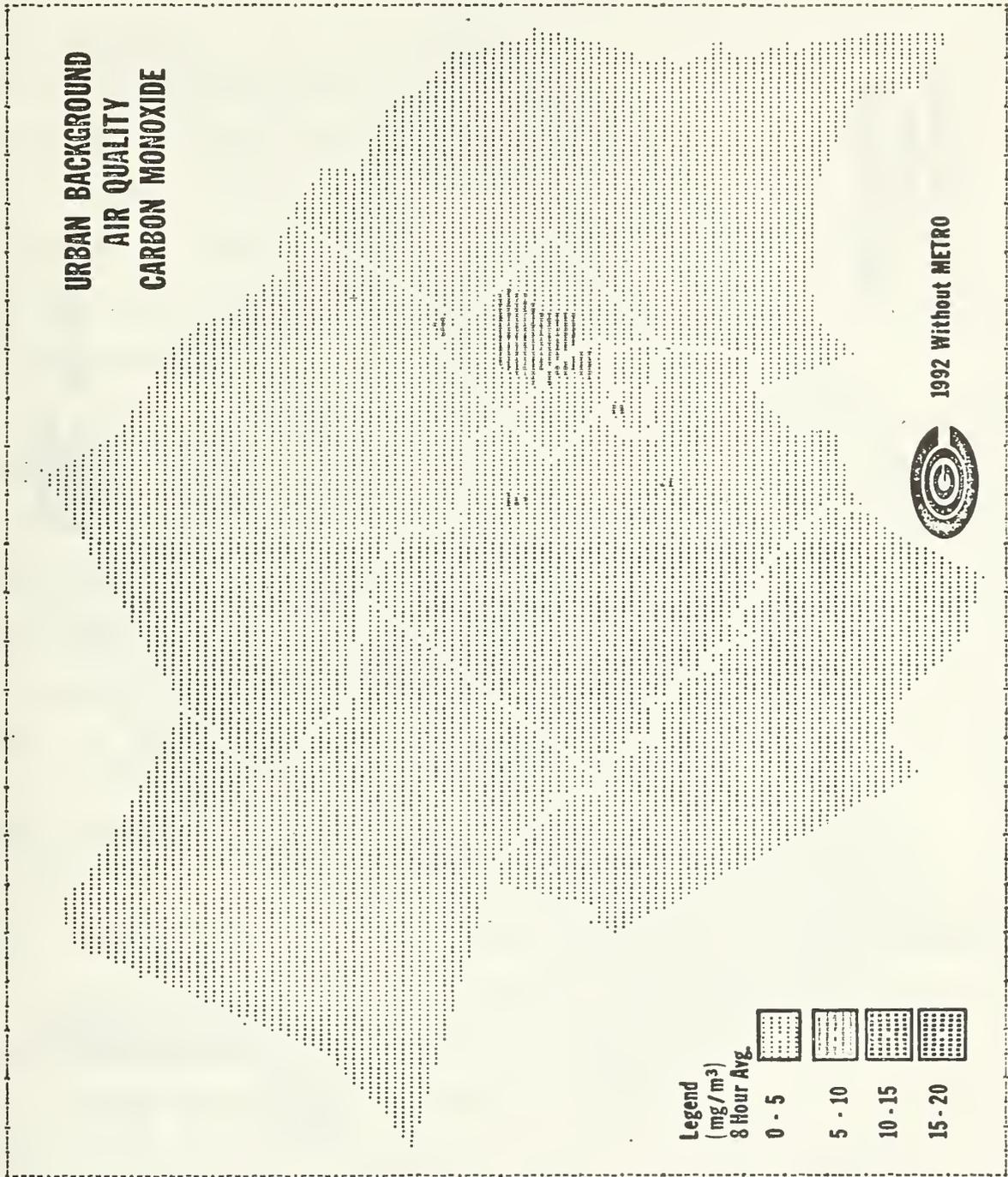
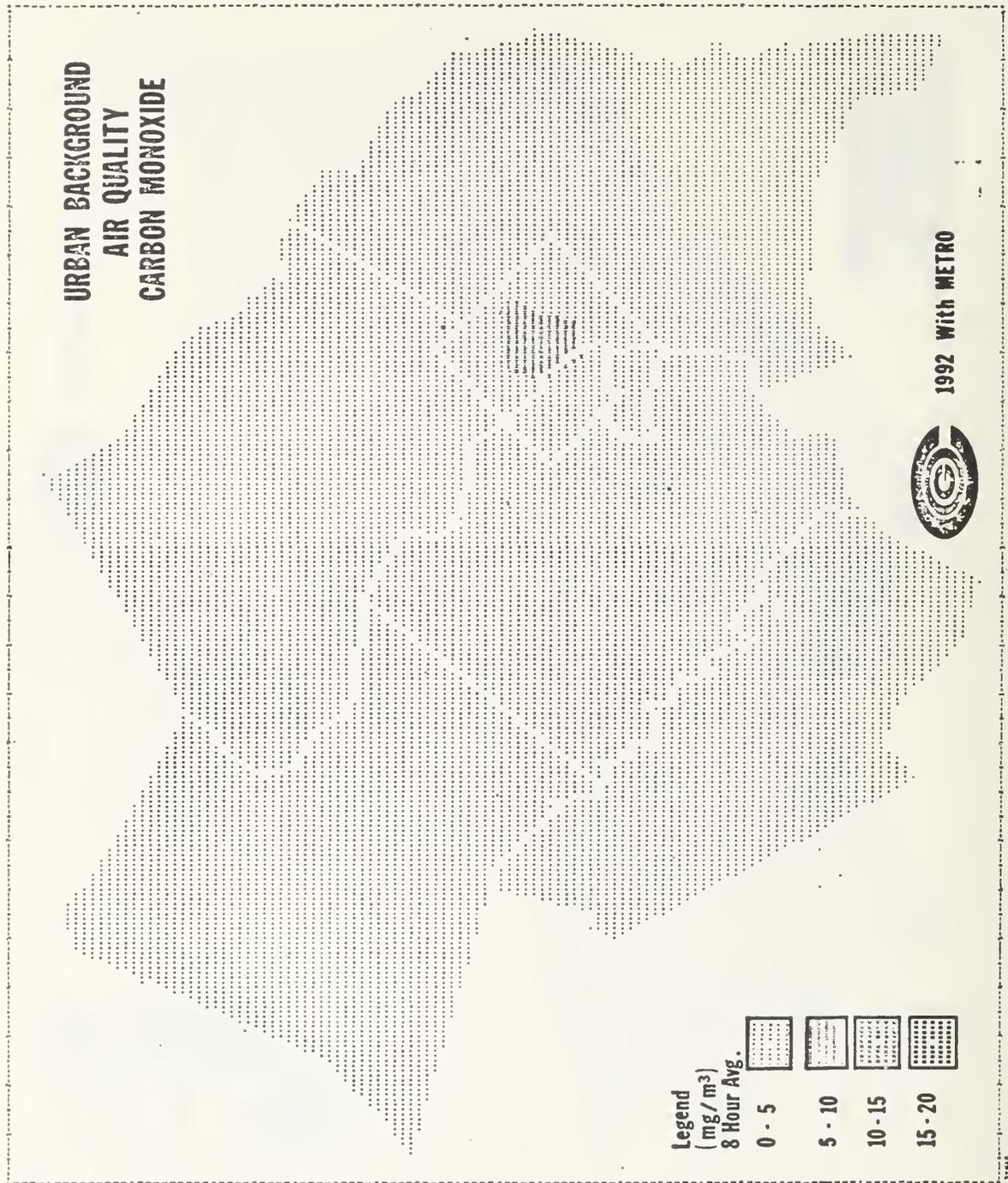


FIGURE 21



In 1972 each of the three states--working together through the National Capital Interstate Air Quality Planning Committee--submitted plans to achieve air quality standards for photochemical oxidants by 1977. With some additions and modifications, that plan has been promulgated by the EPA. Included in the plan were provisions to reduce auto hydrocarbon emissions by 12 percent. To accomplish this a \$2.00 a day surcharge on commuter parking, elimination of free commuter parking, addition of 750 buses, a car pooling service, and the creation of 150 miles of bikeways were recommended.

As shown in Figure 2 in Section II, METRO operation in 1980 would reduce HC auto emissions by about seven percent. This impact on regional HC emissions is considerable when compared to the 12% derived from implementation plans which included a large increase in the bus fleet coupled with stringent disincentives for auto use by commuters in 1977. Comparatively, METRO will significantly reduce the photochemical oxidant problem in the metropolitan region.

CARBON MONOXIDE

With the results of the carbon monoxide diffusion model, the impact on the region by geographical distribution can be determined.

In 1992 Figure 2 indicates regional emissions of CO will be reduced by about 4%. This emission reduction can be translated into an air quality impact by comparing Figures 18 and 19 which indicate those areas of the region which are at the threshold (5-10 mg/m³) of the eight-hour CO air quality standard (10 mg/m³). This comparison is presented in Figure 22. Operation of the METRO rapid rail system will reduce the size of that area by about 35%. The maximum concentrations in the region are reduced by 10%. The

FIGURE 22

PERCENT REDUCTIONS IN CARBON MONOXIDE
AIR QUALITY WITH METRO OPERATION

	<u>1980</u>	<u>1992</u>
Maximum CO Concentrations	-10%	- 9%
Area of Exposure	-35%	-45%
Households and Employment in Exposure Area	20%	40%

affected portions of the region are small geographically but represent about 20% of the region's households and jobs.

In a similar comparison of areas for CO eight-hour urban background for 1980, the size of the area in violation of the air quality standard is reduced by about 45%. The maximum concentration is reduced from 22 to 20 mg/m³--a 9% reduction. This portion of the region contains almost 40% of the region's households and jobs. In essence, with METRO, four out of ten people living and working in this metropolitan region in 1980 will have a reduced CO exposure. This represents a significant reduction in population exposure to levels of air quality which will exceed the air quality standards.

Introduction

In order to assess the energy impacts of the Metrorail system, the analysis performed in this section divides the metropolitan ground passenger transportation fuel demand sector into three components:

- 1) Motor gasoline demand attributable to private auto use in 1980 and 1992.
- 2) Diesel fuel demand attributable to the operation of the Metrobus fleet in 1980 and 1992.
- 3) Fossil fuel demands of utility companies attributable to electricity consumption of the Metrorail system in 1980 and 1992.

The basic energy unit of account utilized in this analysis is the British Thermal Unit (Btu), i.e., the unit of energy required to raise the temperature of one pound of water one Fahrenheit degree. Btu equivalent values of fuels utilized in the ground passenger transportation system are assumed to be as follows¹

Motor gasoline:	128,000 Btu/gallon
Diesel fuel:	139,000 Btu/gallon
Coal:	13,000 Btu/pound
Residual Oil:	150,000 Btu/gallon

Motor gasoline demand attributable to private auto operation is assumed to vary directly with Vehicle Miles of Travel (VMT), calculated in Chapter III. Diesel fuel demand is assumed to vary directly with bus miles travelled, whose derivation for 1980 and 1992 is discussed below. Electricity demand attributable to the operation of the rapid rail transit system is considered fixed for both 1980 and 1992 and has been provided by WMATA. Fuel demands created by the electricity requirements of the Metrorail system

¹ U.S. Department of Transportation, Characteristics of Urban Transportation Systems, May, 1974.

are estimated for fossil fuels only and are a function of the anticipated system characteristics and fuels mix of PEPCO and VEPCO in 1980 and 1992. All energy impacts are calculated on an annual basis. Peak daily and average daily electricity impacts have not been calculated due to lack of information, but will be performed if desired and if peak electricity demand information can be provided by WMATA.

Base Year Demand for Fuels Attributable to Private Auto and Metro-Bus Operation

Table I summarizes estimated fuel consumption attributable to private auto and Metrobus operations in 1973. Approximately 99.72×10^{12} Btu (gasoline) were consumed by private autos and 2.08×10^{12} Btu (Diesel fuel) by Metrobuses (excluding charter and contract service). Average fuel consumption rates of 13.5 mpg for autos and 3.1 mpg for Metrobuses were used in deriving these Btu equivalents.^{2, 3}

TABLE I

Estimated Annual Fuel Consumption Attributable To Private Automobile and Metrobus Operation, 1973

	<u>Auto</u>	<u>Metrobus</u>	<u>Total</u>
Vehicle Miles Travelled	10,517,368,000 ^a	46,300,000 ^b	
Gallons of Fuel Consumed	779,064,300	14,935.500	
Btu Equivalent (10^{12})	99.72	2.08	101.8

Sources:

- a MWCOG, Department of Transportation Planning
- b WMATA.

2 Motor Vehicle Manufacturer's Association, 1973/74 Automobile Facts and Figures, n.d.

3 WMATA.

Total energy consumption within the Washington, D.C. SMSA in 1973 is estimated to be 625.3×10^{12} Btu for all uses (including electricity generation) and for all fuel forms.⁴ Therefore, approximately 16.3 percent of all energy resources used as fuels in 1973 was consumed by private auto and Metrobus operation.

Annual Power Consumption Attributable to the Rapid Rail System, 1980 and 1992

Annual electricity consumption of the full Adopted Regional System (ARS) is critical to energy impact analyses of Tests 1 and 3 listed in Section III of this report. Annual requirements, which are assumed to be identical for both 1981 and 1992, have been provided by WMATA by utility company source and system purpose (See Table II).

Estimated herein is the proportion of annual utility system-wide electricity demand attributable to operation of the full rapid rail transit system. The methodology used is: (1) estimate system-wide electricity demand for 1980 and 1992 for the Potomac Electric Power Company and the Virginia Electric and the Virginia Electric and Power Company; (2) estimate the electricity demand attributable to the operation of the full rapid rail system; and (3) compute the proportion of annual electricity demand attributable to the operation of METRO as compared to the utilities' anticipated system-wide sales for 1980 and 1992.

The analysis considers electricity sales for the entire service areas of PEPCO and VEPCO, a portion of which may be

4 MWCOG, Energy Balance for the Metropolitan Washington Area for 1973, Unpublished manuscript to be released in summer, 1975.

"imported" for sale. Neither the Washington, D. C. area demand sector nor the Mid-Atlantic Area Council," or the Southeastern Electric Reliability Council electricity demand is separately considered. Demand estimates from WMATA, PEPCO and VEPCO are believed to be the best and most recent projections available. As previously mentioned, peak daily and average daily electricity impacts have not been calculated due to lack of information.

Projected PEPCO system-wide sales for 1980 are estimated to be 17,666,400 megawatt hours (mwh), and for 1992 are estimated at 30,588,100 mwh.⁵ Projected VEPCO system-wide sales for 1980 are estimated to be 54,150,000 mwh, and for 1992, 139,032,500 mwh. VEPCO's estimated sales are based on an internally generated estimate for 1979 and a compounded annual growth rate of 8.3 percent applied to the years 1980 through 1992.⁶

Annual electricity requirements attributable to full operation of the rapid rail transit system are assumed to be identical for both 1980 and 1992. It is estimated by WMATA that 87.8 percent, or 1,079,700 mwh, of its annual electrical requirements will be supplied by PEPCO and that the remaining 12.2 percent, or 149,500.4 mwh will be supplied by VEPCO.⁷

Annual electric power requirements for 1980 and 1992 by utility company source and purpose are summarized in Table II, below.

5 Potomac Electric Power Company, Research Division.

6 Virginia State Corporation Commission, Testimony of Stanley Regone, Virginia Electric and Power Company, March 24, 1975.

7 WMATA

TABLE II

Annual Electric Power Requirements, 1981 and 1992,
by Utility Company Source and Purpose (in kwh)

<u>PURPOSE</u>	<u>PEPCO</u>	<u>VEPCO</u>	<u>TOTAL</u>
Passenger Stations	569,982,564	13,903,124	583,885,688
Traction	431,531,089	113,857,288	545,388,377
Chiller Plants	37,660,334	4,216,000	41,876,334
Miscellaneous	40,536,000	17,520,000	58,056,000
	<hr/>	<hr/>	<hr/>
TOTAL	1,079,709,987	149,496,412	1,229,206,399
	12	12	12
Btu Equivalent	3.685 x 10	0.510 x 10	4.195 x 10

The estimated proportion of system-wide electricity demand attributable to operation of the rapid rail transit system is obtained by dividing estimated sales to WMATA by the estimated utility system-wide sales. The computed proportions for PEPCO and VEPCO and for both systems combined are reported in Tables III and IV, below.

TABLE III

Estimated Annual Proportion of Electricity Sales
Attributable to WMATA Rapid Rail Operation, 1980

	<u>Estimated Sales to WMATA (Megawatts)</u>	<u>Estimated Utility Systemwide Sales (Megawatts)</u>	<u>WMATA Percentage of Utility Sales</u>
PEPCO	1,079,700	17,666,400	6.11%
VEPCO	149,500	54,140,000	0.28%
Total	1,229,200	71,816,400	1.71%

TABLE IV

Estimated Annual Proportion of Electricity Sales
Attributable to WMATA Rapid Rail Operation, 1992

	Estimated Sales to WMATA (Megawatts)	Estimated Utility Systemwide Sales (Megawatts)	WMATA Proportion of Utility Sales
PEPCO	1,079,700	30,588,100	3.53%
VEPCO	149,500	139,032,500	0.11%
Total	1,229,200	169,620,600	0.72%

Incremental Fuel Consumption, 1980 and 1992, Attributable to Operation
of Metrorail System

A. Auto Driver/Taxi Travel

The operation of the rapid rail system in 1980 and 1992 is estimated to result in a gasoline savings of 37,360,000 gallons (4.78 x 10¹² Btu) in 1980 and 44,881,000 gallons (5.74 x 10¹² Btu) in 1992. Tables V and VI summarize the derivation of these estimates.

B. Metrobus Operation

Operation of the full rapid rail system in 1980 and 1992 is estimated to result in a reduction (compared to the no-transit alternatives) of 5,202,400 gallons (.723 x 10¹² Btu) and 8,879,800 gallons (1.235 x 10¹² Btu) respectively. Miles travelled by Metrobuses assuming no rapid rail system (tests 2 and 4) have been proportionally increased from 1973 levels to reflect increased transit ridership implied by transit demand forecasts. Table VII below, details the assumptions underlying the derivation of these figures.

TABLE V

Energy Requirements for Auto Driver and
Taxi Travel, All Trip Purposes, 1980

	Test 1	Test 2	
	<u>With Metro</u>	<u>Without Metro</u>	<u>Difference</u>
Daily			
Auto VMT	42,695,400	44,252,100	1,556,700
Gasoline Consumed (gal.)	3,049,700	3,160,900	111,200
Btu (10 ¹²)	0.390	0.404	0.014
^c <u>Annual</u>			
Auto VMT	14,345,654,000	14,868,706,000	523,052,000
Gasoline Consumed ^a (gal.)	1,024,690,000	1,062,050,000	37,360,000
Btu (10 ¹²) ^b	131.16	135.94	4.78

Assumptions:

- a Gasoline consumed at average rate of .0714 gpm, or 14.0 mpg.
- b One gallon gasoline = 128,000 Btu.
- c Annual factor = 336 x average daily VMT.

TABLE VI

Energy Requirements for Auto Driver and
Taxi Travel, All Trip Purposes, 1992

	Test 3	Test 4	
	<u>With Metro</u>	<u>Without Metro</u>	<u>Difference</u>
<u>Daily</u>			
Auto VMT	64,181,800	66,506,000	2,324,200
Gasoline Consumed (gal.)	3,688,600	3,822,200	133,600
Btu (10 ¹²)	0.472	0.489	0.017
<u>Annual</u> ^c			
Auto VMT	21,565,085,000	22,346,016,000	780,931,000
Gasoline Consumed ^a (gal.)	1,239,373,000	1,284,254,000	44,881,000
Btu (10 ¹²) ^b	158.64	164.38	5.74

Assumptions:

- a Gasoline consumed at average rate of .0575 gpm, or 17.4 mpg.
- b One gallon gasoline = 128,000 Btu.
- c Annual factor = 336 x average daily VMT

TABLE VII

Incremental Fuel Consumption Attributable to
Operation of METRO Bus Fleet

	<u>Without Metrorail</u>	<u>With Full Metrorail</u>	<u>Difference</u>
<u>1973:</u>			
Miles Travelled	46,300,000 ^a	- -	- -
Fuel Consumed ^c (gal.)	14,935,500	- -	- -
Btu (10 ¹²)	2.076	- -	- -
<u>1980:</u>			
Miles Travelled	74,700,000 ^h	58,572,500	16,127,500
Fuel Consumed ^c (gal.)	24,096,800	18,894,400	5,202,400
Btu (10 ¹²)	3,349	2.626	0.723
Btu @ 3.5 mpg ^d	- -	2.326	
<u>1992:</u>			
Miles Travelled	86,100,000 ^b	58,572,500	27,527,400
Fuel Consumed ^c (gal.)	27,774,200	18,894,400	8,879,800
Btu (10 ¹²)	3,861	2,626	1,235
Btu @ 3.5 mpg ^d	- -	2,326	

Assumptions and Sources for Table:

- a WMATA.
- b MWCOG. Level of bus service is increased proportionally to meet demand implied by transit demand forecasts.
- c Constant 3.1 mpg throughout all time periods.
- d U.S. Department of Transportation, Characteristics of Urban Transportation Systems, May, 1974, Table C-3, p. C-5. Typical for GMVG-71 Diesel Buses in Urban Areas.

C. Fuel Consumption Attributable to Electricity Demands of the Rapid Rail System, 1980 and 1992

As reported above, the annual electricity consumption for the Adopted Regional System is estimated by WMATA to be approximately 1.2 billion kwh. Utility fuel requirements to generate this amount of electricity are calculated as follows:

1) Estimated kilowatt-hour consumption of Metrorail operations is multiplied by 3,413, the Btu heating value equivalent of one kwh of electricity to obtain a Btu equivalent for delivered electrical energy.

2) The delivered Btu equivalent is multiplied by a factor of three, to account for waste heat and system losses.⁷

3) Fossil fuel requirements in Btu's are determined by multiplying the required input fuel in Btu's by the percentage of each utility system's input fuel form fractions in 1980 and 1992 for maximum generation. (see Table VIII.)

These estimates are based upon utility company submissions to the Federal Power Commission and do not reflect possible future conversion requirements which may be mandated under Federal law. Sources other than coal and residual oil--principally nuclear and hydroelectric--are excluded from this analysis, which is confined to conventional fossil fuels.

4) Fuel equivalents in Btu's are transformed into fuel quantities according to the following conversions:

Coal: 13,000 Btu per pound
Oil: 150,000 Btu per gallon

7 MWCOG, Energy Balance for the Metropolitan Washington Area for 1973, unpublished manuscript to be released in Summer, 1975.

5) Assuming that this system-wide fuels mix is applicable to METRO electricity consumption, Table IX, below, summarizes 1980 and 1992 fossil fuel requirements. (It should be noted that these estimates are derived from the fuel mix at peak operation and that, in practice, there may be considerable latitude for fuel form substitution in utility operation.)

TABLE VIII

Percentage of Maximum Generating Capacity Attributable to Fossil Fuel by Fossil Fuel Type

1980 and 1992

	<u>Percent Maximum Generation Coal</u>		<u>Percent Maximum Generation Residual Oil</u>	
	<u>1980</u>	<u>1992</u> ^a	<u>1980</u>	<u>1992</u> ^a
VEPCO	17.6%	14.4%	48.4%	31.6%
PEPCO	60.4%	34.9%	39.6%	39.1%

a . Based upon 1985 fuels mix at maximum generation capacity. Other fuel sources not included.

Sources: MAAC Systems Plans (As of Dec. 31, 1974), Mid-Atlantic Area Council, April 1, 1975.

Southeastern Electric Reliability Council, Coordinated Bulk Power Supply Program, 1975-1984, April 1, 1975.

TABLE IX

Fuels Mix by Utility System Required to Generate
Electricity for Operation of Metro Rail System,
1980 and 1992

1980

	<u>Coal (tons)</u>	<u>Residual Oil (gallons)</u>
PEPCO	256,820	29,185,593
VEPCO	10,362	4,939,038
	<hr/>	<hr/>
Total	267,182	34,124,631

1992

^a

	<u>Coal (tons)</u>	<u>Residual Oil (gallons)</u>
PEPCO	148,394	28,817,088
VEPCO	8,478	3,224,661
	<hr/>	<hr/>
Total	156,872	32,041,749

a Based on 1985 Fuels Mix at maximum generation capacity.

D. Conclusions

Tables X and XI below summarize the 1980 and 1992 level of fuel consumption devoted to the ground passenger transportation system with and without Metrorail operation. In 1980 operation of the Metrorail system will reduce gasoline and diesel fuel consumption by 5.5×10^{12} Btu and will be offset by an increased requirement of 12.1×10^{12} Btu for electricity generation. In 1992 gasoline and diesel fuel requirements will be reduced by 6.9×10^{12} Btu and offset by an increased fossil fuel requirement of 8.9×10^{12} Btu for electricity production.

TABLE X

Fuels Consumption for Ground Passenger Transportation,
Washington Metropolitan Area, 1980,
With and Without Metrorail System

Mode	Gasoline (Million gallons)		Diesel Fuel (Million gallons)		(No. 6 Oil) Residual Oil (Million gallons)		Coal (1000 tons)	
	With	Without	With	Without	With	Without	With	Without
Automobile	1024.7	1062.1	--	--	--	--	--	--
Bus	--	--	18.9	24.1	--	--	--	--
Rapid Rail	--	--	--	--	34.1	--	267.2	--
Diff. with METRO	-37.4		-5.2		+34.1		+267.2	
Percent change with METRO	- 3.5%		- 21.6%		--		--	
Btu equivalent in 1012	- 4.8		-0.7		+ 5.1		+ 6.9	

Conversion from Btu to Fuels:

Coal = 13,000 Btu/lb

No. 6 Oil = 150,000 Btu/gallon

TABLE XI

Fuels Consumption for Ground Passenger Transportation,
Washington Metropolitan Area, 1992,
With and Without Metrorail System

Mode	Million Gallons Gasoline		Million Gallons Diesel Fuel		Million Gallons Residual Oil		(1000 tons) Coal	
	With	Without	With	Without	With	Without	With	Without
Automobile	1,239.4	1,284.3	--	--	--	--	--	--
Bus	--	--	18.9	27.8	--	--	--	--
Rapid Rail	--	--	--	--	32.0	--	156.9	--
Diff. with METRO	-44.9		-8.9		+32.0		+156.9	
Percent change with METRO	- 3.5%		-32.0%		--		--	
Btu Equivalent (10 ¹²)	- 5.7		-1.2		+ 4.8		+ 4.1	

Conversion from Btu to Fuels:

Coal = 13,000 Btu/lb

Oil = 150,000 Btu/gallon

Qualitatively, operation of the Metro rail system will shift ground passenger transportation fuel requirements away from motor gasoline and diesel fuel to coal and residual oil. To the extent that the utilities can in the future make use of non-fossil fuels, this qualitative judgment can be modified accordingly. It should be pointed out, too, that the estimates of fuel consumption, both by motor vehicles and in electricity generation, are highly sensitive to such variables as vehicle efficiency, Btu equivalent values of fuels, and the future fuels mix utilized by utility companies. Because VMT estimates vary so little with and without METRO, alteration of the critical assumptions entering into this analysis could significantly alter or even reverse the summary conclusions reported. Table XII below summarizes the overall impacts on a Btu accounting basis of the energy impacts of METRO for 1980 and 1992 using the best available information and most reasonable assumptions.

TABLE XII

Estimated Btu Equivalent Fuels Consumption for
Ground Passenger Transportation System,
Washington Metropolitan Area, 1980 and 1992

(in 10^{12} Btu)

	<u>1980</u>		<u>1992</u>	
	<u>With METRO</u>	<u>Without METRO</u>	<u>With METRO</u>	<u>Without METRO</u>
Automobile	131.16	135.95	158.64	164.39
Bus	2.63	3.35	2.63	3.86
Rail (Oil)	5.12	--	4.80	--
Rail (Coal)	<u>6.95</u>	<u>--</u>	<u>4.08</u>	<u>--</u>
Total	145.86	139.30	170.15	168.25
Increase, with METRO	4.7%		1.1%	

This work is based on an auto VMT reduction of 3.5% in 1980 and 1992 and is based on land use assumptions contained in COG's "6.2 Modified" projections of future allocations of households and employment. As pointed out earlier in Section II, this assumed land use pattern is not necessarily that which is most likely to result from the completion of the Metrorail system.

Preliminary tests performed by COG in conjunction with an analysis of the energy implications of future land use alternatives indicates that total VMT could be reduced by 15% below the VMT resulting from 6.2 Modified projections, assuming a land use pattern consisting of the incremental growth of households and employment locating in balanced communities in Metrorail corridors, and concentrated at transit stations. Such an assumption would significantly alter the conclusions of the energy impact analysis, and would, in fact, result in a total Btu consumption considerably less than the "without Metrorail" cases for 1980 and 1992. That is to say, total energy consumption is highly sensitive to auto VMT--for each reduction of 1,000,000 miles daily VMT, total Btu's are reduced by about 3.0×10^{12} .

In addition to the regional level analysis included herein, a further study that should be considered is an analysis of the energy efficiency of the Metrorail system, compared to equivalent trips made by automobile and by bus. This analysis would require data on passenger-miles for each mode.

APPENDICES

APPENDIX A

The COG EMISS program calculates emissions from automobiles for any study year. The model goes beyond standard EPA calculation techniques in an attempt to provide more detailed data on the emissions from a typical auto trip by accounting for the "cold start" emissions associated with the beginning of each trip and the "hot soak" (hydrocarbons only) evaporative emissions at the trip end. Estimation of the cold start emissions is particularly important since that portion of the trip is expected to account for 50 to 70 percent of total auto emissions for post-1974 models.

Auto emissions are calculated using a FORTRAN program containing the following equations:

1) Auto Emissions = Cold Start Emissions + Running Emissions + Hot Soak Emissions (HC only)

2) Cold Start Emissions =
$$\sum_{i=N}^{N-13} C_i C_i^P (N-i+1) 7.5 T_O$$

3) Running Emissions =

$$\sum_{i=N}^{N-13} (1-G)_i C_i^P (N-i+1) \sum_{J=1}^{60} S(i,j) M(S) + b_i P_{N-i} \sum_{J=1}^{60} M_j$$

4) Hot Soak Emissions (HC only) =
$$\sum_{i=N}^{N-13} 7.5 V_i P_{N-i+1} T_D$$

Where: N = Calendar year of study
C = Exhaust emission factor
i = Model year
P = Percent VMT by model year
G = Cold start emissions as percentage of total exhaust emissions as measured in federal test cycle (CVS-CH)
S = Speed Corrector Factor
J = Route Speed (MPH)
M = Vehicle miles travelled (VMT)
b = Blow-by Emission Factor
v = Evaporative Emission Factor
T_O = Number of Trip Origins
T_D = Number of Trip Destinations

All emission and correction factors are based on the latest EPA publication "Supplement No. 5 for Compilation of Air Pollutant Emission Factors--Second Edition" (April, 1975).

APPENDIX B

AIR QUALITY MAINTENANCE

ESTIMATED AUTO EMISSIONS FOR 1972 (TONS)

COUNTY	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS		% HS	CARBON MONOXIDE		% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH DAILY	SULPHUR DIOXIDE DAILY
			TOTAL 6-9	% CS		TOTAL 8-9	% CS				
DC	5.4868	20.4	9.00	9.4	25.7	47.02	13.5	11.8	25.95	2.06	1.21
MS	7.0736	30.4	8.39	11.6	21.8	43.04	17.0	12.2	35.96	2.65	1.56
PS	8.1498	28.9	9.71	11.7	20.1	51.55	16.7	11.4	41.03	3.05	1.80
AR	2.3153	21.9	3.32	9.7	20.7	18.43	13.2	9.9	11.05	0.87	0.51
A-EX	0.9481	24.0	1.43	12.7	25.4	7.41	18.5	13.8	4.61	0.36	0.21
FF	7.4644	32.2	7.98	10.7	18.6	41.67	15.5	10.5	38.45	2.80	1.65
LJ	0.1173	36.1	0.13	11.8	25.3	0.60	19.2	14.8	0.62	0.04	0.03
FW	0.8854	35.9	0.94	12.7	20.7	4.72	19.2	12.9	4.68	0.33	0.20
***	32.4402	28.1	40.91	10.9	21.6	214.44	15.7	11.5	162.35	12.16	7.15

CERTIFICATION PLAN ALTERNATIVE 4A (1992 with Metro

ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

COUNTY	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FYH	SULPHUR DIOXIDE DAILY
			TOTAL	% CS	% HS	TOTAL	% CS	% CS				
DC	4,1250	24.1	1.12	26.0	21.5	9.19	18.3	73.48	17.6	0.90	1.79	0.0
MG	14,2238	27.6	1.29	26.5	13.2	11.67	17.0	77.93	13.9	1.57	3.14	0.0
PG	16,1700	28.0	1.47	24.0	14.1	12.38	16.5	87.81	14.1	1.78	3.56	0.0
APL	2,8541	21.7	0.36	27.0	18.4	3.16	17.7	23.37	16.0	0.31	0.63	0.0
ALFX	1,8717	16.9	0.24	23.1	13.7	2.06	15.4	14.91	13.0	0.21	0.41	0.0
FE	17,8428	22.3	1.76	20.3	11.1	14.78	14.1	106.32	11.3	1.97	3.93	0.0
LD	0,8844	30.2	0.08	27.3	16.5	0.68	18.3	4.77	16.1	0.10	0.19	0.0
EM	2,4224	15.2	0.29	18.6	7.6	2.44	12.7	16.85	9.0	0.27	0.53	0.0
***	64,3037	25.0	6.59	23.8	14.4	56.37	16.2	405.45	13.8	7.11	14.20	0.0

WMATA ALTERNATIVE WITHOUT METRO

ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

COUNTY	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS		CARBON MONOXIDE		% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FYH	SULPHUR DIOXIDE DAILY			
			TOTAL 6-9	% CS	TOTAL 8-9	% CS					TOTAL 2-10	% CS	
DC	8,7028	22.7	1.21	25.8	22.0	9.86	19.3	78.14	14.8	3.89	0.96	1.92	0.0
MD	14,7109	26.6	1.34	27.4	13.5	12.31	17.4	80.71	13.4	6.69	1.62	3.24	0.0
PA	16,5791	28.5	1.51	25.2	14.6	12.90	17.1	90.12	13.8	7.68	1.83	3.66	0.0
VA	3,0435	19.7	0.40	26.2	18.1	3.44	17.5	25.27	15.0	1.33	0.34	0.67	0.0
ALFX	1,9536	16.6	0.26	23.0	13.5	2.18	15.7	15.64	12.4	0.84	0.22	0.43	0.0
EF	18,3769	21.6	1.83	20.9	11.3	15.42	14.4	110.62	10.8	8.19	2.03	4.05	0.0
LD	0,8984	29.4	0.08	28.5	16.8	0.72	18.8	4.86	15.7	0.42	0.10	0.20	0.0
VA	2,4519	15.1	0.29	20.3	8.0	2.49	13.6	17.05	8.8	1.06	0.27	0.54	0.0
**	66,7167	24.2	6.91	24.4	14.7	59.41	16.5	422.41	13.3	30.09	7.36	14.71	0.0

WMATA ALTERNATIVE WITH METRO

ESTIMATED AUTO EMISSIONS FOR 1980 (TONS)

COUNTY	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH TYPE	SULPHUR DIOXIDE DAILY
			TOTAL 6-9	% CS	% MS	TOTAL 8-9	% CS	TOTAL 2-10				
DC	5.6023	25.6	4.14	13.4	37.8	24.47	13.3	171.41	11.7	0.94	1.24	0.18
MG	9.0345	22.2	4.88	12.1	25.2	37.37	9.3	256.25	6.9	1.52	1.99	0.28
OG	10.7025	31.4	4.88	12.2	27.8	33.24	10.6	228.07	8.2	1.80	2.36	0.34
ARI	2.1781	25.7	1.43	14.3	35.3	9.12	13.3	61.87	11.0	0.37	0.48	0.07
ALFX	1.6764	30.0	0.84	13.1	30.9	5.47	11.8	37.29	9.5	0.28	0.37	0.05
FF	11.4395	25.4	5.69	10.5	23.4	41.87	8.4	293.05	6.3	1.92	2.52	0.36
LD	0.5609	42.2	0.20	13.0	25.0	1.34	11.7	8.79	8.5	0.09	0.12	0.02
PW	1.6037	20.5	0.76	10.1	18.2	6.50	7.0	45.10	4.7	0.27	0.35	0.05
***	42.8013	26.5	22.82	12.1	28.2	159.39	10.2	1101.91	8.0	7.20	9.44	1.34

WMATA ALTERNATIVE WITHOUT METRO

ESTIMATED AUTO EMISSIONS FOR 1980 (TONS)

COUNTY	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS		CARBON MONOXIDE		% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER DAILY FXH TPF	SULPHUR DIOXIDE DAILY			
			TOTAL 6-9	% CS	TOTAL 8-9	% CS					TOTAL 2-10	% CS	
DC	5.9721	24.6	4.53	12.7	36.7	27.69	12.6	186.00	11.3	15.06	1.00	1.32	0.19
MG	9.3370	21.4	5.32	11.6	23.7	41.72	9.0	272.86	6.6	22.91	1.57	2.06	0.29
PG	11.0042	31.1	5.17	12.0	27.1	36.11	10.5	235.45	8.2	29.02	1.85	2.43	0.35
APL	2.3159	23.6	1.58	13.5	33.7	10.59	12.2	69.24	10.2	5.77	0.39	0.51	0.07
AIFX	1.7332	29.0	0.89	12.8	29.9	6.02	11.5	39.11	9.2	4.46	0.29	0.38	0.05
FF	11.8019	24.5	6.09	10.1	22.3	46.17	8.1	308.02	6.1	29.84	1.99	2.60	0.37
IN	0.5644	43.1	0.21	13.2	24.3	1.44	11.9	8.89	8.6	1.62	0.10	0.12	0.02
PW	1.6258	20.4	0.80	10.3	17.6	6.95	7.2	45.65	4.7	3.94	0.27	0.36	0.05
***	44.3580	25.7	24.58	11.6	27.2	176.69	9.9	1166.12	7.8	112.63	7.46	9.78	1.39

RASE EMISSIONS 1972

ESTIMATED TRUCK EMISSIONS FOR 1972 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
DC	0.659	20.1	0.68	1.45	0.10	8.5	19.7	1.2	0.15	2.27	3.04	0.18	0.32	0.18	0.04	0.09	0.38
MG	0.929	32.1	0.79	1.50	0.10	7.1	18.6	1.0	0.23	3.42	4.88	0.25	0.45	0.25	0.06	0.13	0.54
PG	1.251	30.8	1.08	2.08	0.14	10.1	26.0	1.4	0.31	4.58	6.53	0.31	0.61	0.34	0.08	0.18	0.73
ARI	0.212	21.7	0.21	0.44	0.03	2.5	6.0	0.4	0.05	0.74	1.00	0.06	0.10	0.06	0.01	0.03	0.12
ALFX	0.002	25.3	0.09	0.17	0.01	0.9	2.2	0.1	0.02	0.33	0.45	0.02	0.04	0.02	0.01	0.01	0.05
EF	0.824	34.9	0.68	1.29	0.09	5.8	15.6	0.8	0.21	3.12	4.47	0.22	0.40	0.22	0.05	0.12	0.48
LD	0.024	27.7	0.02	0.04	0.00	0.2	0.4	0.0	0.01	0.10	0.14	0.01	0.01	0.01	0.00	0.00	0.02
PW	0.119	39.3	0.09	0.17	0.01	0.7	2.1	0.1	0.03	0.45	0.65	0.03	0.06	0.03	0.01	0.02	0.07
ΣΣΣ	4.121	29.9	3.64	7.14	0.48	35.9	90.7	4.9	1.00	15.00	21.17	1.10	1.99	1.11	0.27	0.59	2.30

ALTERNATIVE 44 TRUCKS EMISSIONS ASSUMPTION A (1992 with Metro)

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

VST	WMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HDD	HDD	LT	HDD	HDD	LT	HDD	HDD	LT	HDD	HDD	LT	HDD	HDD
DC	1.018	24.8	0.19	0.50	0.16	2.0	13.1	1.8	0.12	4.60	5.97	0.27	0.44	0.33	0.07	0.13	0.70
DR	1.704	28.7	0.30	0.79	0.24	2.9	14.9	2.5	0.21	7.80	10.31	0.46	0.74	0.55	0.11	0.22	1.18
DS	1.032	32.1	0.21	0.53	0.26	2.9	20.0	2.5	0.24	9.05	12.08	0.52	0.84	0.62	0.12	0.25	1.34
AS	0.207	22.4	0.06	0.15	0.05	0.6	4.1	0.6	0.03	1.31	1.69	0.08	0.13	0.10	0.02	0.04	0.21
AFV	0.144	20.4	0.04	0.10	0.03	0.4	2.5	0.4	0.02	0.83	1.08	0.05	0.08	0.06	0.01	0.02	0.13
EE	1.097	25.3	0.27	0.69	0.32	3.0	25.6	3.5	0.26	9.02	11.83	0.53	0.87	0.64	0.13	0.26	1.34
LD	0.146	11.8	0.02	0.06	0.02	0.2	1.4	0.2	0.02	0.68	0.91	0.04	0.06	0.05	0.01	0.02	0.10
PL	0.170	14.2	0.08	0.22	0.07	1.0	6.4	0.9	0.06	1.59	2.02	0.10	0.16	0.12	0.02	0.05	0.26
MS	7.651	27.2	1.36	3.64	1.15	13.9	93.1	12.3	0.93	34.87	45.89	2.04	3.34	2.66	0.49	0.99	5.29

WMA TA ALTERNATIVE WITHOUT METRO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS 4-9			CAPRON MONOXIDE 2-10			NITROGEN DIOXIDE DAILY			PARTICULATE MATTER DAILY			SULPHUR DIOXIDE DAILY		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
DC	0.704	24.8	0.47	0.87	0.10	4.8	14.1	1.1	0.16	3.25	3.87	0.19	0.32	0.21	0.05	0.10	0.46
WG	1.046	22.0	0.74	1.41	0.16	8.3	23.4	1.9	0.23	4.75	5.55	0.28	0.48	0.31	0.07	0.14	0.68
DR	1.437	34.0	0.86	1.53	0.17	7.4	23.0	1.7	0.35	6.95	8.46	0.38	0.65	0.43	0.09	0.19	0.93
API	0.226	23.5	0.15	0.29	0.03	1.6	4.7	0.4	0.05	1.04	1.21	0.06	0.10	0.07	0.01	0.03	0.15
ALFX	0.209	33.6	0.12	0.22	0.03	1.0	3.3	0.2	0.05	1.01	1.24	0.06	0.09	0.06	0.01	0.03	0.13
FF	1.253	27.0	0.82	1.52	0.18	8.3	24.3	1.9	0.29	5.85	6.98	0.33	0.57	0.38	0.08	0.17	0.81
LD	0.058	34.7	0.03	0.06	0.01	0.3	0.8	0.1	0.01	0.29	0.35	0.02	0.03	0.02	0.00	0.01	0.04
PW	0.241	22.4	0.17	0.32	0.04	1.9	5.3	0.4	0.05	1.10	1.26	0.06	0.11	0.07	0.02	0.03	0.16
***	5.174	27.7	3.35	6.23	0.72	33.6	98.8	7.8	1.21	24.23	28.92	1.38	2.35	1.56	0.33	0.70	3.35

WIMATA ALTERNATIVE WITH METRO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
AC	0.704	25.6	0.46	0.86	0.10	4.7	13.7	1.1	0.16	3.26	3.91	0.19	0.32	0.21	0.05	0.10	0.46
AG	1.044	23.0	0.72	1.38	0.16	8.0	22.5	1.9	0.24	4.77	5.57	0.28	0.48	0.31	0.07	0.14	0.68
AP	1.437	24.4	0.85	1.53	0.17	7.3	22.9	1.6	0.35	6.97	8.47	0.38	0.65	0.43	0.09	0.19	0.93
AP1	0.224	25.3	0.15	0.28	0.03	1.5	4.5	0.4	0.05	1.04	1.24	0.06	0.10	0.07	0.01	0.03	0.15
AP2	0.200	24.2	0.12	0.22	0.02	1.0	3.2	0.2	0.05	1.01	1.24	0.06	0.09	0.06	0.01	0.03	0.13
AP3	1.253	27.6	0.80	1.48	0.17	7.0	23.4	1.9	0.30	5.89	7.01	0.33	0.57	0.38	0.09	0.17	0.81
AP4	0.059	29.7	0.03	0.06	0.01	0.3	0.9	0.1	0.01	0.29	0.35	0.02	0.03	0.02	0.00	0.01	0.04
AP5	0.241	22.5	0.17	0.32	0.04	1.9	5.3	0.4	0.05	1.10	1.26	0.06	0.11	0.07	0.02	0.03	0.16
AP6	5.174	28.4	3.31	6.12	0.71	32.6	96.4	7.6	1.22	24.32	29.06	1.38	2.35	1.56	0.33	0.70	3.35

WYATA ALTERNATIVE WITHOUT WFTRO

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
DC	1.019	23.4	0.19	0.52	0.17	2.1	13.7	1.9	0.12	4.56	5.92	0.27	0.44	0.33	0.07	0.13	0.70
UC	1.704	27.8	0.30	0.80	0.25	3.0	20.4	2.6	0.21	7.76	10.23	0.46	0.74	0.55	0.11	0.22	1.18
PG	1.932	31.7	0.31	0.83	0.26	2.9	20.2	2.6	0.24	9.03	12.05	0.52	0.84	0.62	0.12	0.25	1.34
APL	(.297	20.5	0.06	0.16	0.05	0.7	4.4	0.6	0.03	1.30	1.68	0.08	0.13	0.10	0.02	0.04	0.21
ALFX	(.186	20.6	0.04	0.10	0.03	0.4	2.5	0.4	0.02	0.43	1.08	0.05	0.08	0.06	0.01	0.02	0.13
FF	1.997	24.6	0.37	1.00	0.32	4.0	26.4	3.6	0.24	8.99	11.79	0.53	0.87	0.64	0.13	0.26	1.38
LD	(.146	30.8	0.02	0.06	0.02	0.2	1.5	0.2	0.02	0.67	0.91	0.04	0.06	0.05	0.01	0.02	0.10
P4	(.370	16.1	0.08	0.22	0.07	1.0	6.4	0.9	0.04	1.59	2.02	0.10	0.16	0.12	0.02	0.05	0.26
ΣΣ	7.651	26.4	1.38	3.70	1.17	14.3	95.4	12.7	0.93	34.72	45.67	2.04	3.34	2.46	0.49	0.99	5.29

APPENDIX C

AIR QUALITY MAINTENANCE

ESTIMATED AUTO EMISSIONS FOR 1972 (TONS)

DISTRICT	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS TOTAL 6-9 CS	% CS	% HS	TOTAL 8-9	% CS	CARBON MONOXIDE TOTAL 2-10	% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH DAILY	SULPHUR DIOXIDE DAILY
51	0.2488	24.6	0.33	8.5	25.9	1.64	17.3	10.41	16.0	1.22	0.09	0.05
52	0.1635	20.0	0.31	18.5	28.6	1.70	34.6	9.35	23.5	0.77	0.06	0.03
53	0.2568	22.7	0.33	11.7	17.6	1.92	20.6	11.27	12.9	1.24	0.10	0.05
54	1.3332	30.4	1.47	8.2	23.6	7.25	17.0	45.72	15.2	6.76	0.50	0.26
55	0.4783	27.9	0.51	7.1	17.9	2.69	13.7	16.83	11.2	2.39	0.18	0.09
56	0.3486	27.9	0.40	12.7	18.1	2.21	23.4	12.74	14.5	1.74	0.13	0.07
57	0.3235	27.3	0.44	10.9	29.9	2.13	23.3	13.19	20.4	1.61	0.12	0.06
58	0.5623	28.1	0.69	14.1	21.8	3.73	26.9	21.31	17.6	2.81	0.21	0.11
59	0.5123	28.0	0.60	13.6	18.8	3.32	25.1	18.93	15.4	2.56	0.19	0.10
60	0.3410	20.7	0.74	17.9	37.1	3.57	38.0	20.32	29.9	1.62	0.13	0.07
61	0.7623	27.7	0.98	14.4	23.9	5.14	28.1	29.44	19.1	3.81	0.29	0.15
62	0.9218	29.9	0.92	9.2	15.1	5.03	17.3	30.15	11.1	4.67	0.35	0.18
63	0.4945	31.6	0.52	13.5	18.4	2.81	25.6	15.94	15.7	2.54	0.19	0.10
64	0.5734	28.0	0.69	13.2	21.2	3.71	25.1	21.48	16.6	2.83	0.21	0.11
65	0.4371	27.5	0.56	12.1	19.2	3.06	22.6	17.85	14.7	2.43	0.18	0.10
66	0.5253	33.2	0.55	13.5	18.8	2.91	26.1	16.49	16.1	2.72	0.20	0.10
67	0.1846	14.7	0.25	2.6	8.2	1.68	3.9	10.79	3.7	0.84	0.07	0.04
68	0.4726	25.8	0.66	11.5	28.7	3.25	23.8	19.89	19.8	2.33	0.18	0.10
69	0.0599	18.4	0.13	26.9	21.6	0.80	43.6	3.82	24.3	0.28	0.02	0.01
70	0.5528	33.5	0.43	2.8	6.0	2.38	5.2	15.12	3.7	2.86	0.21	0.11
71	0.2984	22.8	0.53	15.0	34.0	2.59	31.7	15.32	25.5	1.44	0.11	0.07
72	0.6416	26.5	0.77	13.2	18.8	4.27	24.2	24.51	15.0	3.18	0.24	0.14
73	0.4327	28.7	0.55	13.9	25.3	2.80	27.8	16.25	19.8	2.18	0.16	0.09
74	0.3136	24.3	0.39	11.5	16.8	2.24	20.3	13.13	12.5	1.52	0.12	0.06
75	0.5512	35.2	0.44	4.2	10.5	2.31	8.1	14.63	6.5	2.89	0.21	0.11
76	0.4423	28.4	0.05	10.8	22.4	0.26	21.2	1.57	15.8	0.21	0.02	0.01
77	0.3207	33.0	0.33	11.8	19.5	1.71	23.2	9.99	15.4	1.66	0.12	0.06
78	0.3470	31.5	0.41	15.6	22.3	2.17	30.3	12.09	19.4	1.77	0.13	0.08
79	0.2957	25.7	0.48	14.1	34.3	2.24	30.9	13.43	25.7	1.46	0.11	0.07
80	0.3278	25.5	0.42	16.3	18.2	2.42	28.9	13.24	16.4	1.61	0.12	0.07
81	0.2081	24.1	0.34	13.9	31.4	1.66	28.7	9.89	22.9	1.01	0.08	0.04
82	0.1179	28.4	0.16	20.2	22.9	0.91	37.3	4.75	22.5	0.59	0.04	0.02
83	0.1000	24.2	0.15	16.1	26.4	0.82	30.9	11.43	21.1	0.49	0.04	0.02
84	0.2603	25.3	0.38	13.7	26.9	1.95	27.1	11.43	19.9	1.27	0.10	0.05
85	0.0787	26.9	0.09	9.7	19.8	0.49	18.5	2.96	13.5	0.39	0.03	0.02
86	0.1102	29.8	0.10	9.6	10.4	0.60	17.0	3.52	8.9	0.56	0.04	0.02
87	0.2984	25.1	0.38	7.1	26.1	1.91	14.7	12.37	15.2	1.46	0.11	0.07
88	0.2788	22.6	0.44	18.5	24.1	2.49	33.6	13.50	21.0	1.34	0.10	0.06
89	0.0226	22.6	0.06	34.2	29.9	0.34	60.0	1.42	39.2	0.11	0.01	0.00
90	0.0033	23.0	0.00	0.1	0.0	0.02	0.2	0.13	0.1	0.02	0.00	0.00
91	0.2237	25.4	0.33	21.4	20.2	1.94	37.1	9.93	20.8	1.09	0.08	0.04
92	0.6599	28.1	0.82	13.5	22.5	4.33	26.1	25.03	17.6	3.30	0.25	0.13
93	0.4909	33.1	0.52	12.5	21.1	2.68	25.0	15.56	16.9	2.54	0.18	0.10
94	0.0978	25.7	0.14	20.3	19.9	0.80	35.7	4.13	20.1	0.48	0.04	0.02
95	0.2931	32.2	0.37	15.3	27.5	1.82	31.9	10.46	15.9	1.51	0.11	0.06
96	0.3645	36.1	0.36	5.7	26.0	1.57	13.1	10.46	15.9	1.93	0.14	0.08
97	0.2001	32.2	0.16	4.1	3.7	0.91	7.2	5.63	3.3	1.03	0.08	0.04
98	0.0231	32.7	0.03	17.6	19.8	0.14	33.2	0.76	19.4	0.12	0.01	0.00
99	0.3572	38.2	0.28	7.6	10.5	1.49	14.8	8.94	8.6	1.91	0.13	0.07
100	0.3273	31.0	0.52	15.1	38.4	2.23	35.9	13.32	30.9	1.67	0.12	0.06

AIR QUALITY MAINTENANCE

ESTIMATED AUTO EMISSIONS FOR 1972 (TONS)

DISTRICT	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER EXH			SULPHUR DIOXIDE DAILY
			TOTAL 6-9	% CS	% HS	TOTAL 8-9	% CS	TOTAL 2-10	% CS	DAILY	EXH	TIPE	DAILY	DAILY	
101	0.1523	23.9	0.38	26.4	38.1	1.89	54.2	9.25	39.7	0.74	0.06	0.03	0.03		
102	0.3281	31.9	0.31	11.5	13.0	1.76	21.1	10.08	11.5	1.69	0.12	0.07	0.07		
103	0.2364	27.2	0.28	11.7	19.4	1.52	21.8	8.97	14.4	1.17	0.09	0.05	0.05		
104	0.4638	33.1	0.50	9.9	24.6	2.40	21.0	14.78	17.4	2.40	0.17	0.10	0.09		
105	0.3245	33.6	0.36	12.0	24.9	1.73	25.4	10.25	19.1	1.69	0.12	0.07	0.06		
106	0.3079	33.3	0.35	15.0	21.9	1.83	30.5	10.06	19.4	1.59	0.12	0.07	0.06		
107	0.3619	31.5	0.32	6.0	12.7	1.73	11.5	10.74	8.4	1.86	0.14	0.08	0.07		
108	0.3118	34.0	0.27	6.2	14.7	1.41	12.3	8.82	9.6	1.63	0.12	0.07	0.06		
109	0.0858	28.5	0.10	13.2	19.8	0.55	24.8	3.18	15.8	0.43	0.03	0.02	0.02		
110	0.1706	34.2	0.17	11.5	20.4	0.88	23.1	5.18	15.9	0.89	0.06	0.04	0.03		
111	0.0543	28.4	0.05	8.3	11.0	0.31	14.6	1.85	8.3	0.27	0.02	0.01	0.01		
112	0.0263	27.2	0.11	17.0	63.0	0.32	58.3	2.12	59.7	0.13	0.01	0.01	0.01		
113	0.3281	38.7	0.26	7.3	10.8	1.33	14.3	8.02	8.6	1.77	0.12	0.07	0.07		
114	0.2370	30.7	0.28	12.7	24.0	1.39	25.7	8.17	18.5	1.21	0.09	0.05	0.05		
115	0.2750	34.6	0.30	11.6	25.9	1.41	25.0	8.49	19.6	1.44	0.10	0.06	0.05		
116	0.0660	32.9	0.07	16.2	13.2	0.38	28.9	2.03	14.5	0.34	0.02	0.01	0.01		
117	0.0952	36.3	0.09	14.5	11.5	0.48	26.4	2.64	12.9	0.50	0.04	0.02	0.02		
118	0.0100	33.0	0.02	28.9	25.1	0.09	52.6	0.39	32.3	0.05	0.00	0.00	0.00		
119	0.0436	30.0	0.10	23.1	43.8	0.43	54.3	2.26	43.9	0.22	0.02	0.01	0.01		
120	0.6358	41.9	0.51	9.7	14.1	2.57	19.8	15.13	12.1	3.50	0.24	0.14	0.13		
121	0.0431	35.2	0.04	10.7	13.1	0.21	20.3	1.21	11.4	0.23	0.02	0.01	0.01		
122	0.0724	37.1	0.06	9.4	9.6	0.32	17.7	1.87	9.1	0.39	0.03	0.02	0.01		
123	0.0654	35.0	0.05	10.5	6.3	0.31	18.6	1.76	7.8	0.34	0.02	0.01	0.01		
124	0.2845	44.7	0.18	3.5	4.1	0.94	17.0	5.84	3.6	1.60	0.11	0.06	0.06		
125	0.3845	34.6	0.28	3.3	4.8	1.58	6.0	9.88	3.5	2.02	0.14	0.08	0.08		
126	0.2505	44.0	0.20	11.0	12.7	1.01	22.1	5.75	12.3	1.40	0.09	0.06	0.05		
127	0.1989	36.2	0.20	11.7	21.1	0.98	24.2	5.77	16.8	1.05	0.07	0.04	0.04		
128	0.1327	33.3	0.19	18.6	31.6	0.90	39.7	4.91	28.8	0.69	0.05	0.03	0.03		
129	0.0377	37.1	0.05	5.0	41.3	0.16	14.6	1.20	26.2	0.20	0.01	0.01	0.01		
130	0.0796	35.6	0.08	17.0	19.4	0.44	32.8	2.38	19.3	0.42	0.03	0.02	0.02		
131	0.2323	43.0	0.26	17.7	27.7	1.21	38.7	6.52	26.9	1.29	0.09	0.05	0.05		
132	0.4820	32.0	0.47	10.4	16.0	2.54	19.9	14.98	12.5	2.48	0.18	0.11	0.10		
133	0.1671	37.1	0.21	16.4	30.1	0.95	36.1	5.35	26.6	0.89	0.06	0.04	0.03		
134	0.0039	38.0	0.00	0.2	0.1	0.01	0.3	0.09	0.1	0.02	0.00	0.00	0.00		
***	32.4402	28.1	40.91	10.9	21.6	214.44	15.7	1279.31	11.5	162.35	12.16	7.15	6.44		

AIR QUALITY MAINTENANCE

ESTIMATED AUTO EMISSIONS FOR 1972 (TONS)

DISTRICT	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS TOTAL 6-9	% CS	% HS	CARBON MONOXIDE TOTAL 8-9	% CS	% TOTAL 2-10	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH	DAILY TIRE	SULPHUR DIOXIDE DAILY
1	0.0629	13.5	0.20	6.8	47.0	0.75	18.7	5.57	0.29	0.02	0.01	0.01
2	0.0474	14.9	0.21	10.1	62.0	0.63	33.9	4.86	0.21	0.02	0.01	0.01
3	0.0816	13.4	0.25	6.1	44.6	0.95	16.1	6.96	0.38	0.03	0.02	0.02
4	0.0615	14.6	0.23	8.7	59.5	0.74	27.8	5.81	0.28	0.02	0.01	0.01
5	0.0736	13.7	0.17	4.7	37.3	0.76	10.7	5.43	0.34	0.03	0.02	0.01
6	0.0695	13.5	0.18	5.6	43.2	0.75	14.0	5.44	0.32	0.03	0.02	0.01
7	0.1016	14.6	0.17	6.0	22.2	0.99	10.6	6.44	0.46	0.04	0.02	0.02
8	0.0753	17.7	0.13	8.9	26.8	0.68	16.9	4.30	0.35	0.03	0.02	0.01
9	0.1169	15.2	0.21	8.0	25.5	1.20	13.9	7.64	0.53	0.04	0.03	0.02
10	0.2733	17.0	0.33	1.6	5.4	2.21	2.5	14.20	1.26	0.10	0.06	0.05
11	0.0527	13.9	0.18	7.7	53.2	0.63	22.7	4.76	0.24	0.02	0.01	0.01
12	0.0093	14.2	0.05	9.4	65.4	0.13	35.9	1.10	0.04	0.00	0.00	0.00
13	0.0331	14.6	0.15	6.8	66.1	0.39	26.3	3.46	0.15	0.01	0.01	0.01
14	0.0665	15.5	0.09	0.9	9.4	0.59	1.4	3.88	0.30	0.02	0.01	0.01
15	0.2987	17.2	0.45	2.6	22.1	2.47	4.8	16.77	1.37	0.11	0.07	0.06
16	0.1244	15.5	0.24	8.6	28.1	1.30	16.1	8.30	0.56	0.05	0.03	0.02
17	0.1565	17.5	0.25	6.6	23.6	1.40	12.1	9.06	0.72	0.06	0.03	0.03
18	0.3434	26.9	0.36	8.2	14.4	2.03	14.9	12.36	1.70	0.13	0.08	0.07
19	0.2315	18.4	0.40	14.3	22.5	2.31	25.1	13.35	1.07	0.09	0.05	0.05
20	0.2783	18.5	0.45	10.4	22.2	2.56	18.6	15.60	1.29	0.10	0.06	0.06
21	0.1485	17.6	0.29	17.1	27.6	1.62	31.4	9.11	0.69	0.06	0.03	0.03
22	0.1066	17.8	0.23	17.0	33.8	1.21	33.9	6.92	0.49	0.04	0.02	0.02
23	0.1702	18.8	0.27	10.2	24.1	1.50	18.9	9.20	0.80	0.06	0.04	0.03
24	0.0925	23.4	0.14	10.2	31.0	0.70	21.4	4.41	0.45	0.03	0.02	0.02
25	0.2834	22.6	0.39	11.2	22.7	2.13	21.0	12.81	1.37	0.11	0.06	0.06
26	0.1027	20.3	0.15	11.7	20.8	0.88	20.9	5.24	0.48	0.04	0.02	0.02
27	0.2408	22.1	0.31	6.0	21.2	1.69	11.4	10.88	1.15	0.09	0.05	0.05
28	0.1915	24.5	0.28	4.1	35.2	1.21	9.7	8.63	0.93	0.07	0.04	0.04
29	0.3671	24.0	0.40	8.6	9.9	2.44	14.4	14.56	1.78	0.14	0.08	0.07
30	0.0332	18.0	0.08	22.6	31.4	0.43	42.2	2.24	0.15	0.01	0.01	0.01
31	0.2018	21.9	0.22	4.7	6.9	1.36	7.6	8.44	0.96	0.08	0.04	0.04
32	0.1213	19.8	0.29	15.7	42.2	1.29	36.1	7.81	0.57	0.05	0.03	0.02
33	0.0397	21.5	0.06	16.6	22.0	0.37	29.4	2.03	0.19	0.01	0.01	0.01
34	0.1331	32.5	0.13	11.0	14.9	0.69	20.8	4.00	0.69	0.05	0.03	0.03
35	0.1064	25.0	0.19	11.7	40.1	0.81	28.1	5.19	0.52	0.04	0.02	0.02
36	0.0845	19.6	0.16	16.7	31.0	0.85	32.6	4.86	0.40	0.03	0.02	0.02
37	0.1552	18.3	0.23	7.3	19.8	1.33	12.9	8.42	0.72	0.06	0.03	0.03
38	0.1309	17.0	0.20	15.2	15.4	1.30	24.5	7.26	0.61	0.05	0.03	0.03
39	0.3896	18.5	0.63	12.2	21.1	3.71	21.2	21.94	1.81	0.15	0.09	0.08
40	0.1753	19.5	0.30	15.4	23.3	1.72	27.4	9.79	0.82	0.07	0.04	0.03
41	0.1572	25.0	0.23	9.2	32.1	1.07	20.1	6.93	0.77	0.06	0.03	0.03
42	0.5160	26.4	0.53	7.1	11.9	3.09	12.4	18.92	2.54	0.19	0.11	0.10
43	0.1656	19.5	0.23	12.6	13.3	1.42	20.5	8.13	0.78	0.06	0.04	0.03
44	0.4830	24.3	0.73	12.5	29.3	3.68	25.4	22.26	2.34	0.18	0.11	0.10
45	0.0914	25.4	0.09	6.5	7.0	0.56	10.8	3.40	0.45	0.03	0.02	0.02
46	0.1144	21.3	0.19	19.3	22.9	1.12	33.9	6.01	0.54	0.04	0.03	0.02
47	0.2085	24.9	0.24	10.4	16.4	1.40	18.7	8.31	1.02	0.08	0.05	0.04
48	0.0703	21.0	0.14	24.1	25.7	0.79	42.4	3.96	0.33	0.03	0.02	0.01
49	0.0882	21.0	0.16	22.1	25.6	0.94	39.4	4.87	0.42	0.03	0.02	0.02
50	0.0752	20.0	0.10	14.3	12.2	0.66	22.8	3.71	0.35	0.03	0.02	0.01

CERTIFICATION PLAN ALTERNATIVE 4A (1992 with Metro)

ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

DISTRICT	DAILY VMT (FAM)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			TOTAL P-10 CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER DAILY FWH TYPE	SULPHUR DIOXIDE DAILY	
			TOTAL	CS	HS	TOTAL	CS	CS					
1	0.0304	21.2	0.02	30.3	54.1	0.14	92.0	1.64	93.9	0.01	0.00	0.01	0.0
2	0.0649	37.6	0.03	39.7	52.1	0.22	92.3	2.42	93.9	0.04	0.01	0.02	0.0
3	0.1451	9.9	0.05	29.5	31.5	0.35	67.5	3.27	69.5	0.07	0.02	0.04	0.0
4	0.0766	9.4	0.04	30.8	39.6	0.25	76.8	2.54	80.4	0.04	0.01	0.02	0.0
5	0.0854	19.4	0.02	30.9	45.7	0.15	74.4	1.64	80.1	0.04	0.01	0.02	0.0
6	0.1409	8.9	0.04	19.3	24.9	0.22	52.3	2.17	57.7	0.07	0.02	0.03	0.0
7	0.2313	32.4	0.02	25.5	24.5	0.13	57.7	1.11	57.3	0.11	0.03	0.05	0.0
8	0.0429	7.5	0.02	28.5	21.1	0.16	67.3	1.25	62.6	0.03	0.01	0.01	0.0
9	0.0476	11.9	0.02	35.8	32.1	0.18	76.1	1.43	74.4	0.03	0.01	0.01	0.0
10	0.0445	24.2	0.01	34.5	30.2	0.08	70.1	0.62	68.3	0.03	0.01	0.02	0.0
11	0.1753	44.0	0.02	35.3	41.3	0.17	82.4	1.62	84.3	0.09	0.02	0.04	0.0
12	0.3306	15.3	0.03	17.8	15.5	0.27	36.1	2.27	34.1	0.14	0.04	0.07	0.0
13	0.2073	18.5	0.04	26.3	43.1	0.25	65.6	2.94	74.3	0.09	0.02	0.05	0.0
14	0.3022	29.6	0.02	21.8	13.1	0.14	46.7	1.08	38.2	0.14	0.03	0.07	0.0
15	0.1302	20.5	0.02	20.7	38.4	0.12	53.0	1.32	65.6	0.06	0.02	0.03	0.0
16	0.2424	29.0	0.02	33.6	22.8	0.19	66.4	1.40	60.2	0.11	0.03	0.05	0.0
17	0.2064	27.2	0.02	32.9	31.3	0.19	69.7	1.66	69.2	0.09	0.02	0.05	0.0
18	0.4898	14.7	0.05	19.8	18.0	0.43	40.2	3.63	38.8	0.20	0.05	0.11	0.0
19	0.5047	20.0	0.05	31.5	18.1	0.49	58.8	3.45	49.4	0.22	0.06	0.11	0.0
20	0.3430	22.0	0.04	32.5	24.0	0.34	43.7	2.76	58.7	0.16	0.04	0.08	0.0
21	0.2551	20.6	0.04	42.7	24.1	0.19	74.8	2.53	66.3	0.11	0.03	0.06	0.0
22	0.1633	21.3	0.04	43.0	33.1	0.32	80.6	2.40	77.6	0.07	0.02	0.04	0.0
23	0.2350	23.6	0.04	40.0	30.4	0.33	76.5	2.48	73.0	0.10	0.03	0.05	0.0
24	0.1429	18.7	0.04	34.3	41.3	0.29	75.8	2.86	78.7	0.07	0.02	0.04	0.0
25	0.3545	32.8	0.04	38.7	27.5	0.33	75.6	2.44	71.1	0.17	0.04	0.08	0.0
26	0.1424	44.2	0.02	50.4	21.2	0.16	86.8	0.86	76.1	0.07	0.02	0.03	0.0
27	0.2519	32.4	0.02	34.1	25.1	0.19	69.1	1.45	64.4	0.12	0.03	0.06	0.0
28	0.1964	24.1	0.04	37.8	40.8	0.34	80.8	3.10	82.0	0.09	0.02	0.04	0.0
29	0.2451	24.3	0.03	46.2	18.5	0.31	76.5	1.70	64.3	0.11	0.03	0.05	0.0
30	0.4236	14.7	0.03	14.0	6.6	0.30	27.2	2.35	18.5	0.19	0.05	0.09	0.0
31	0.0722	29.2	0.01	44.1	19.7	0.09	77.8	0.50	66.7	0.03	0.01	0.02	0.0
32	0.1736	27.4	0.03	35.2	37.4	0.24	75.1	2.14	76.3	0.08	0.02	0.04	0.0
33	0.0276	25.7	0.01	54.0	25.2	0.07	87.4	0.37	80.5	0.01	0.00	0.01	0.0
34	0.0445	24.4	0.01	43.2	13.1	0.10	73.5	0.60	61.2	0.04	0.01	0.02	0.0
35	0.2505	40.0	0.02	30.1	32.7	0.16	70.5	1.44	72.1	0.13	0.03	0.04	0.0
36	0.1529	24.3	0.02	37.2	34.0	0.21	75.7	1.72	74.7	0.07	0.02	0.03	0.0
37	0.1314	17.5	0.02	30.8	30.3	0.14	63.5	1.30	63.6	0.06	0.01	0.03	0.0
38	0.2396	12.9	0.04	31.1	10.0	0.33	57.6	2.02	39.9	0.10	0.03	0.05	0.0
39	0.4364	22.8	0.06	45.6	19.1	0.61	75.5	3.56	63.6	0.19	0.05	0.10	0.0
40	0.3144	15.5	0.04	33.1	20.9	0.40	60.8	2.91	53.1	0.13	0.04	0.07	0.0
41	0.4327	34.1	0.03	30.7	25.7	0.27	66.5	2.14	63.8	0.21	0.05	0.10	0.0
42	0.3535	31.0	0.03	30.7	22.4	0.24	70.8	1.94	63.3	0.17	0.04	0.08	0.0
43	0.1743	32.9	0.02	48.5	14.7	0.18	78.3	0.94	63.3	0.08	0.02	0.04	0.0
44	0.6807	22.5	0.07	32.6	20.7	0.62	62.4	4.50	54.8	0.30	0.08	0.15	0.0
45	0.0064	4.9	0.00	53.3	14.0	0.04	86.5	0.18	74.1	0.00	0.00	0.00	0.0
46	0.2204	15.4	0.03	35.2	19.6	0.32	62.3	2.14	52.5	0.09	0.03	0.05	0.0
47	0.1236	20.4	0.02	40.5	24.5	0.18	72.4	1.22	65.1	0.05	0.01	0.03	0.0
48	0.2155	18.1	0.03	34.7	17.7	0.25	61.8	1.68	50.7	0.09	0.02	0.05	0.0
49	0.1327	26.0	0.02	51.0	20.7	0.22	81.8	1.21	71.4	0.06	0.01	0.03	0.0
50	0.3367	19.4	0.02	19.2	5.5	0.22	36.5	1.54	21.0	0.14	0.04	0.07	0.0

CERTIFICATION PLAN ALTERNATIVE 4A

ESTIMATED AUTO EMISSIONS FOR 1992 (IONS)

DISTRICT	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER DAILY FPM	SULPHUR DIOXIDE DAILY
			TOTAL	%	W5	TOTAL	%	TOTAL				
51	0.1755	24.4	0.02	35.7	36.8	0.18	75.7	1.63	76.3	0.01	0.03	0.0
52	0.2661	11.0	0.06	21.8	13.8	0.47	48.9	3.57	41.1	0.16	0.04	0.0
53	0.2755	26.8	0.05	22.3	8.7	0.64	44.9	3.02	30.7	0.38	0.12	0.0
54	0.7744	17.6	0.11	34.4	21.7	0.98	63.1	7.06	55.6	0.09	0.17	0.0
55	0.4944	24.8	0.06	30.2	18.5	0.38	59.0	2.76	50.7	0.22	0.05	0.0
56	0.7153	21.5	0.06	28.1	10.8	0.56	51.7	3.72	36.7	0.31	0.08	0.0
57	0.1820	21.6	0.04	22.4	35.5	0.36	81.8	2.85	80.0	0.02	0.06	0.0
58	0.9293	20.8	0.08	34.9	17.5	0.69	65.8	4.54	54.8	0.43	0.10	0.0
59	0.7373	23.5	0.07	34.5	13.2	0.63	61.6	3.93	47.1	0.33	0.08	0.0
60	0.4713	15.8	0.11	33.2	27.0	0.92	66.2	7.35	60.9	0.28	0.07	0.0
61	1.0835	26.0	0.11	38.1	18.8	1.04	68.7	6.69	57.8	0.49	0.12	0.0
62	1.4444	45.7	0.07	23.4	9.8	0.50	52.7	3.36	38.7	0.75	0.16	0.0
63	0.5995	32.5	0.05	46.5	15.4	0.52	78.3	2.76	64.3	0.30	0.07	0.0
64	0.9247	34.8	0.07	34.7	19.6	0.62	48.0	4.20	59.0	0.45	0.10	0.0
65	0.7544	38.4	0.06	36.7	21.3	0.52	71.8	3.51	63.7	0.37	0.08	0.0
66	0.6289	35.0	0.05	42.3	16.3	0.52	74.1	2.97	60.8	0.30	0.07	0.0
67	0.4125	26.6	0.02	12.3	12.8	0.17	29.2	1.47	30.1	0.05	0.05	0.0
68	0.7002	21.0	0.09	36.4	22.9	0.81	67.4	5.77	50.1	0.30	0.08	0.0
69	0.6552	14.8	0.06	24.4	5.9	0.60	42.8	3.92	24.4	0.27	0.14	0.0
70	0.5103	48.1	0.02	23.4	12.7	0.17	54.7	1.23	44.4	0.27	0.06	0.0
71	1.2700	18.9	0.11	22.0	15.0	0.95	44.3	7.58	39.0	0.54	0.14	0.0
72	0.9422	29.1	0.08	37.1	14.4	0.77	66.5	4.69	51.8	0.65	0.11	0.0
73	1.2372	18.6	0.13	17.1	9.6	1.05	35.3	8.12	26.9	0.52	0.14	0.0
74	0.4831	18.0	0.06	37.5	16.8	0.60	64.5	3.84	51.7	0.21	0.05	0.0
75	1.0773	16.8	0.08	12.4	7.1	0.67	25.2	5.37	18.7	0.45	0.12	0.0
76	0.9512	32.2	0.01	50.7	19.1	0.23	68.4	0.36	70.7	0.02	0.01	0.0
77	0.2447	33.0	0.06	34.5	19.2	0.53	61.6	3.08	45.0	0.43	0.10	0.0
78	0.3714	22.3	0.06	47.8	19.0	0.59	77.2	3.33	65.0	0.16	0.04	0.0
79	0.9214	25.5	0.05	39.3	33.7	0.44	78.2	3.55	76.5	0.15	0.04	0.0
80	0.7161	32.2	0.07	45.2	15.6	0.69	75.6	3.80	61.3	0.34	0.08	0.0
81	0.4218	27.7	0.05	41.5	20.6	0.44	73.7	2.79	63.6	0.19	0.05	0.0
82	0.2604	35.8	0.03	35.7	17.5	0.23	68.4	1.51	57.3	0.18	0.04	0.0
83	0.4500	7.5	0.10	10.0	5.2	0.55	30.0	4.26	21.6	0.22	0.05	0.0
84	0.4339	30.6	0.06	37.3	20.9	0.52	70.4	3.51	61.6	0.30	0.07	0.0
85	0.1089	17.7	0.02	45.0	24.8	0.21	76.7	1.34	68.7	0.05	0.01	0.0
86	0.2458	14.3	0.03	24.8	8.9	0.25	44.8	1.72	31.5	0.10	0.03	0.0
87	0.4143	23.2	0.04	24.9	25.3	0.37	61.3	2.90	58.5	0.18	0.05	0.0
88	0.2246	25.5	0.08	47.2	15.5	0.80	75.7	4.34	60.8	0.07	0.14	0.0
89	0.2676	23.7	0.03	34.8	9.0	0.30	60.1	1.75	40.0	0.16	0.04	0.0
90	0.0144	3.0	0.00	93.8	4.2	0.00	100.0	0.00	100.0	0.00	0.00	0.0
91	0.2263	30.4	0.04	56.3	16.0	0.46	84.2	2.20	71.2	0.13	0.03	0.0
92	1.0835	17.6	0.13	27.7	23.2	1.07	55.5	8.77	52.5	0.46	0.12	0.0
93	1.6013	8.1	0.25	58.8	6.3	1.48	24.9	12.10	20.8	0.69	0.16	0.0
94	0.4387	17.9	0.04	31.4	10.8	0.43	54.7	2.72	38.0	0.05	0.10	0.0
95	0.7401	27.1	0.08	43.3	14.6	0.78	72.1	4.35	56.6	0.35	0.08	0.0
96	0.5774	16.1	0.09	22.5	38.2	0.60	52.9	6.53	62.2	0.24	0.06	0.0
97	0.5430	27.6	0.03	21.9	7.2	0.29	44.1	1.95	28.2	0.27	0.06	0.0
98	0.5824	47.6	0.02	14.0	5.4	0.16	36.2	1.06	21.5	0.31	0.06	0.0
99	0.6701	37.0	0.05	36.8	18.8	0.43	68.7	2.58	54.8	0.23	0.07	0.0
100	0.5014	31.4	0.06	35.2	36.0	0.46	75.2	4.26	75.0	0.06	0.11	0.0

CERTIFICATION PLAN ALTERNATIVE 4A

ESTIMATED ANNUAL EMISSIONS FOR 1992 (TONS)

DISTRICT	DAILY M3 (F04)	AVG SPD WPM	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE DAILY	PARTICULATE MATTER DAILY FYM TYP	SULPHUR DIOXIDE DAILY		
			INITIAL 4-9	% CS	% MS	INITIAL R-9	% CS	% CS					
101	0.5672	31.3	0.08	41.7	14.1	0.82	71.6	4.63	55.9	0.45	0.11	0.21	0.0
102	1.3071	32.4	0.08	32.4	7.5	0.77	59.4	4.36	34.5	0.62	0.14	0.29	0.0
103	1.0276	14.8	0.12	14.6	10.2	1.05	29.1	8.55	24.3	0.59	0.16	0.31	0.0
104	1.5547	20.2	0.15	19.6	24.1	1.13	44.1	10.71	48.5	0.60	0.19	0.35	0.0
105	0.7586	26.1	0.07	29.5	22.6	0.57	60.6	4.40	54.0	0.34	0.08	0.17	0.0
106	1.1383	38.0	0.07	31.5	11.1	0.57	61.5	3.51	45.2	0.56	0.13	0.25	0.0
107	0.4900	23.4	0.04	32.5	15.3	0.30	60.0	2.61	47.6	0.21	0.05	0.11	0.0
108	0.8266	27.6	0.07	18.3	20.3	0.43	46.7	4.55	54.6	0.38	0.09	0.18	0.0
109	0.5776	31.5	0.03	17.7	15.2	0.24	41.1	2.01	38.7	0.27	0.05	0.13	0.0
110	0.2412	12.6	0.03	42.3	12.9	0.33	49.6	1.86	50.8	0.11	0.03	0.06	0.0
111	0.0627	18.6	0.01	21.9	14.3	0.05	43.2	0.34	36.2	0.03	0.01	0.01	0.0
112	0.1167	24.3	0.03	51.3	26.6	0.25	84.9	1.59	78.3	0.05	0.01	0.03	0.0
113	1.0121	14.7	0.09	19.0	5.6	0.81	34.9	5.78	20.2	0.42	0.11	0.22	0.0
114	0.5481	20.1	0.07	41.3	18.7	0.73	70.2	4.55	54.3	0.34	0.06	0.12	0.0
115	0.2967	16.6	0.05	26.1	26.0	0.42	53.8	3.72	54.1	0.17	0.04	0.09	0.0
116	0.4552	24.4	0.05	44.3	11.0	0.51	70.6	2.64	51.2	0.20	0.05	0.10	0.0
117	0.6783	29.1	0.04	29.8	6.2	0.37	54.7	2.19	32.8	0.30	0.07	0.14	0.0
118	0.0655	10.1	0.01	43.4	12.9	0.10	63.9	0.55	51.2	0.03	0.01	0.02	0.0
119	0.3470	14.7	0.06	34.1	19.1	0.55	65.4	3.64	54.3	0.15	0.04	0.08	0.0
120	1.3425	23.3	0.10	30.1	14.2	0.91	54.0	6.03	45.6	0.64	0.15	0.30	0.0
121	0.1565	24.0	0.01	37.0	13.5	0.14	64.4	0.87	48.7	0.07	0.02	0.03	0.0
122	0.0577	27.6	0.01	48.4	9.4	0.11	74.6	0.51	53.7	0.04	0.01	0.02	0.0
123	0.0263	24.8	0.01	45.7	19.3	0.10	91.5	0.45	83.6	0.01	0.00	0.01	0.0
124	0.5922	40.9	0.03	18.6	14.1	0.19	65.1	1.56	40.7	0.30	0.07	0.13	0.0
125	0.6445	32.0	0.04	24.6	8.5	0.35	54.8	2.15	36.5	0.31	0.07	0.15	0.0
126	1.0180	31.0	0.06	20.8	11.3	0.55	54.6	3.56	41.4	0.48	0.11	0.22	0.0
127	0.8843	21.0	0.07	20.5	17.4	0.59	43.2	4.90	40.6	0.38	0.10	0.19	0.0
128	0.7074	27.9	0.04	34.5	17.7	0.55	64.8	3.69	54.1	0.32	0.08	0.16	0.0
129	0.1401	37.8	0.03	42.9	36.4	0.22	45.7	1.72	84.3	0.08	0.02	0.04	0.0
130	0.7243	28.5	0.05	30.8	13.4	0.47	58.9	3.05	45.4	0.34	0.08	0.16	0.0
131	0.4657	10.7	0.08	23.2	11.1	0.61	49.9	4.31	37.9	0.21	0.05	0.10	0.0
132	1.5150	14.4	0.14	20.3	7.1	1.38	39.6	9.72	25.2	0.64	0.17	0.33	0.0
133	0.4109	23.0	0.04	38.2	17.1	0.43	67.1	2.70	54.6	0.18	0.05	0.09	0.0
134	0.0308	10.6	0.00	0.1	0.0	0.01	0.2	0.12	0.1	0.01	0.00	0.01	0.0
000	64.3037	25.0	6.59	23.8	14.4	54.37	16.2	405.45	13.8	29.17	7.11	14.20	0.0

WMOATA ALTERNATIVE WITHOUT METRO
ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

DISTRICT	DAILY VMT (F04)	AVG SPD WPM	HYDROCARBONS TOTAL A-9 CS	% CS	TOTAL A-9 CS	% CS	CARBON MONOXIDE TOTAL 2-10 CS	% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FYH	DAILY TYPF	SULPHUR DIOXIDE DAILY
1	0.0328	20.6	0.02	34.6	56.4	0.15	91.9	1.74	93.5	0.00	0.01	0.0
2	0.0955	37.8	0.04	37.1	54.2	0.23	92.5	2.56	93.7	0.01	0.02	0.0
3	0.1741	9.3	0.06	26.6	31.6	0.37	47.0	3.50	67.4	0.02	0.06	0.0
4	0.0521	0.0	0.04	30.3	41.5	0.26	77.4	2.64	79.6	0.01	0.02	0.0
5	0.0914	14.9	0.02	29.8	44.0	0.24	51.7	1.78	79.1	0.01	0.02	0.0
6	0.1506	8.6	0.04	17.9	24.9	0.14	55.1	1.24	51.0	0.02	0.03	0.0
7	0.2562	20.6	0.02	24.5	24.2	0.17	68.2	1.30	61.0	0.01	0.01	0.0
8	0.0676	6.7	0.02	28.9	22.1	0.18	77.2	1.44	73.4	0.01	0.02	0.0
9	0.0711	11.7	0.02	37.1	33.5	0.08	71.2	0.63	67.1	0.01	0.02	0.0
10	0.0724	26.3	0.01	34.7	31.6	0.18	82.9	1.71	83.8	0.01	0.04	0.0
11	0.1000	43.4	0.03	34.4	43.5	0.28	36.5	2.43	32.4	0.04	0.08	0.0
12	0.3603	15.2	0.03	17.9	16.4	0.27	66.0	3.24	71.8	0.02	0.05	0.0
13	0.2242	17.0	0.04	25.0	44.8	0.15	47.1	1.13	35.6	0.04	0.07	0.0
14	0.3275	20.6	0.02	21.9	13.3	0.13	51.3	1.54	62.4	0.02	0.03	0.0
15	0.1495	17.7	0.02	19.7	39.5	0.21	63.3	1.54	54.1	0.03	0.06	0.0
16	0.2611	25.0	0.03	32.1	22.3	0.21	69.6	1.78	67.1	0.02	0.05	0.0
17	0.2230	24.2	0.03	32.5	32.6	0.44	41.3	3.80	37.2	0.04	0.12	0.0
18	0.5227	14.5	0.05	20.3	18.9	0.57	53.5	4.13	41.1	0.04	0.12	0.0
19	0.5638	16.0	0.06	28.9	16.9	0.38	63.9	2.92	56.0	0.04	0.09	0.0
20	0.3867	21.1	0.04	32.7	24.6	0.41	75.1	2.63	64.3	0.03	0.06	0.0
21	0.2795	10.6	0.04	43.0	24.6	0.34	81.5	2.43	76.4	0.02	0.04	0.0
22	0.1730	20.6	0.04	43.5	33.6	0.35	76.0	2.58	69.9	0.02	0.05	0.0
23	0.2459	22.4	0.04	39.7	30.8	0.30	77.0	2.93	77.9	0.02	0.04	0.0
24	0.1764	18.6	0.04	34.4	42.7	0.35	75.5	2.52	68.2	0.04	0.08	0.0
25	0.3738	30.6	0.04	38.8	27.7	0.17	85.0	0.89	73.9	0.02	0.03	0.0
26	0.1520	42.2	0.02	51.0	21.4	0.21	66.9	1.61	59.4	0.03	0.06	0.0
27	0.2666	28.3	0.03	33.0	25.4	0.36	80.4	3.22	79.9	0.02	0.05	0.0
28	0.2066	22.1	0.05	37.1	41.8	0.11	74.4	0.61	59.1	0.01	0.01	0.0
29	0.2580	25.6	0.03	47.8	19.1	0.16	71.6	1.47	71.0	0.01	0.02	0.0
30	0.4524	13.7	0.04	12.9	6.0	0.22	73.7	1.81	70.1	0.03	0.06	0.0
31	0.0759	27.8	0.01	47.0	19.8	0.17	62.0	1.49	59.3	0.02	0.04	0.0
32	0.1795	22.8	0.03	36.0	38.4	0.09	78.4	0.51	64.3	0.01	0.02	0.0
33	0.0246	25.7	0.01	56.3	25.4	0.07	88.5	0.37	79.9	0.00	0.01	0.0
34	0.0951	25.5	0.01	43.9	18.4	0.11	74.4	0.61	59.1	0.01	0.02	0.0
35	0.2644	30.7	0.02	30.3	34.0	0.16	71.6	1.47	71.0	0.03	0.06	0.0
36	0.1629	20.8	0.03	36.4	33.7	0.22	73.7	1.81	70.1	0.02	0.04	0.0
37	0.1406	15.5	0.02	30.1	30.4	0.17	62.0	1.49	59.3	0.02	0.04	0.0
38	0.2522	12.6	0.04	32.2	10.3	0.34	68.4	2.09	38.1	0.03	0.04	0.0
39	0.4592	22.1	0.06	46.4	19.2	0.66	76.1	3.73	61.1	0.05	0.10	0.0
40	0.3796	15.1	0.05	33.6	21.3	0.43	61.2	3.12	50.3	0.04	0.07	0.0
41	0.4747	33.7	0.04	30.7	25.9	0.29	65.9	2.20	60.0	0.05	0.10	0.0
42	0.3794	29.7	0.04	37.4	22.2	0.31	70.8	2.10	59.8	0.04	0.08	0.0
43	0.1852	32.3	0.02	49.9	14.5	0.20	79.2	0.98	61.1	0.02	0.04	0.0
44	0.2716	20.8	0.08	33.2	20.5	0.68	62.4	4.87	51.2	0.08	0.16	0.0
45	0.0055	4.8	0.00	54.7	14.2	0.04	87.3	0.18	73.0	0.00	0.00	0.0
46	0.2609	15.4	0.03	36.3	20.0	0.33	63.8	2.23	50.8	0.03	0.05	0.0
47	0.1293	17.8	0.02	40.4	24.5	0.19	71.8	1.29	61.3	0.01	0.03	0.0
48	0.2271	14.9	0.03	35.1	17.8	0.26	62.0	1.77	47.5	0.03	0.05	0.0
49	0.1408	25.0	0.02	52.0	20.8	0.24	82.4	1.24	69.4	0.02	0.03	0.0
50	0.3720	12.9	0.04	13.4	3.8	0.29	29.2	2.23	14.3	0.04	0.08	0.0

WMAST ALTERNATIVE WITHOUT MFPD

ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

DISTRICT	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS			CARBON MONOXIDE			TOTAL P-10 CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FXH TYPE	SULPHUR DIOXIDE DAILY
			TOTAL 4-9	CS	% HS	TOTAL R-9	% CS	% CS				
51	0.1417	23.6	0.02	36.5	37.6	0.19	77.1	1.66	75.4	0.02	0.03	0.0
52	0.3226	10.5	0.07	22.1	13.5	0.51	50.0	3.84	38.6	0.04	0.08	0.0
53	0.9043	21.3	0.06	19.9	7.7	0.53	30.0	3.91	23.4	0.10	0.20	0.0
54	0.8106	17.0	0.11	35.6	22.4	1.02	65.0	7.23	54.2	0.09	0.18	0.0
55	0.5204	24.0	0.05	30.7	18.4	0.40	59.4	2.87	27.9	0.06	0.11	0.0
56	0.7468	20.8	0.06	29.4	11.3	0.54	53.6	3.83	35.3	0.08	0.16	0.0
57	0.1843	21.0	0.04	43.0	35.4	0.39	82.5	2.90	78.5	0.02	0.04	0.0
58	0.9448	29.2	0.08	36.0	17.8	0.73	66.9	4.71	52.5	0.11	0.21	0.0
59	0.7485	22.2	0.07	35.1	13.7	0.69	61.7	4.30	43.6	0.08	0.17	0.0
60	0.6943	15.1	0.11	34.1	27.3	0.98	65.2	7.64	59.5	0.08	0.15	0.0
61	1.1400	25.3	0.12	39.0	19.1	1.11	69.6	7.03	55.4	0.13	0.25	0.0
62	1.5474	43.4	0.07	26.2	11.5	0.59	56.7	3.85	40.0	0.17	0.34	0.0
63	0.6215	38.2	0.05	48.2	15.7	0.56	79.6	2.85	62.9	0.07	0.14	0.0
64	0.9555	34.2	0.07	36.1	20.0	0.65	69.5	4.31	57.2	0.11	0.21	0.0
65	0.7813	38.5	0.06	38.3	22.0	0.55	73.8	3.58	62.9	0.09	0.17	0.0
66	0.6478	34.5	0.06	43.9	13.5	0.55	75.5	3.05	59.1	0.07	0.14	0.0
67	0.4300	24.6	0.02	12.9	13.4	0.17	30.4	1.51	28.5	0.05	0.09	0.0
68	0.7145	20.9	0.09	37.7	23.7	0.84	69.4	5.83	59.1	0.21	0.08	0.0
69	0.6947	14.4	0.07	22.8	5.4	0.64	42.9	4.31	22.1	0.08	0.15	0.0
70	0.5207	49.1	0.02	24.9	13.4	0.18	57.2	1.25	43.5	0.06	0.11	0.0
71	1.3157	17.2	0.12	22.1	16.0	1.03	43.8	8.31	35.3	0.15	0.29	0.0
72	0.9997	28.6	0.08	39.0	14.9	0.80	68.8	4.73	51.0	0.11	0.22	0.0
73	1.2749	11.8	0.16	15.4	8.3	1.16	35.2	9.15	24.0	0.14	0.28	0.0
74	0.5013	14.3	0.07	37.9	14.9	0.66	44.4	4.14	48.2	0.06	0.11	0.0
75	1.1427	15.5	0.09	12.3	7.0	0.72	24.8	6.01	16.5	0.13	0.26	0.0
76	0.9534	31.8	0.01	52.1	19.2	0.07	83.1	0.36	60.5	0.01	0.01	0.0
77	0.9469	33.2	0.06	35.1	10.1	0.56	63.8	3.26	42.0	0.03	0.21	0.0
78	0.3828	22.4	0.06	49.4	14.1	0.62	78.8	3.36	64.1	0.04	0.08	0.0
79	0.3322	25.1	0.06	39.8	34.1	0.47	78.8	3.60	74.7	0.06	0.07	0.0
80	0.7240	31.9	0.07	46.9	15.9	0.72	77.3	3.82	60.3	0.06	0.16	0.0
81	0.4355	27.5	0.05	42.5	20.9	0.47	74.6	2.84	61.4	0.05	0.10	0.0
82	0.3468	35.8	0.03	37.4	18.0	0.26	70.5	1.53	56.3	0.04	0.08	0.0
83	0.4445	7.4	0.10	10.9	5.5	0.56	32.2	4.43	20.9	0.05	0.10	0.0
84	0.6429	30.2	0.06	38.6	21.4	0.55	71.7	3.57	59.8	0.07	0.14	0.0
85	0.1108	17.7	0.02	46.5	25.3	0.22	78.6	1.34	68.0	0.01	0.02	0.0
86	0.2527	14.3	0.03	27.1	9.3	0.27	50.2	1.77	31.1	0.03	0.06	0.0
87	0.4154	23.1	0.05	31.3	26.7	0.38	63.9	3.00	58.3	0.05	0.09	0.0
88	0.6399	25.4	0.08	49.2	15.8	0.85	77.6	4.39	60.0	0.07	0.14	0.0
89	0.3822	23.8	0.03	36.5	9.3	0.31	42.0	1.70	38.8	0.04	0.08	0.0
90	0.0150	3.0	0.00	94.5	5.5	0.00	100.0	0.00	100.0	0.00	0.00	0.0
91	0.2943	30.4	0.04	58.0	16.1	0.49	85.5	2.22	70.5	0.03	0.06	0.0
92	1.1129	17.1	0.13	28.5	23.7	1.13	56.4	9.10	50.1	0.12	0.25	0.0
93	1.5302	9.1	0.25	9.2	6.6	1.48	26.1	12.59	10.7	0.17	0.34	0.0
94	0.4474	17.9	0.04	33.1	11.2	0.43	56.9	2.75	37.0	0.05	0.10	0.0
95	0.7864	25.5	0.08	44.0	14.3	0.84	72.2	4.60	53.0	0.09	0.17	0.0
96	0.5845	16.0	0.09	23.1	36.6	0.61	55.0	6.48	61.1	0.06	0.13	0.0
97	0.6203	27.8	0.04	23.1	7.4	0.30	46.0	2.05	26.9	0.07	0.14	0.0
98	0.5873	47.0	0.02	15.4	5.8	0.14	39.1	1.05	23.1	0.06	0.13	0.0
99	0.7054	37.3	0.05	38.2	15.1	0.45	70.3	2.65	53.3	0.08	0.16	0.0
100	0.5126	31.0	0.07	36.5	34.8	0.52	77.1	4.28	74.3	0.06	0.11	0.0

WYATA ALTERNATIVE WITHOUT METRO
 ESTIMATED AUTO EMISSIONS FOR 1992 (TONS)

DISTRICT	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS TOTAL LBS	% CS	% HS	TOTAL A-G	CARBON MONOXIDE & CS	TOTAL P-10 CS	% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH TONF	DAILY TONF	SULPHUR DIOXIDE DAILY
101	0.9761	29.7	0.09	43.4	14.3	0.87	73.0	4.74	54.3	0.64	0.11	0.22	0.0
102	1.332A	32.3	0.0A	35.1	7.8	0.79	62.5	4.44	37.9	0.63	0.15	0.29	0.0
103	1.4440	14.7	0.12	15.8	10.9	1.04	31.4	8.64	23.7	0.60	0.16	0.32	0.0
104	1.6167	20.2	0.15	20.8	25.4	1.14	46.6	10.77	47.6	0.70	0.14	0.36	0.0
105	0.7687	26.0	0.07	30.8	23.6	0.59	62.6	4.40	55.0	0.45	0.08	0.17	0.0
106	1.1404	37.9	0.07	33.8	11.6	0.59	64.5	3.51	44.8	0.56	0.13	0.25	0.0
107	0.4790	23.8	0.04	34.4	15.9	0.40	62.7	2.59	46.9	0.21	0.05	0.11	0.0
108	0.8100	27.1	0.07	18.9	10.9	0.43	48.3	4.55	55.2	0.37	0.09	0.14	0.0
109	0.5700	30.3	0.03	19.2	15.9	0.24	43.6	2.03	37.4	0.27	0.06	0.13	0.0
110	0.2629	19.5	0.03	45.0	13.3	0.34	71.2	1.84	50.7	0.11	0.03	0.06	0.0
111	0.0632	19.4	0.01	23.4	14.9	0.05	45.8	0.34	35.1	0.03	0.01	0.01	0.0
112	0.1214	24.2	0.03	52.3	27.4	0.27	66.2	1.59	78.0	0.05	0.01	0.03	0.0
113	1.0431	14.7	0.09	20.7	5.9	0.83	37.6	5.93	19.8	0.63	0.12	0.23	0.0
114	0.5550	20.3	0.07	42.7	19.3	0.75	71.9	4.52	57.1	0.24	0.06	0.12	0.0
115	0.4021	16.2	0.05	27.2	27.2	0.43	56.1	3.70	53.1	0.17	0.04	0.09	0.0
116	0.4664	24.5	0.05	46.7	11.4	0.52	73.3	2.62	51.1	0.21	0.05	0.10	0.0
117	0.6681	27.5	0.04	30.5	6.2	0.39	55.3	2.32	30.5	0.31	0.07	0.15	0.0
118	0.0714	18.3	0.01	46.2	13.0	0.11	71.6	0.56	50.6	0.03	0.01	0.02	0.0
119	0.3757	14.6	0.06	40.7	19.5	0.59	68.5	3.72	53.9	0.16	0.04	0.08	0.0
120	1.6266	25.8	0.11	31.1	14.3	0.98	58.6	6.53	42.6	0.65	0.14	0.31	0.0
121	0.1587	24.0	0.02	39.0	13.9	0.15	66.4	0.87	47.9	0.07	0.02	0.03	0.0
122	0.0999	27.6	0.01	51.2	9.4	0.11	77.0	0.52	53.3	0.05	0.01	0.02	0.0
123	0.0273	25.0	0.01	67.0	19.3	0.11	92.3	0.44	83.1	0.01	0.00	0.01	0.0
124	0.6019	40.4	0.03	19.4	14.7	0.20	46.8	1.59	39.0	0.30	0.07	0.13	0.0
125	0.4745	31.8	0.04	30.3	8.8	0.35	57.4	2.17	35.8	0.32	0.07	0.15	0.0
126	1.0601	30.7	0.07	30.1	11.5	0.57	57.9	3.68	38.4	0.49	0.11	0.23	0.0
127	0.8924	21.0	0.07	22.2	18.3	0.60	46.3	4.92	39.9	0.30	0.10	0.20	0.0
128	0.7204	27.9	0.06	36.4	18.3	0.57	67.3	3.72	53.2	0.33	0.08	0.16	0.0
129	0.1614	37.8	0.03	43.4	37.3	0.22	66.7	1.69	83.8	0.04	0.02	0.04	0.0
130	0.7370	27.6	0.05	32.9	13.7	0.50	61.2	3.17	43.8	0.34	0.08	0.14	0.0
131	0.4713	10.6	0.08	25.2	11.6	0.63	53.0	4.35	37.2	0.21	0.05	0.10	0.0
132	1.5353	14.4	0.16	22.2	7.5	1.40	42.7	9.87	24.8	0.65	0.17	0.34	0.0
133	0.4144	22.7	0.05	40.7	17.6	0.45	70.0	2.72	54.1	0.18	0.05	0.09	0.0
134	0.0308	19.4	0.00	0.1	0.1	0.01	0.3	0.12	0.3	0.01	0.00	0.01	0.0
999	66.7167	24.2	6.91	24.4	14.7	59.41	16.5	422.41	13.3	30.09	7.36	14.71	0.0

WMATA ALTERNATIVE WITH METRO

ESTIMATED AUTO EMISSIONS FOR 1980 (TONS)

DISTRICT	DAILY VMT (000)	AVG SPD MPH	HYDROCARBONS		% HS	CARBON MONOXIDE		% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER		SULPHUR DIOXIDE DAILY
			TOTAL	CS		TOTAL	CS			FXH	DAILY	
1	0.0229	24.1	0.09	15.5	78.0	0.28	79.2	2.55	0.06	0.00	0.01	0.00
2	0.0253	18.8	0.13	15.1	77.8	0.39	75.9	3.64	0.07	0.00	0.01	0.00
3	0.1255	12.5	0.19	12.5	50.9	0.97	37.7	7.54	0.31	0.02	0.03	0.00
4	0.0422	8.6	0.14	11.3	51.7	0.59	39.1	4.80	0.16	0.01	0.01	0.00
5	0.1035	14.2	0.11	11.2	48.3	0.40	44.7	3.68	0.16	0.01	0.02	0.00
6	0.1257	44.3	0.13	10.0	55.7	0.64	30.9	5.42	0.25	0.02	0.02	0.00
7	0.0444	9.5	0.04	13.9	50.2	0.30	44.6	2.27	0.12	0.02	0.03	0.00
8	0.0544	12.7	0.08	16.8	54.0	0.44	47.2	3.06	0.17	0.01	0.01	0.00
9	0.0547	14.3	0.04	11.1	34.6	0.29	22.7	3.17	0.13	0.01	0.01	0.00
10	0.1540	33.5	0.11	12.2	58.8	0.47	43.3	3.94	0.14	0.01	0.01	0.00
11	0.0461	15.2	0.06	15.7	60.0	0.31	48.6	2.34	0.43	0.03	0.03	0.00
12	0.1441	28.0	0.16	9.8	67.9	0.55	42.3	5.28	0.11	0.01	0.01	0.00
13	0.1019	24.7	0.07	8.1	22.7	0.55	15.9	4.07	0.38	0.02	0.03	0.00
14	0.0744	31.6	0.08	10.0	67.9	0.26	44.3	2.52	0.48	0.03	0.04	0.01
15	0.1740	31.4	0.11	14.9	50.2	0.59	42.9	4.36	0.21	0.01	0.02	0.00
16	0.1598	34.2	0.10	15.1	53.4	0.48	47.3	3.60	0.47	0.03	0.04	0.01
17	0.3453	27.2	0.14	11.6	29.6	1.03	24.8	7.35	0.44	0.03	0.04	0.01
18	0.2020	25.1	0.15	23.8	40.9	1.06	52.5	6.33	0.89	0.06	0.08	0.01
19	0.3346	24.8	0.21	15.9	41.9	1.32	38.0	9.19	0.52	0.04	0.05	0.01
20	0.2168	23.2	0.16	21.8	39.9	1.09	47.5	6.81	0.85	0.06	0.07	0.01
21	0.1241	25.7	0.13	21.9	53.8	0.74	52.7	4.73	0.54	0.04	0.05	0.01
22	0.1765	26.1	0.12	20.3	44.4	0.80	48.7	5.13	0.33	0.02	0.03	0.00
23	0.1424	27.1	0.07	12.9	40.6	0.46	31.6	3.38	0.45	0.03	0.04	0.01
24	0.1536	25.7	0.12	22.2	46.9	0.78	54.3	4.86	0.36	0.02	0.03	0.00
25	0.0420	18.8	0.05	25.2	47.2	0.32	57.7	1.92	0.39	0.03	0.03	0.00
26	0.2060	21.7	0.11	10.6	36.2	0.75	23.7	5.62	0.10	0.01	0.01	0.00
27	0.2220	22.0	0.23	13.6	58.7	1.07	43.1	8.60	0.51	0.03	0.05	0.01
28	0.1143	21.5	0.09	27.4	36.7	0.70	54.4	3.91	0.54	0.04	0.05	0.01
29	0.2321	24.4	0.10	12.0	19.3	0.84	22.4	5.79	0.28	0.02	0.03	0.00
30	0.0545	31.4	0.03	24.4	37.7	0.24	53.3	1.40	0.72	0.05	0.06	0.01
31	0.1463	24.7	0.14	17.2	56.4	0.73	51.3	5.26	0.16	0.01	0.01	0.00
32	0.0209	20.7	0.02	30.3	49.8	0.15	72.6	0.79	0.37	0.02	0.03	0.00
33	0.0742	27.5	0.04	21.6	35.3	0.29	46.0	1.79	0.05	0.00	0.00	0.00
34	0.1543	40.3	0.11	12.9	55.2	0.47	44.2	3.74	0.19	0.01	0.02	0.00
35	0.0791	23.8	0.04	23.3	49.8	0.48	58.3	2.96	0.52	0.03	0.04	0.01
36	0.1101	20.5	0.09	14.2	48.6	0.51	36.8	3.78	0.20	0.01	0.02	0.00
37	0.2050	23.7	0.11	22.9	27.2	0.90	42.5	5.37	0.27	0.02	0.02	0.00
38	0.3388	24.2	0.26	22.3	37.9	1.87	47.4	11.46	0.51	0.03	0.05	0.01
39	0.2343	22.7	0.16	21.5	37.6	1.14	45.5	7.09	0.97	0.07	0.09	0.01
40	0.1293	24.8	0.10	17.5	52.4	0.54	49.1	3.97	0.58	0.04	0.05	0.01
41	0.3347	31.2	0.15	16.5	34.6	1.01	37.4	6.74	0.33	0.02	0.03	0.00
42	0.2046	22.0	0.10	18.3	23.3	0.86	32.9	5.51	0.88	0.04	0.07	0.01
43	0.5238	20.8	0.26	10.8	38.5	1.73	40.5	11.53	0.51	0.04	0.05	0.01
44	0.1000	19.1	0.04	10.8	12.6	0.39	17.5	2.72	1.37	0.09	0.12	0.02
45	0.0605	21.0	0.09	27.6	52.4	0.55	67.9	3.13	0.24	0.02	0.02	0.00
46	0.1053	24.0	0.07	20.8	42.6	0.49	48.1	3.12	0.15	0.01	0.01	0.00
47	0.1731	25.3	0.10	21.5	33.3	0.74	43.8	4.57	0.27	0.02	0.02	0.00
48	0.1106	26.7	0.08	27.6	39.2	0.59	58.3	3.26	0.44	0.03	0.04	0.01
49	0.2931	20.9	0.11	9.2	9.7	1.00	14.9	7.05	0.28	0.05	0.06	0.01
50									0.72	0.05	0.06	0.01

MMATA ALTERNATIVE WITH METRO
ESTIMATED AUTO EMISSIONS FOR 1980 (TONS)

DISTRICT	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS TOTAL 6-9	% CS	% HS	TOTAL A-9	CARBON MONOXIDE % CS	TOTAL 2-10	% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FXH	SULPHUR DIOXIDE DAILY
51	0.1651	17.3	0.14	12.5	46.3	0.85	30.5	6.48	30.2	0.39	0.03	0.04
52	0.2306	25.2	0.16	21.9	40.9	1.09	49.0	6.78	37.3	0.58	0.04	0.01
53	0.5868	18.1	0.26	9.2	15.8	2.36	15.4	16.88	9.7	1.40	0.10	0.02
54	0.6299	23.1	0.42	16.9	42.1	2.76	39.5	18.92	32.7	1.56	0.11	0.02
55	0.4548	16.1	0.26	9.9	27.3	2.12	18.4	15.54	15.2	1.07	0.08	0.01
56	0.4484	15.2	0.25	13.0	20.7	2.30	21.8	15.90	13.6	1.04	0.08	0.01
57	0.4125	20.9	0.29	14.2	44.0	1.83	34.3	13.33	31.1	1.01	0.07	0.01
58	0.9145	26.0	0.37	12.9	25.7	2.85	25.8	19.74	18.8	2.32	0.15	0.03
59	0.7319	23.6	0.31	13.0	33.8	2.46	24.8	16.97	16.8	1.83	0.12	0.02
60	0.5050	17.0	0.48	13.4	44.6	3.13	31.6	23.18	29.6	1.41	0.10	0.02
61	1.0033	28.6	0.47	15.7	34.1	3.25	37.0	21.61	27.7	2.60	0.17	0.03
62	1.0151	42.8	0.28	12.7	22.7	1.88	28.9	12.69	19.7	2.91	0.17	0.03
63	0.5171	30.6	0.20	20.7	31.5	1.37	46.3	8.25	32.3	1.45	0.09	0.02
64	0.7140	30.2	0.28	18.1	33.7	1.82	42.4	11.63	31.4	2.00	0.12	0.02
65	0.5806	42.0	0.23	15.3	38.8	1.31	40.4	9.00	33.8	1.65	0.10	0.02
66	0.4839	37.7	0.21	20.0	35.6	1.36	46.7	8.44	34.5	1.34	0.08	0.02
67	0.3164	40.3	0.08	6.6	22.7	0.53	15.5	4.01	14.7	0.89	0.05	0.01
68	0.2353	31.4	0.40	14.1	40.8	2.45	35.5	17.49	31.2	2.20	0.14	0.03
69	0.4299	35.8	0.13	19.1	18.1	1.08	26.6	6.53	20.2	1.17	0.07	0.01
70	0.1983	47.9	0.07	14.6	35.6	0.39	39.1	2.65	32.0	0.59	0.03	0.04
71	0.5453	35.0	0.41	13.3	38.2	2.44	33.8	17.50	29.5	2.67	0.17	0.03
72	0.2450	32.6	0.34	19.1	28.8	2.48	40.0	15.47	26.8	2.26	0.14	0.03
73	1.0327	19.7	0.45	10.6	20.5	1.91	18.9	27.75	12.9	2.50	0.17	0.03
74	0.4022	22.0	0.21	15.8	30.2	1.43	31.3	10.97	22.3	0.99	0.07	0.01
75	0.7901	20.7	0.22	5.3	15.3	1.75	11.3	12.99	9.0	2.07	0.13	0.02
76	0.0335	34.6	0.02	27.9	35.3	0.13	58.7	0.72	41.6	0.09	0.01	0.00
77	0.4009	25.7	0.18	18.5	27.0	1.45	35.9	9.21	23.2	1.02	0.07	0.01
78	0.5750	30.2	0.25	17.3	31.9	1.80	37.4	11.76	26.9	1.50	0.10	0.02
79	0.3005	26.2	0.25	15.0	54.4	1.26	44.7	9.46	44.0	0.76	0.05	0.01
80	0.4862	23.2	0.25	20.2	27.3	2.08	38.0	12.94	24.1	1.20	0.08	0.02
81	0.3204	27.4	0.18	14.7	41.3	1.11	35.8	7.85	33.1	0.82	0.05	0.01
82	0.3041	34.4	0.14	12.8	30.5	0.96	29.4	6.70	23.1	1.07	0.07	0.01
83	0.2150	17.0	0.12	12.4	27.4	1.02	23.0	7.24	17.1	0.52	0.04	0.01
84	0.3085	29.1	0.20	13.8	41.3	1.24	34.5	8.96	30.8	1.03	0.07	0.01
85	0.2639	21.9	0.11	10.0	24.1	0.91	19.2	6.56	14.7	0.65	0.04	0.01
86	0.1314	13.3	0.09	11.5	15.8	0.75	21.1	5.16	12.3	0.32	0.02	0.00
87	0.2648	29.0	0.17	13.7	49.6	0.89	39.1	6.68	38.3	0.69	0.04	0.01
88	0.4119	28.8	0.23	24.9	33.3	1.70	50.7	9.80	34.6	1.07	0.07	0.01
89	0.2217	22.4	0.09	16.7	15.0	0.85	27.7	5.47	14.1	0.55	0.04	0.01
90	0.0146	3.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
91	0.2226	31.3	0.14	32.0	32.5	1.10	61.6	5.53	42.1	0.59	0.04	0.01
92	0.7926	20.1	0.49	11.9	38.9	3.33	26.8	24.65	24.7	1.02	0.13	0.02
93	1.0439	17.4	0.50	7.8	21.1	4.35	13.8	32.21	11.1	2.47	0.18	0.03
94	0.2704	11.7	0.20	11.8	13.1	1.66	22.1	10.20	11.8	0.66	0.05	0.01
95	0.6187	37.3	0.25	18.8	33.8	1.68	43.2	10.63	31.6	1.70	0.10	0.02
96	0.4677	15.8	0.48	7.4	57.6	2.30	22.9	20.87	35.1	1.10	0.08	0.01
97	0.1744	8.2	0.18	4.4	4.4	1.19	9.9	8.61	4.7	0.46	0.03	0.01
98	0.0362	21.0	0.02	23.7	17.3	0.17	38.3	1.00	19.7	0.09	0.01	0.00
99	0.1727	15.0	0.12	19.0	28.8	1.05	34.0	6.79	22.1	0.40	0.03	0.01
100	0.6246	33.2	0.31	12.2	46.4	1.68	34.7	12.84	34.8	1.67	0.11	0.02

WMATA ALTERNATIVE WITH METRO
ESTIMATED AUTO EMISSIONS FOR 1990 (TONS)

DISTRICT	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS TOTAL 6-9	CS	MS	TOTAL 8-9	CS	CARBON MONOXIDE %	TOTAL 2-10	CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER EXH	DAILY TIME	SULPHUR DIOXIDE DAILY
101	0.5733	16.7	0.35	18.2	25.5	3.03	32.1	19.63	19.9	1.35	0.10	0.13	0.02	
102	0.3976	17.9	0.21	19.3	19.4	1.99	31.8	12.50	17.3	0.95	0.07	0.09	0.01	
103	0.4475	16.2	0.26	10.7	24.5	2.19	19.0	15.79	14.2	1.10	0.08	0.10	0.01	
104	0.8211	36.1	0.38	11.5	45.7	1.96	33.4	15.18	34.4	2.24	0.14	0.18	0.03	
105	0.2801	16.5	0.22	13.6	41.2	1.49	30.4	10.87	27.1	0.68	0.05	0.06	0.01	
106	0.4355	25.2	0.19	16.8	23.2	1.53	31.3	9.05	19.3	1.10	0.07	0.10	0.01	
107	0.1077	33.3	0.10	21.1	36.3	0.66	47.3	4.06	34.7	0.53	0.03	0.04	0.01	
108	0.2579	22.0	0.15	6.6	42.2	0.94	23.5	7.36	25.8	0.63	0.04	0.05	0.01	
109	0.2442	37.3	0.07	10.6	23.5	0.49	23.6	3.48	17.5	0.67	0.04	0.05	0.01	
110	0.1427	23.8	0.08	19.6	30.9	0.59	39.0	3.74	26.5	0.36	0.02	0.03	0.00	
111	0.0426	21.9	0.02	11.4	25.9	0.15	22.0	1.08	16.6	0.10	0.01	0.01	0.00	
112	0.1035	25.9	0.09	23.1	49.3	0.57	58.1	3.53	48.3	0.26	0.02	0.02	0.00	
113	0.5205	21.0	0.20	12.4	13.2	1.83	20.8	12.37	10.8	1.28	0.09	0.11	0.02	
114	0.3515	19.1	0.22	17.2	31.5	1.71	33.5	11.33	23.6	0.84	0.06	0.08	0.01	
115	0.2594	24.5	0.18	13.3	46.4	1.07	34.8	8.03	33.5	0.73	0.05	0.06	0.01	
116	0.3569	26.3	0.14	21.8	14.0	1.29	34.0	7.64	17.6	0.91	0.04	0.08	0.01	
117	0.2949	10.5	0.23	6.6	5.2	1.83	12.8	12.93	5.6	0.75	0.05	0.07	0.01	
118	0.0464	18.2	0.02	20.6	17.2	0.24	33.0	1.45	17.0	0.11	0.01	0.01	0.00	
119	0.1088	20.1	0.14	22.1	33.5	1.07	43.0	6.59	29.4	0.48	0.03	0.04	0.01	
120	0.7804	10.4	0.39	11.4	25.2	3.20	21.2	22.78	15.6	1.87	0.13	0.17	0.02	
121	0.1200	19.7	0.05	11.3	14.2	0.45	18.8	3.13	10.3	0.29	0.02	0.03	0.00	
122	0.0577	23.2	0.03	22.6	20.8	0.25	38.9	1.49	21.6	0.14	0.01	0.01	0.00	
123	0.0874	13.1	0.02	42.6	37.3	0.15	78.2	0.65	60.4	0.02	0.00	0.00	0.00	
124	0.1176	19.9	0.05	15.2	16.4	0.51	25.0	3.35	13.4	0.28	0.02	0.03	0.00	
125	0.2503	30.6	0.07	10.5	16.5	0.59	20.3	4.12	12.5	0.66	0.04	0.06	0.01	
126	0.6007	41.4	0.17	15.2	20.4	1.22	32.3	7.88	19.8	1.70	0.10	0.13	0.02	
127	0.3376	20.2	0.19	12.9	32.7	1.41	26.4	10.04	21.3	0.82	0.06	0.07	0.01	
128	0.3650	21.2	0.19	14.2	28.7	1.47	27.6	10.15	19.9	0.89	0.06	0.08	0.01	
129	0.3965	50.4	0.12	9.0	35.1	0.62	26.3	4.78	26.0	1.19	0.07	0.09	0.01	
130	0.1644	26.0	0.08	26.2	24.5	0.72	46.9	4.01	27.8	0.42	0.03	0.04	0.01	
131	0.2043	24.4	0.16	15.4	34.9	1.12	33.3	7.65	25.8	0.73	0.05	0.06	0.01	
132	0.9950	17.4	0.45	9.7	14.7	4.24	15.7	30.09	9.3	2.35	0.17	0.22	0.03	
133	0.3064	26.2	0.15	17.8	32.5	1.12	37.1	7.31	26.6	0.77	0.05	0.07	0.01	
134	0.0101	33.0	0.00	0.0	0.0	0.02	0.0	0.14	0.0	0.03	0.00	0.00	0.00	
***	42.8013	26.5	22.82	12.1	28.2	159.39	10.2	1101.91	8.0	109.21	7.20	9.44	1.34	

WMATA ALTERNATIVE WITHOUT METRO

ESTIMATED AUTO EMISSIONS FOR 1990 (TONS)

DISTRICT	DAILY VMT (F06)	AVG SPD MPH	HYDROCARBONS		% CS HS		TOTAL 8-9	CARBON MONOXIDE		% CS	NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FXH TYPE	SULPHUR DIOXIDE DAILY
			TOTAL 6-9	% CS	TOTAL 2-10	% CS							
1	0.0246	23.3	0.10	14.5	79.7	0.30	77.5	2.81	82.4	0.06	0.00	0.01	0.00
2	0.0317	18.3	0.14	14.2	78.2	0.43	73.7	3.98	79.4	0.09	0.01	0.01	0.00
3	0.1348	12.1	0.21	11.7	50.6	1.06	36.2	8.03	39.0	0.33	0.02	0.03	0.00
4	0.0470	18.0	0.15	10.0	48.2	0.68	36.0	5.29	40.8	0.18	0.01	0.01	0.00
5	0.0732	18.0	0.12	10.4	68.5	0.45	42.1	4.10	53.9	0.17	0.01	0.02	0.00
6	0.1102	13.5	0.14	9.3	56.1	0.70	29.9	5.80	38.7	0.26	0.02	0.02	0.00
7	0.1418	43.5	0.07	13.2	48.0	0.33	42.8	2.42	42.7	0.41	0.02	0.03	0.00
8	0.0477	9.1	0.09	13.5	40.5	0.47	39.2	3.24	35.5	0.12	0.01	0.01	0.00
9	0.0575	13.3	0.04	15.6	51.3	0.49	44.9	3.43	42.6	0.14	0.01	0.01	0.00
10	0.0436	15.3	0.04	10.4	32.8	0.34	21.0	2.39	19.0	0.15	0.01	0.01	0.00
11	0.1767	32.4	0.12	11.3	58.0	0.54	40.2	4.41	46.5	0.45	0.03	0.04	0.01
12	0.0449	16.7	0.07	14.8	59.3	0.34	45.9	2.54	47.4	0.12	0.01	0.01	0.00
13	0.1109	26.7	0.18	9.1	68.0	0.62	39.8	5.92	54.4	0.41	0.03	0.04	0.01
14	0.2072	23.9	0.08	7.2	21.2	0.64	14.3	4.53	12.3	0.52	0.03	0.05	0.01
15	0.0953	24.6	0.09	9.0	64.8	0.34	36.0	3.09	49.3	0.21	0.01	0.02	0.00
16	0.1073	30.2	0.12	14.2	49.1	0.66	40.8	4.68	39.5	0.50	0.03	0.04	0.01
17	0.1741	30.6	0.11	13.8	51.1	0.59	41.7	4.27	41.6	0.46	0.03	0.04	0.01
18	0.3726	24.0	0.16	10.5	26.9	1.26	21.7	8.66	17.4	0.93	0.04	0.08	0.01
19	0.2214	25.1	0.16	23.0	40.0	1.15	51.2	6.59	38.4	0.56	0.04	0.05	0.01
20	0.3628	23.9	0.23	15.1	40.4	1.50	35.9	10.03	30.6	0.91	0.06	0.08	0.01
21	0.2297	22.5	0.17	21.1	38.2	1.23	45.6	7.32	33.9	0.56	0.04	0.05	0.01
22	0.1359	25.2	0.14	21.4	52.4	0.82	57.9	5.02	50.4	0.34	0.02	0.03	0.00
23	0.1870	24.4	0.14	19.2	42.5	0.91	45.5	5.65	36.6	0.47	0.03	0.04	0.01
24	0.1530	26.4	0.08	12.3	38.8	0.53	30.0	3.70	27.4	0.39	0.03	0.03	0.00
25	0.1413	25.4	0.13	21.6	45.4	0.84	52.5	5.14	42.5	0.41	0.03	0.04	0.01
26	0.0642	17.6	0.05	24.7	45.9	0.36	66.2	2.05	44.3	0.11	0.01	0.01	0.00
27	0.2247	19.5	0.13	9.4	33.0	0.95	20.0	6.83	19.3	0.54	0.04	0.05	0.01
28	0.2290	22.0	0.24	13.1	58.5	1.15	42.3	8.92	45.9	0.56	0.04	0.05	0.01
29	0.1188	20.3	0.10	26.3	35.5	0.80	52.1	4.32	35.9	0.29	0.02	0.03	0.00
30	0.2982	22.6	0.12	10.7	17.2	1.03	19.6	6.83	12.2	0.74	0.05	0.07	0.01
31	0.0624	31.3	0.04	23.9	36.8	0.26	52.8	1.45	38.2	0.16	0.01	0.01	0.00
32	0.1511	24.7	0.15	17.0	66.0	0.78	51.3	5.43	49.0	0.39	0.03	0.03	0.00
33	0.0215	29.8	0.02	30.4	49.1	0.16	72.8	0.81	60.4	0.06	0.00	0.00	0.00
34	0.0795	27.5	0.04	20.8	33.8	0.32	44.6	1.87	31.6	0.20	0.01	0.02	0.00
35	0.1923	40.2	0.11	12.4	54.7	0.50	43.4	3.87	46.6	0.54	0.03	0.04	0.01
36	0.0823	23.3	0.08	22.7	48.7	0.52	56.5	3.11	46.8	0.20	0.01	0.02	0.00
37	0.1182	18.3	0.10	13.0	45.2	0.62	32.0	4.42	30.9	0.28	0.02	0.03	0.00
38	0.2160	23.0	0.12	21.7	25.8	1.01	40.5	5.78	24.8	0.54	0.04	0.05	0.01
39	0.4104	23.4	0.28	21.5	36.5	2.09	45.6	12.32	33.0	1.02	0.07	0.09	0.01
40	0.2476	21.8	0.17	20.8	36.3	1.28	43.9	7.66	31.9	0.61	0.04	0.05	0.01
41	0.1372	25.6	0.11	16.9	51.0	0.63	47.3	4.25	43.4	0.35	0.02	0.03	0.00
42	0.3594	30.7	0.16	16.4	33.1	1.13	37.4	7.15	29.0	0.95	0.06	0.08	0.01
43	0.2251	21.4	0.11	17.4	21.4	1.00	31.2	6.10	18.3	0.55	0.04	0.05	0.01
44	0.5512	20.2	0.29	16.9	36.9	1.94	39.4	12.34	30.8	1.43	0.09	0.12	0.02
45	0.1059	15.9	0.05	9.2	10.6	0.30	14.6	3.30	7.6	0.25	0.02	0.02	0.00
46	0.0614	20.6	0.09	27.5	51.8	0.59	67.9	3.18	56.9	0.15	0.01	0.01	0.00
47	0.1095	24.0	0.08	20.1	41.3	0.54	46.5	3.30	36.4	0.27	0.02	0.02	0.00
48	0.1815	23.8	0.11	20.6	31.7	0.83	41.8	4.87	28.5	0.45	0.03	0.04	0.01
49	0.1168	26.9	0.09	27.3	38.3	0.64	58.0	3.39	42.1	0.30	0.02	0.03	0.00
50	0.3301	17.1	0.14	7.2	7.6	1.40	11.3	9.53	5.5	0.78	0.06	0.07	0.01

WMATA ALTERNATIVE WITHOUT METRO
ESTIMATED AUTO EMISSIONS FOR 1980 (TONS)

DISTRICT	DAILY VMT (E06)	AVG SPD MPH	HYDROCARBONS			CARRON MONOXIDE			NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FYH	SULPHUR DIOXIDE DAILY
			TOTAL	% CS	% MS	TOTAL A-9	% CS	% L 2-10			
51	0.1713	15.6	0.15	12.1	44.7	0.96	29.2	6.06	0.03	0.01	
52	0.2345	25.1	0.17	21.8	40.1	1.19	49.2	6.07	0.04	0.01	
53	0.6159	17.1	0.29	8.5	14.6	2.70	14.6	18.46	0.10	0.02	
54	0.6498	22.9	0.44	16.7	41.4	2.97	39.4	19.60	0.11	0.02	
55	0.4740	17.1	0.34	7.6	20.8	2.65	15.5	18.62	0.08	0.01	
56	0.4696	14.2	0.30	11.2	17.8	2.63	20.3	17.35	0.08	0.01	
57	0.4244	19.0	0.32	13.3	41.2	2.18	30.6	15.20	0.07	0.01	
58	0.9436	25.5	0.40	12.5	24.4	3.18	25.0	20.00	0.16	0.03	
59	0.7575	23.4	0.33	12.5	22.4	2.74	24.0	18.14	0.13	0.02	
60	0.6142	16.6	0.51	13.3	43.8	3.38	31.6	23.82	0.10	0.02	
61	1.0631	28.1	0.50	16.2	32.8	3.61	35.8	22.04	0.18	0.03	
62	1.0616	41.8	0.30	12.5	21.8	2.10	28.7	13.45	0.18	0.03	
63	0.5375	30.2	0.21	20.6	30.7	1.52	46.3	8.72	0.09	0.02	
64	0.7484	39.2	0.29	17.9	32.7	1.98	42.3	11.90	0.13	0.02	
65	0.6055	41.8	0.24	15.2	37.9	1.43	40.5	9.34	0.10	0.02	
66	0.4984	37.6	0.22	19.9	34.7	1.47	46.8	8.63	0.13	0.02	
67	0.3241	39.0	0.09	6.1	21.2	0.60	14.3	4.33	0.04	0.01	
68	0.8559	31.4	0.42	13.8	40.1	2.62	35.3	17.83	0.14	0.03	
69	0.4517	32.6	0.15	17.7	16.5	1.25	33.7	7.34	0.08	0.01	
70	0.2032	48.0	0.07	14.3	34.8	0.41	38.9	2.70	0.03	0.01	
71	1.0142	34.8	0.43	13.0	37.4	2.62	33.5	17.00	0.17	0.03	
72	0.8610	32.3	0.36	18.6	27.8	2.70	39.2	16.08	0.14	0.03	
73	1.0643	19.3	0.50	10.2	19.4	4.40	18.3	29.77	0.18	0.03	
74	0.4147	20.4	0.23	14.9	28.5	1.88	29.2	12.17	0.07	0.01	
75	0.8577	27.3	0.27	5.0	13.4	2.20	9.5	15.61	0.14	0.03	
76	0.0347	34.6	0.02	27.5	34.5	0.14	58.3	0.73	0.01	0.00	
77	0.4171	24.2	0.20	17.3	25.0	1.66	33.4	10.15	0.07	0.01	
78	0.6017	29.9	0.27	16.6	30.5	2.01	35.9	12.53	0.10	0.02	
79	0.3114	25.6	0.26	14.9	53.4	1.35	44.3	9.60	0.05	0.01	
80	0.5019	22.2	0.27	19.4	26.1	2.30	36.6	13.74	0.08	0.02	
81	0.3313	24.9	0.19	14.6	40.2	1.20	35.8	8.05	0.06	0.01	
82	0.4029	34.4	0.15	12.7	29.9	1.02	29.6	6.76	0.07	0.01	
83	0.2229	16.6	0.13	12.2	26.7	1.09	23.1	7.33	0.04	0.01	
84	0.4045	29.0	0.21	13.6	40.5	1.32	34.5	9.05	0.07	0.01	
85	0.2449	21.9	0.12	9.9	23.6	0.97	19.4	6.66	0.05	0.01	
86	0.1245	13.1	0.10	11.4	15.2	0.82	21.4	5.33	0.02	0.00	
87	0.2742	28.5	0.18	13.4	49.1	0.96	38.7	6.89	0.05	0.01	
88	0.4207	28.8	0.24	24.7	32.7	1.83	50.8	9.94	0.07	0.01	
89	0.2272	22.3	0.10	16.3	14.6	0.91	27.7	5.58	0.04	0.01	
90	0.0158	7.0	0.00	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
91	0.2275	31.5	0.14	31.8	32.0	1.19	41.7	5.62	0.04	0.01	
92	0.8031	19.8	0.51	11.8	38.0	3.53	26.8	24.86	0.14	0.03	
93	1.0451	15.8	0.55	7.2	13.5	4.94	12.7	34.88	0.18	0.03	
94	0.2754	11.7	0.21	11.5	12.7	1.77	22.0	11.34	0.05	0.01	
95	0.6425	33.3	0.24	17.8	31.6	1.96	39.9	11.98	0.11	0.02	
96	0.4740	15.7	0.49	7.3	56.9	2.43	22.5	21.08	0.08	0.01	
97	0.1856	7.7	0.20	4.1	4.1	1.33	9.7	9.10	0.03	0.01	
98	0.0375	20.3	0.02	22.7	16.4	0.19	37.0	1.07	0.01	0.00	
99	0.1777	14.8	0.13	18.8	28.2	1.13	34.2	6.96	0.03	0.01	
100	0.6515	31.1	0.33	12.1	45.2	1.83	34.5	13.27	0.11	0.02	

WMATA ALTERNATIVE WITHOUT METRO

ESTIMATED AUTO EMISSIONS FOR 1990 (TONS)

DISTRICT	DAILY VMT (FOK)	AVG SPD MPH	HYDROCARBONS		CARBON MONOXIDE		NITROGEN DIOXIDE DAILY	PARTICULATE MATTER FKH	SULPHUR DIOXIDE DAILY				
			TOTAL 6-9	% CS	TOTAL 8-9	% CS				TOTAL 2-10	% CS		
101	0.5865	14.4	0.37	17.6	24.3	3.39	31.1	20.90	19.1	1.37	0.10	0.13	0.02
102	0.4077	18.0	0.22	19.1	18.8	2.14	32.0	12.74	17.3	0.97	0.07	0.09	0.01
103	0.4706	14.2	0.27	10.6	23.9	2.32	19.3	15.84	14.4	1.10	0.08	0.10	0.01
104	0.8270	35.9	0.39	11.3	45.0	2.07	33.4	15.24	34.5	2.26	0.14	0.18	0.03
105	0.2020	14.0	0.23	13.2	39.9	1.64	29.4	11.60	26.2	0.68	0.05	0.06	0.01
106	0.4375	25.3	0.19	16.5	22.7	1.62	31.5	9.95	19.4	1.10	0.07	0.10	0.01
107	0.1094	33.3	0.10	21.0	35.7	0.70	47.8	4.08	34.9	0.53	0.03	0.04	0.01
108	0.2627	21.9	0.16	9.5	41.6	1.00	23.6	7.48	26.0	0.65	0.04	0.06	0.01
109	0.2490	37.2	0.08	10.9	22.6	0.53	24.5	3.54	17.7	0.68	0.04	0.05	0.01
110	0.1428	23.8	0.08	20.0	29.9	0.63	39.9	3.74	26.7	0.36	0.02	0.03	0.00
111	0.0430	21.9	0.02	11.2	25.0	0.16	22.1	1.08	16.4	0.11	0.01	0.01	0.00
112	0.1053	25.8	0.10	22.7	49.1	0.61	57.9	3.58	48.3	0.27	0.02	0.02	0.00
113	0.5362	20.0	0.22	11.6	12.0	2.14	19.4	13.85	9.8	1.30	0.09	0.12	0.02
114	0.3565	18.6	0.22	16.8	30.7	1.80	33.2	11.60	23.4	0.86	0.06	0.08	0.01
115	0.2030	24.1	0.14	13.0	45.1	1.17	33.7	8.34	32.6	0.73	0.05	0.06	0.01
116	0.3669	26.7	0.14	21.6	13.7	1.35	36.9	7.51	17.9	0.94	0.06	0.08	0.01
117	0.3113	9.7	0.25	6.2	4.8	2.02	12.4	13.54	5.4	0.79	0.05	0.07	0.01
118	0.0477	18.2	0.03	20.5	16.6	0.26	33.4	1.69	17.0	0.11	0.01	0.01	0.00
119	0.2030	19.5	0.14	22.3	32.9	1.16	43.9	6.73	29.8	0.69	0.03	0.04	0.01
120	0.7085	18.3	0.42	11.1	23.9	3.59	20.6	24.28	15.0	1.90	0.13	0.14	0.03
121	0.1219	19.6	0.05	11.1	13.7	0.48	18.9	3.17	10.3	0.30	0.02	0.03	0.00
122	0.0690	23.2	0.03	22.8	19.9	0.27	39.6	1.51	21.7	0.15	0.01	0.01	0.00
123	0.0075	13.1	0.02	42.6	36.9	0.16	78.5	0.65	60.5	0.02	0.00	0.00	0.00
124	0.1197	18.5	0.06	14.9	15.8	0.54	25.1	3.39	13.4	0.29	0.02	0.03	0.00
125	0.2549	30.7	0.08	10.3	16.0	0.63	20.4	4.17	12.5	0.67	0.04	0.06	0.01
126	0.6210	41.6	0.18	14.9	19.7	1.30	32.5	7.91	19.8	1.77	0.10	0.14	0.02
127	0.3420	20.2	0.20	13.0	31.9	1.50	26.9	10.14	21.5	0.83	0.06	0.08	0.01
128	0.3740	20.7	0.20	14.0	27.7	1.60	27.7	10.66	19.8	0.92	0.06	0.08	0.01
129	0.3080	50.4	0.12	8.7	34.4	0.65	26.1	4.78	27.0	1.19	0.07	0.09	0.01
130	0.1685	26.1	0.09	26.7	23.6	0.78	48.1	4.11	28.2	0.63	0.03	0.04	0.01
131	0.2095	24.5	0.16	15.9	33.8	1.21	34.4	7.78	26.1	0.75	0.05	0.07	0.01
132	1.0075	17.4	0.47	9.7	14.2	4.52	16.2	30.34	9.4	2.38	0.17	0.22	0.03
133	0.3087	24.2	0.16	18.0	31.6	1.20	38.0	7.40	26.8	0.78	0.05	0.07	0.01
134	0.0101	33.0	0.00	0.0	0.0	0.02	0.0	0.13	0.0	0.03	0.00	0.00	0.00
000	44.3580	25.7	24.58	11.6	27.2	176.69	9.9	1166.12	7.8	112.63	7.46	9.78	1.39

RACF EMISSIONS 1972

ESTIMATED TRUCK EMISSIONS FOR 1972 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			6-9			2-10			DAILY			DAILY			DAILY		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
1	0.004	13.5	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	
2	0.005	14.5	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	
3	0.012	13.5	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.04	0.06	0.00	0.01	0.00	0.00	0.01	
4	0.010	13.4	0.01	0.03	0.00	0.2	0.4	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	
5	0.011	13.7	0.01	0.03	0.00	0.2	0.4	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
6	0.002	13.5	0.01	0.02	0.00	0.2	0.4	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	
7	0.011	14.3	0.01	0.03	0.00	0.2	0.4	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
8	0.011	17.5	0.01	0.03	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
9	0.017	15.7	0.02	0.04	0.00	0.3	0.6	0.0	0.00	0.06	0.08	0.00	0.00	0.00	0.00	0.01	
10	0.024	17.0	0.04	0.04	0.01	0.5	1.2	0.1	0.01	0.12	0.15	0.01	0.02	0.01	0.00	0.02	
11	0.005	14.7	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	
12	0.002	13.7	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	
13	0.005	14.3	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	
14	0.007	15.0	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	
15	0.020	17.0	0.03	0.07	0.00	0.4	1.0	0.1	0.01	0.10	0.13	0.01	0.01	0.01	0.00	0.02	
16	0.004	15.0	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	
17	0.015	17.3	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.01	
18	0.034	27.0	0.03	0.06	0.00	0.3	0.8	0.0	0.01	0.13	0.18	0.01	0.02	0.01	0.00	0.02	
19	0.027	18.2	0.03	0.07	0.00	0.4	0.9	0.1	0.01	0.09	0.12	0.01	0.01	0.01	0.00	0.02	
20	0.025	18.6	0.03	0.06	0.00	0.4	0.9	0.1	0.01	0.10	0.13	0.01	0.01	0.01	0.00	0.02	
21	0.020	17.6	0.02	0.05	0.00	0.3	0.5	0.0	0.00	0.07	0.09	0.01	0.01	0.01	0.00	0.01	
22	0.012	17.5	0.01	0.03	0.00	0.2	0.4	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
23	0.023	18.8	0.02	0.05	0.00	0.3	0.7	0.0	0.01	0.08	0.10	0.01	0.01	0.01	0.00	0.01	
24	0.016	21.5	0.02	0.03	0.00	0.2	0.4	0.0	0.00	0.05	0.07	0.00	0.01	0.00	0.00	0.01	
25	0.033	22.3	0.03	0.07	0.00	0.4	0.9	0.1	0.01	0.12	0.16	0.01	0.02	0.01	0.00	0.02	
26	0.015	20.3	0.02	0.03	0.00	0.2	0.4	0.0	0.00	0.05	0.07	0.00	0.01	0.00	0.00	0.01	
27	0.024	22.0	0.03	0.05	0.00	0.3	0.7	0.0	0.01	0.09	0.12	0.01	0.01	0.01	0.00	0.02	
28	0.020	24.5	0.02	0.04	0.00	0.3	0.8	0.0	0.00	0.07	0.10	0.01	0.01	0.01	0.00	0.01	
29	0.032	23.0	0.03	0.06	0.00	0.3	0.8	0.0	0.01	0.11	0.16	0.01	0.02	0.01	0.00	0.02	
30	0.003	15.0	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	
31	0.014	21.7	0.02	0.03	0.00	0.2	0.4	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.01	
32	0.011	20.0	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
33	0.005	21.5	0.01	0.01	0.00	0.1	0.1	0.0	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	
34	0.013	22.0	0.01	0.03	0.00	0.1	0.3	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.01	
35	0.009	26.1	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.03	0.05	0.00	0.00	0.00	0.00	0.01	
36	0.011	19.7	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
37	0.014	18.3	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.01	
38	0.014	17.6	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.01	
39	0.041	14.5	0.04	0.00	0.01	0.6	1.3	0.1	0.01	0.14	0.19	0.01	0.02	0.01	0.00	0.02	
40	0.032	14.3	0.03	0.07	0.00	0.4	1.0	0.1	0.01	0.11	0.14	0.01	0.02	0.01	0.00	0.02	
41	0.022	24.6	0.02	0.04	0.00	0.2	0.5	0.0	0.01	0.08	0.11	0.01	0.01	0.01	0.00	0.01	
42	0.048	26.4	0.06	0.12	0.01	0.6	1.6	0.1	0.02	0.24	0.34	0.02	0.03	0.02	0.00	0.04	
43	0.012	14.3	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.06	0.08	0.00	0.00	0.00	0.00	0.01	
44	0.040	23.0	0.04	0.08	0.01	0.4	1.0	0.1	0.01	0.14	0.20	0.01	0.02	0.01	0.00	0.02	
45	0.007	24.7	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	
46	0.011	20.6	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
47	0.014	25.0	0.01	0.03	0.00	0.2	0.4	0.0	0.00	0.06	0.08	0.00	0.01	0.00	0.00	0.01	
48	0.007	21.1	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	
49	0.009	20.6	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	
50	0.008	20.4	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	

RASF EMISSIONS 1972

ESTIMATED TRUCK EMISSIONS FOR 1972 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			Daily			Daily			Daily			Daily			Daily		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
51	0.029	25.7	0.03	0.05	0.00	0.7	0.0	0.01	0.10	0.14	0.01	0.01	0.01	0.00	0.00	0.02	
52	0.012	20.0	0.02	0.04	0.00	0.5	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01	
53	0.047	25.1	0.05	0.03	0.01	1.2	0.1	0.01	0.16	0.23	0.01	0.02	0.01	0.00	0.01	0.01	
54	0.232	32.1	0.20	0.38	0.03	1.8	0.2	0.06	0.88	1.26	0.06	0.06	0.06	0.06	0.06	0.14	
55	0.045	24.7	0.04	0.07	0.01	0.4	0.0	0.01	0.16	0.23	0.01	0.02	0.01	0.00	0.01	0.03	
56	0.037	20.1	0.03	0.06	0.00	0.3	0.0	0.01	0.13	0.19	0.01	0.02	0.01	0.00	0.01	0.02	
57	0.033	20.0	0.03	0.04	0.00	0.3	0.0	0.01	0.12	0.17	0.01	0.02	0.01	0.00	0.00	0.02	
58	0.056	20.7	0.05	0.06	0.01	0.6	0.1	0.01	0.21	0.29	0.02	0.03	0.02	0.00	0.01	0.03	
59	0.266	23.3	0.06	0.11	0.01	0.6	0.1	0.02	0.24	0.34	0.01	0.02	0.01	0.00	0.01	0.04	
60	0.033	21.2	0.03	0.07	0.00	0.4	0.0	0.01	0.12	0.16	0.01	0.02	0.01	0.00	0.00	0.02	
61	0.103	23.0	0.09	0.17	0.01	0.9	0.1	0.02	0.37	0.53	0.03	0.05	0.03	0.01	0.01	0.06	
62	0.123	31.0	0.11	0.21	0.01	1.0	0.2	0.03	0.47	0.67	0.03	0.06	0.03	0.01	0.01	0.07	
63	0.109	32.5	0.09	0.17	0.01	0.8	0.1	0.03	0.40	0.59	0.03	0.05	0.03	0.01	0.02	0.06	
64	0.091	20.6	0.08	0.15	0.01	0.7	0.1	0.02	0.33	0.47	0.02	0.04	0.02	0.01	0.01	0.05	
65	0.070	17.6	0.06	0.11	0.01	0.5	0.1	0.02	0.26	0.37	0.02	0.03	0.02	0.00	0.01	0.04	
66	0.091	37.3	0.07	0.13	0.01	0.6	0.1	0.02	0.34	0.50	0.02	0.04	0.02	0.01	0.01	0.05	
67	0.032	12.8	0.03	0.10	0.01	0.7	0.1	0.01	0.13	0.17	0.01	0.02	0.01	0.00	0.01	0.02	
68	0.222	27.3	0.04	0.07	0.00	0.4	0.1	0.01	0.15	0.21	0.01	0.02	0.01	0.00	0.01	0.02	
69	0.004	14.5	0.00	0.01	0.00	0.0	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
70	0.026	33.8	0.08	0.16	0.01	0.7	0.1	0.02	0.35	0.51	0.03	0.05	0.03	0.01	0.01	0.05	
71	0.020	23.7	0.02	0.04	0.00	0.2	0.0	0.00	0.07	0.10	0.01	0.01	0.01	0.00	0.00	0.01	
72	0.041	28.8	0.05	0.10	0.01	0.5	0.1	0.01	0.22	0.31	0.02	0.03	0.02	0.00	0.01	0.04	
73	0.046	20.6	0.04	0.07	0.01	0.4	0.0	0.01	0.17	0.24	0.01	0.02	0.01	0.00	0.01	0.03	
74	0.021	27.5	0.03	0.05	0.00	0.3	0.0	0.01	0.11	0.16	0.01	0.01	0.01	0.00	0.00	0.02	
75	0.070	24.3	0.06	0.11	0.01	0.5	0.1	0.02	0.26	0.38	0.02	0.03	0.02	0.00	0.01	0.04	
76	0.007	24.1	0.01	0.01	0.00	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	
77	0.041	33.2	0.03	0.06	0.00	0.3	0.0	0.01	0.15	0.22	0.01	0.02	0.01	0.00	0.01	0.02	
78	0.042	31.9	0.04	0.07	0.00	0.3	0.0	0.01	0.15	0.22	0.01	0.02	0.01	0.00	0.01	0.02	
79	0.022	26.1	0.02	0.04	0.00	0.2	0.0	0.01	0.08	0.11	0.01	0.01	0.01	0.00	0.00	0.01	
80	0.022	25.5	0.03	0.05	0.00	0.3	0.0	0.01	0.10	0.14	0.01	0.01	0.01	0.00	0.00	0.02	
81	0.014	24.6	0.02	0.03	0.00	0.2	0.0	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.00	0.01	
82	0.014	24.1	0.01	0.03	0.00	0.1	0.0	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.00	0.01	
83	0.017	25.2	0.02	0.03	0.00	0.2	0.0	0.00	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.01	
84	0.024	25.7	0.02	0.05	0.00	0.2	0.0	0.01	0.09	0.13	0.01	0.01	0.01	0.00	0.00	0.01	
85	0.010	24.4	0.01	0.02	0.00	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01	
86	0.012	20.2	0.02	0.03	0.00	0.2	0.0	0.00	0.07	0.10	0.01	0.01	0.01	0.00	0.00	0.01	
87	0.047	24.3	0.06	0.09	0.01	0.4	0.1	0.01	0.17	0.24	0.01	0.02	0.01	0.00	0.01	0.03	
88	0.025	22.0	0.02	0.05	0.00	0.3	0.0	0.01	0.09	0.12	0.01	0.01	0.01	0.00	0.00	0.01	
89	0.002	23.0	0.00	0.00	0.00	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
90	0.001	23.0	0.00	0.00	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
91	0.013	25.5	0.02	0.03	0.00	0.4	0.0	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.00	0.00	
92	0.042	30.4	0.05	0.10	0.01	0.5	0.1	0.02	0.23	0.33	0.02	0.03	0.02	0.00	0.01	0.04	
93	0.049	20.1	0.04	0.07	0.00	0.3	0.0	0.01	0.19	0.27	0.01	0.02	0.01	0.00	0.01	0.03	
94	0.011	24.6	0.01	0.02	0.00	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01	
95	0.020	35.0	0.02	0.04	0.00	0.2	0.0	0.01	0.11	0.16	0.01	0.01	0.01	0.00	0.00	0.02	
96	0.035	26.1	0.03	0.05	0.00	0.2	0.0	0.01	0.13	0.19	0.01	0.02	0.01	0.00	0.01	0.02	
97	0.020	30.9	0.02	0.03	0.00	0.4	0.0	0.00	0.07	0.10	0.00	0.01	0.01	0.00	0.00	0.01	
98	0.003	25.3	0.00	0.00	0.00	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
99	0.045	35.0	0.04	0.07	0.00	0.3	0.0	0.01	0.19	0.25	0.01	0.02	0.01	0.00	0.01	0.03	
100	0.020	32.2	0.02	0.05	0.00	0.2	0.0	0.01	0.11	0.15	0.01	0.01	0.01	0.00	0.00	0.02	

BASE EMISSIONS 1977

ESTIMATED TRUCK EMISSIONS FOR 1977 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
101	0.021	24.3	0.02	0.04	0.00	0.2	0.5	0.0	0.00	0.07	0.10	0.01	0.01	0.01	0.00	0.00	0.01
102	0.040	22.2	0.05	0.10	0.01	0.4	1.2	0.1	0.01	0.22	0.32	0.02	0.03	0.02	0.00	0.00	0.03
103	0.033	24.2	0.03	0.05	0.00	0.3	0.7	0.0	0.01	0.12	0.17	0.01	0.02	0.01	0.00	0.00	0.02
104	0.044	22.5	0.05	0.09	0.01	0.4	1.1	0.1	0.01	0.20	0.29	0.01	0.03	0.01	0.00	0.01	0.03
105	0.042	22.6	0.03	0.04	0.00	0.3	0.4	0.0	0.01	0.16	0.23	0.01	0.02	0.01	0.00	0.01	0.02
106	0.051	22.1	0.04	0.07	0.01	0.3	0.9	0.1	0.02	0.19	0.28	0.01	0.02	0.01	0.00	0.01	0.01
107	0.047	22.8	0.04	0.07	0.01	0.7	1.9	0.1	0.02	0.16	0.52	0.03	0.05	0.03	0.01	0.01	0.06
108	0.057	24.7	0.05	0.09	0.01	0.4	1.0	0.1	0.01	0.21	0.31	0.02	0.03	0.02	0.00	0.01	0.03
109	0.032	22.1	0.02	0.03	0.00	0.2	0.4	0.0	0.00	0.07	0.10	0.01	0.01	0.01	0.00	0.00	0.01
110	0.030	26.5	0.02	0.04	0.00	0.2	0.5	0.0	0.01	0.11	0.16	0.01	0.01	0.01	0.00	0.00	0.01
111	0.010	28.4	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.04	0.05	0.00	0.01	0.00	0.00	0.00	0.02
112	0.051	22.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
113	0.033	22.8	0.03	0.05	0.00	0.2	0.5	0.0	0.01	0.13	0.19	0.01	0.02	0.01	0.00	0.00	0.02
114	0.024	21.5	0.02	0.04	0.00	0.2	0.5	0.0	0.01	0.10	0.14	0.01	0.01	0.01	0.00	0.00	0.02
115	0.032	22.5	0.03	0.05	0.00	0.2	0.5	0.0	0.01	0.12	0.18	0.01	0.02	0.01	0.00	0.00	0.02
116	0.005	22.0	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
117	0.005	24.3	0.01	0.01	0.00	0.1	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
118	0.001	22.4	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
119	0.007	24.3	0.01	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
120	0.044	44.1	0.04	0.11	0.01	0.4	1.3	0.1	0.02	0.33	0.47	0.02	0.04	0.02	0.01	0.01	0.05
121	0.002	25.2	0.01	0.01	0.00	0.1	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
122	0.021	27.4	0.02	0.03	0.00	0.1	0.4	0.0	0.01	0.08	0.11	0.01	0.01	0.01	0.00	0.00	0.01
123	0.003	24.9	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
124	0.044	47.1	0.03	0.06	0.00	0.2	0.7	0.0	0.01	0.17	0.25	0.01	0.02	0.01	0.00	0.01	0.03
125	0.027	29.2	0.04	0.06	0.01	0.3	0.9	0.0	0.01	0.22	0.31	0.02	0.03	0.02	0.00	0.01	0.03
126	0.041	46.2	0.03	0.05	0.00	0.2	0.5	0.0	0.01	0.16	0.24	0.01	0.02	0.01	0.00	0.01	0.02
127	0.021	27.5	0.02	0.03	0.00	0.1	0.4	0.0	0.01	0.08	0.11	0.01	0.01	0.01	0.00	0.00	0.01
128	0.012	24.1	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.01
129	0.019	24.0	0.01	0.03	0.00	0.1	0.3	0.0	0.00	0.07	0.10	0.00	0.01	0.01	0.00	0.00	0.01
130	0.007	27.2	0.01	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
131	0.035	47.5	0.03	0.05	0.00	0.2	0.5	0.0	0.01	0.14	0.21	0.01	0.02	0.01	0.00	0.01	0.02
132	0.047	22.4	0.04	0.04	0.01	0.4	0.9	0.0	0.01	0.17	0.25	0.01	0.02	0.01	0.00	0.01	0.03
133	0.024	20.1	0.03	0.05	0.00	0.2	0.5	0.0	0.01	0.13	0.19	0.01	0.02	0.01	0.00	0.00	0.02
134	0.001	22.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
000	4.121	29.9	3.64	7.14	0.48	25.9	90.7	4.9	1.00	15.00	21.17	1.10	1.99	1.11	0.27	0.59	2.39

ALTERNATIVE 4A TRUCKS EMISSIONS ASSUMPTION A (1992 with Metro)

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			A-9			2-10			DAILY			DAILY			DAILY		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
1	0.004	22.4	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	
2	0.014	17.4	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.07	0.09	0.00	0.01	0.00	0.00	0.01	
3	0.022	11.2	0.00	0.00	0.00	0.0	0.2	0.1	0.00	0.13	0.13	0.01	0.01	0.01	0.00	0.02	
4	0.013	10.3	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.06	0.07	0.00	0.00	0.00	0.00	0.01	
5	0.013	14.9	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.05	0.07	0.00	0.01	0.00	0.00	0.01	
6	0.015	2.5	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.08	0.12	0.01	0.01	0.00	0.00	0.01	
7	0.024	33.9	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.13	0.18	0.01	0.01	0.01	0.00	0.02	
8	0.009	8.4	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
9	0.010	13.4	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
10	0.011	25.0	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.04	0.07	0.00	0.00	0.00	0.00	0.01	
11	0.024	62.0	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.14	0.19	0.01	0.01	0.00	0.00	0.02	
12	0.050	15.1	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.21	0.27	0.01	0.02	0.00	0.01	0.03	
13	0.025	20.2	0.00	0.00	0.00	0.0	0.4	0.1	0.00	0.11	0.14	0.01	0.01	0.00	0.00	0.02	
14	0.035	20.0	0.00	0.00	0.00	0.0	0.4	0.0	0.00	0.16	0.22	0.01	0.02	0.00	0.00	0.02	
15	0.011	22.1	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.08	0.10	0.00	0.01	0.00	0.00	0.02	
16	0.023	25.9	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.11	0.15	0.01	0.01	0.00	0.00	0.02	
17	0.024	29.7	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.12	0.16	0.01	0.01	0.00	0.00	0.02	
18	0.040	15.1	0.00	0.00	0.00	0.0	1.1	0.1	0.00	0.25	0.32	0.03	0.03	0.00	0.01	0.04	
19	0.054	14.0	0.00	0.00	0.00	0.0	0.9	0.1	0.00	0.17	0.22	0.01	0.02	0.00	0.00	0.03	
20	0.033	21.7	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.13	0.16	0.01	0.01	0.00	0.00	0.02	
21	0.030	20.0	0.00	0.00	0.00	0.0	0.5	0.0	0.00	0.08	0.10	0.00	0.01	0.00	0.00	0.01	
22	0.011	20.0	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.10	0.13	0.01	0.01	0.00	0.00	0.02	
23	0.022	21.3	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.11	0.13	0.01	0.01	0.00	0.00	0.02	
24	0.025	10.4	0.00	0.00	0.00	0.0	0.4	0.1	0.00	0.22	0.30	0.01	0.02	0.00	0.01	0.03	
25	0.043	32.5	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.09	0.13	0.01	0.01	0.00	0.00	0.01	
26	0.019	32.0	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.14	0.20	0.01	0.01	0.00	0.00	0.02	
27	0.041	22.3	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.09	0.12	0.01	0.01	0.00	0.00	0.01	
28	0.024	27.7	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.12	0.14	0.01	0.01	0.00	0.00	0.02	
29	0.035	14.7	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.16	0.21	0.01	0.02	0.00	0.00	0.03	
30	0.001	29.3	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
31	0.020	22.8	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.09	0.11	0.01	0.01	0.00	0.00	0.01	
32	0.003	25.2	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	
33	0.011	24.9	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.01	
34	0.024	42.4	0.00	0.00	0.00	0.0	0.3	0.0	0.00	0.14	0.22	0.01	0.01	0.00	0.00	0.02	
35	0.015	23.6	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.07	0.09	0.00	0.01	0.00	0.00	0.01	
36	0.014	17.1	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.11	0.14	0.01	0.01	0.00	0.00	0.01	
37	0.043	22.2	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.19	0.24	0.01	0.02	0.01	0.00	0.03	
38	0.015	15.2	0.00	0.00	0.00	0.0	0.7	0.1	0.00	0.15	0.19	0.01	0.02	0.01	0.00	0.02	
39	0.044	34.0	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.32	0.43	0.02	0.03	0.00	0.01	0.05	
40	0.052	33.8	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.24	0.33	0.01	0.02	0.00	0.01	0.04	
41	0.024	33.4	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.11	0.15	0.01	0.01	0.00	0.00	0.02	
42	0.001	22.0	0.00	0.00	0.00	0.0	1.1	0.1	0.00	0.09	0.11	0.00	0.00	0.00	0.00	0.06	
43	0.001	15.2	0.00	0.00	0.00	0.0	0.4	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
44	0.015	20.0	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.07	0.08	0.00	0.00	0.00	0.00	0.01	
45	0.021	17.9	0.00	0.00	0.00	0.0	0.3	0.1	0.00	0.09	0.11	0.01	0.01	0.00	0.00	0.01	
46	0.013	25.6	0.00	0.00	0.00	0.0	0.2	0.0	0.00	0.06	0.08	0.00	0.01	0.00	0.00	0.01	
47	0.034	14.7	0.00	0.00	0.00	0.0	0.5	0.1	0.00	0.15	0.18	0.01	0.01	0.00	0.00	0.02	

ALTERNATIVE 4A TRUCKS EMISSIONS ASSUMPTION 4

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT	SO	HYDROCARBONS			CAPROL MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	MDD	LT	HD	MDD	LT	HD	MDD	LT	HD	MDD	LT	HD	MDD
51	0.012	24.4	0.00	0.01	0.00	0.00	0.2	0.0	0.00	0.05	0.07	0.00	0.01	0.00	0.00	0.00	0.01
52	0.035	11.6	0.01	0.02	0.01	0.1	0.4	0.1	0.00	0.15	0.19	0.01	0.02	0.01	0.00	0.00	0.02
53	0.132	27.8	0.02	0.04	0.02	0.2	1.5	0.2	0.02	0.50	0.80	0.04	0.06	0.04	0.01	0.02	0.09
54	0.100	17.2	0.02	0.04	0.02	0.3	1.7	0.2	0.01	0.43	0.52	0.03	0.04	0.03	0.01	0.01	0.07
55	0.045	20.3	0.01	0.02	0.01	0.1	0.5	0.1	0.01	0.20	0.20	0.01	0.02	0.01	0.00	0.01	0.03
56	0.074	24.7	0.01	0.04	0.01	0.1	0.5	0.1	0.01	0.33	0.44	0.02	0.03	0.02	0.00	0.01	0.05
57	0.015	21.1	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.04	0.04	0.00	0.01	0.00	0.00	0.00	0.01
58	0.103	22.0	0.02	0.04	0.01	0.1	1.0	0.1	0.01	0.44	0.65	0.03	0.04	0.03	0.01	0.01	0.07
59	0.033	25.1	0.01	0.04	0.01	0.2	1.0	0.1	0.01	0.37	0.49	0.02	0.04	0.03	0.01	0.01	0.06
60	0.050	15.4	0.01	0.03	0.01	0.2	0.9	0.1	0.01	0.27	0.27	0.02	0.02	0.02	0.00	0.01	0.03
61	0.110	27.6	0.02	0.05	0.02	0.2	1.2	0.2	0.01	0.50	0.67	0.03	0.05	0.04	0.01	0.01	0.09
62	0.205	44.1	0.03	0.07	0.02	0.2	1.6	0.1	0.03	1.05	1.41	0.05	0.09	0.07	0.01	0.03	0.14
63	0.071	37.3	0.01	0.03	0.01	0.1	0.6	0.1	0.01	0.34	0.44	0.02	0.03	0.02	0.00	0.01	0.05
64	0.050	25.7	0.01	0.04	0.01	0.1	0.5	0.1	0.01	0.43	0.50	0.02	0.04	0.03	0.01	0.01	0.06
65	0.022	42.9	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.45	0.61	0.02	0.04	0.03	0.01	0.01	0.06
66	0.107	42.4	0.02	0.04	0.01	0.1	0.9	0.1	0.01	0.53	0.71	0.03	0.05	0.03	0.01	0.01	0.07
67	0.034	25.3	0.02	0.05	0.01	0.2	1.2	0.2	0.01	0.42	0.56	0.03	0.04	0.03	0.01	0.01	0.07
68	0.065	27.8	0.01	0.04	0.01	0.1	1.0	0.1	0.01	0.39	0.52	0.02	0.04	0.03	0.01	0.01	0.06
69	0.053	15.1	0.01	0.03	0.01	0.2	1.0	0.1	0.01	0.22	0.28	0.01	0.02	0.02	0.00	0.01	0.04
70	0.102	45.4	0.01	0.04	0.01	0.1	0.8	0.1	0.01	0.52	0.69	0.03	0.04	0.03	0.01	0.01	0.07
71	0.120	15.5	0.02	0.07	0.02	0.3	1.9	0.3	0.01	0.52	0.63	0.03	0.05	0.04	0.01	0.02	0.09
72	0.024	32.2	0.02	0.04	0.01	0.1	0.9	0.1	0.01	0.45	0.60	0.03	0.04	0.03	0.01	0.01	0.07
73	0.125	14.7	0.03	0.04	0.02	0.4	2.3	0.3	0.01	0.53	0.67	0.03	0.05	0.04	0.01	0.02	0.09
74	0.057	24.3	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.24	0.34	0.02	0.03	0.02	0.00	0.01	0.04
75	0.152	20.6	0.03	0.09	0.03	0.3	2.2	0.3	0.02	0.47	0.44	0.04	0.07	0.05	0.01	0.02	0.11
76	0.012	30.3	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.05	0.07	0.00	0.01	0.00	0.00	0.00	0.01
77	0.017	22.2	0.02	0.04	0.01	0.1	1.0	0.1	0.01	0.45	0.61	0.01	0.04	0.03	0.01	0.01	0.07
78	0.034	19.9	0.01	0.02	0.01	0.1	0.5	0.1	0.00	0.15	0.19	0.01	0.01	0.01	0.00	0.00	0.02
79	0.024	25.0	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.11	0.15	0.01	0.01	0.01	0.00	0.00	0.02
80	0.075	24.0	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.34	0.40	0.02	0.03	0.02	0.00	0.01	0.05
81	0.041	24.4	0.01	0.02	0.01	0.1	0.5	0.1	0.01	0.19	0.25	0.01	0.02	0.01	0.00	0.01	0.03
82	0.022	30.6	0.01	0.02	0.00	0.0	0.4	0.0	0.01	0.20	0.24	0.01	0.02	0.01	0.00	0.01	0.03
83	0.052	4.4	0.01	0.02	0.02	0.1	0.5	0.2	0.01	0.20	0.30	0.02	0.03	0.02	0.00	0.01	0.04
84	0.075	34.7	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.35	0.48	0.02	0.03	0.02	0.00	0.01	0.05
85	0.012	17.9	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.05	0.06	0.00	0.01	0.00	0.00	0.00	0.01
86	0.027	13.1	0.01	0.02	0.01	0.1	0.5	0.1	0.00	0.11	0.15	0.01	0.01	0.01	0.00	0.00	0.02
87	0.055	27.2	0.01	0.03	0.01	0.1	0.6	0.1	0.00	0.25	0.33	0.01	0.02	0.02	0.00	0.01	0.04
88	0.040	22.7	0.01	0.02	0.01	0.1	0.6	0.1	0.01	0.28	0.30	0.02	0.03	0.02	0.00	0.01	0.04
89	0.024	24.0	0.01	0.03	0.01	0.1	0.5	0.1	0.01	0.21	0.27	0.01	0.02	0.01	0.00	0.01	0.01
90	0.001	3.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
91	0.010	26.4	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.09	0.12	0.01	0.01	0.01	0.00	0.00	0.01
92	0.074	17.7	0.02	0.04	0.01	0.2	1.2	0.2	0.01	0.33	0.30	0.02	0.03	0.02	0.00	0.01	0.05
93	0.144	4.7	0.03	0.06	0.04	0.4	2.6	0.4	0.02	0.71	0.90	0.04	0.07	0.05	0.01	0.02	0.11
94	0.041	19.1	0.01	0.02	0.01	0.1	0.6	0.1	0.00	0.14	0.22	0.01	0.02	0.01	0.00	0.01	0.03
95	0.075	21.7	0.01	0.03	0.01	0.1	0.9	0.1	0.01	0.34	0.44	0.02	0.03	0.02	0.01	0.01	0.05
96	0.052	15.7	0.01	0.03	0.01	0.1	0.9	0.1	0.01	0.27	0.27	0.01	0.02	0.02	0.00	0.01	0.04
97	0.074	25.4	0.01	0.03	0.01	0.1	0.8	0.1	0.01	0.35	0.46	0.02	0.03	0.02	0.00	0.01	0.05
98	0.123	44.7	0.02	0.04	0.01	0.1	1.0	0.1	0.02	0.61	0.83	0.03	0.05	0.04	0.01	0.02	0.09
99	0.075	34.7	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.36	0.49	0.02	0.03	0.02	0.00	0.01	0.05
100	0.047	35.0	0.01	0.02	0.01	0.1	0.4	0.1	0.01	0.22	0.30	0.01	0.02	0.02	0.00	0.01	0.03

ALTERNATIVE 4A TRUCKS EMISSIONS ASSUMPTION A

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	M/T	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	MDD	LT	HD	MDD	LT	HD	MDD	LT	HD	MDD	LT	HD	MDD
			2-10			2-10			DAILY			DAILY			DAILY		
101	0.155	33.4	0.02	0.06	0.01	0.1	1.0	0.1	0.01	0.51	0.69	0.03	0.05	0.04	0.01	0.01	0.08
102	0.145	32.5	0.03	0.07	0.02	0.2	1.7	0.2	0.02	0.70	1.07	0.05	0.07	0.05	0.01	0.03	0.13
103	0.147	15.4	0.04	0.11	0.03	0.5	3.1	0.4	0.02	0.71	0.89	0.04	0.07	0.05	0.01	0.02	0.12
104	0.176	21.2	0.03	0.05	0.03	0.4	2.5	0.3	0.02	0.76	0.97	0.05	0.08	0.06	0.01	0.02	0.12
105	0.031	33.9	0.01	0.06	0.01	0.4	0.4	0.1	0.01	0.43	0.59	0.04	0.04	0.03	0.01	0.01	0.06
106	0.111	42.5	0.02	0.06	0.01	0.1	0.9	0.1	0.02	0.54	0.74	0.03	0.05	0.04	0.01	0.01	0.08
107	0.074	25.2	0.01	0.04	0.01	0.1	0.9	0.1	0.01	0.33	0.44	0.02	0.03	0.02	0.00	0.01	0.05
108	0.103	36.0	0.02	0.06	0.01	0.1	0.9	0.1	0.01	0.40	0.67	0.03	0.04	0.03	0.01	0.01	0.07
109	0.042	31.2	0.01	0.03	0.01	0.1	0.6	0.1	0.01	0.29	0.39	0.02	0.03	0.02	0.00	0.01	0.04
110	0.022	24.4	0.01	0.01	0.00	0.1	0.4	0.0	0.00	0.12	0.14	0.01	0.01	0.01	0.00	0.00	0.02
111	0.007	18.5	0.00	0.00	0.00	0.0	0.4	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
112	0.003	22.4	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.01
113	0.027	17.6	0.02	0.04	0.02	0.3	1.0	0.2	0.01	0.41	0.53	0.03	0.04	0.03	0.01	0.01	0.07
114	0.044	21.3	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.21	0.27	0.01	0.02	0.02	0.00	0.01	0.03
115	0.023	15.8	0.01	0.02	0.01	0.1	0.6	0.1	0.00	0.14	0.17	0.01	0.01	0.01	0.00	0.00	0.02
116	0.040	24.2	0.01	0.02	0.01	0.1	0.5	0.1	0.01	0.22	0.28	0.01	0.02	0.02	0.00	0.01	0.03
117	0.073	31.3	0.01	0.03	0.01	0.1	0.8	0.1	0.01	0.37	0.50	0.02	0.03	0.03	0.01	0.01	0.05
118	0.024	17.0	0.01	0.01	0.00	0.1	0.4	0.1	0.00	0.10	0.12	0.01	0.01	0.01	0.00	0.00	0.02
119	0.060	16.7	0.01	0.04	0.01	0.2	1.0	0.1	0.01	0.26	0.32	0.02	0.03	0.02	0.00	0.01	0.04
120	0.134	29.7	0.02	0.06	0.02	0.2	1.5	0.2	0.02	0.44	0.56	0.04	0.06	0.04	0.01	0.02	0.10
121	0.021	22.2	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.09	0.12	0.01	0.01	0.01	0.00	0.00	0.01
122	0.014	27.4	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.07	0.10	0.00	0.01	0.01	0.00	0.00	0.01
123	0.003	22.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
124	0.074	44.6	0.01	0.03	0.01	0.4	0.6	0.1	0.01	0.38	0.51	0.02	0.03	0.02	0.00	0.01	0.05
125	0.049	35.3	0.01	0.03	0.01	0.1	0.4	0.1	0.01	0.42	0.54	0.02	0.04	0.03	0.01	0.01	0.06
126	0.151	37.0	0.02	0.04	0.02	0.2	1.5	0.2	0.02	0.71	0.96	0.04	0.07	0.05	0.01	0.02	0.10
127	0.135	26.6	0.02	0.06	0.02	0.2	1.5	0.2	0.02	0.61	0.81	0.04	0.06	0.04	0.01	0.02	0.09
128	0.075	32.2	0.01	0.03	0.01	0.1	0.7	0.1	0.01	0.35	0.47	0.02	0.03	0.02	0.00	0.01	0.05
129	0.013	31.0	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.09	0.11	0.00	0.01	0.01	0.00	0.00	0.01
130	0.124	31.0	0.02	0.05	0.02	0.2	1.3	0.2	0.02	0.50	0.60	0.03	0.06	0.04	0.01	0.02	0.09
131	0.024	13.0	0.02	0.05	0.02	0.3	1.6	0.2	0.01	0.34	0.44	0.02	0.04	0.03	0.01	0.01	0.06
132	0.144	14.6	0.05	0.13	0.04	0.6	3.6	0.5	0.02	0.83	1.05	0.05	0.09	0.06	0.01	0.03	0.14
133	0.022	22.0	0.02	0.04	0.01	0.2	1.1	0.2	0.01	0.34	0.47	0.02	0.04	0.03	0.01	0.01	0.06
134	0.003	10.7	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.01
000	7.651	27.2	1.34	3.64	1.15	13.9	93.1	12.3	0.93	34.87	45.89	2.04	3.34	2.46	0.49	0.99	5.29

WYATA ALTERNATIVE WITHOUT MFRTR
 ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT	SQ	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
1	0.004	21.8	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2	0.014	27.5	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.00	0.01
3	0.022	10.7	0.00	0.00	0.00	0.0	0.2	0.1	0.00	0.11	0.13	0.00	0.01	0.01	0.00	0.00	0.02
4	0.013	10.0	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.06	0.08	0.00	0.00	0.01	0.00	0.00	0.01
5	0.013	17.8	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.05	0.06	0.00	0.00	0.01	0.00	0.00	0.01
6	0.019	8.0	0.00	0.01	0.00	0.0	0.3	0.1	0.00	0.08	0.12	0.01	0.01	0.01	0.00	0.00	0.01
7	0.022	20.5	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.13	0.17	0.01	0.01	0.01	0.00	0.00	0.02
8	0.008	4.1	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
9	0.010	13.4	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.01
10	0.011	25.8	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.01
11	0.020	42.5	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.14	0.18	0.01	0.01	0.01	0.00	0.00	0.02
12	0.050	15.0	0.01	0.03	0.01	0.1	0.2	0.1	0.01	0.21	0.27	0.01	0.02	0.02	0.00	0.01	0.03
13	0.025	18.7	0.01	0.01	0.00	0.1	0.4	0.1	0.00	0.11	0.13	0.01	0.01	0.01	0.00	0.00	0.02
14	0.025	20.5	0.01	0.01	0.00	0.0	0.4	0.0	0.00	0.16	0.22	0.01	0.02	0.01	0.00	0.00	0.02
15	0.014	19.7	0.00	0.01	0.00	0.0	0.0	0.0	0.00	0.08	0.10	0.00	0.00	0.01	0.00	0.00	0.01
16	0.023	25.4	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.11	0.14	0.01	0.01	0.01	0.00	0.00	0.02
17	0.024	28.4	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.12	0.16	0.01	0.01	0.01	0.00	0.00	0.02
18	0.020	14.9	0.01	0.04	0.01	0.1	1.1	0.1	0.01	0.25	0.32	0.02	0.03	0.02	0.00	0.01	0.04
19	0.053	14.6	0.01	0.06	0.01	0.2	1.1	0.1	0.01	0.25	0.32	0.02	0.03	0.02	0.00	0.01	0.04
20	0.034	22.7	0.01	0.02	0.01	0.1	0.5	0.1	0.00	0.17	0.22	0.01	0.02	0.01	0.00	0.00	0.03
21	0.030	14.1	0.01	0.02	0.01	0.1	0.5	0.1	0.00	0.13	0.16	0.01	0.01	0.01	0.00	0.00	0.02
22	0.012	19.3	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.08	0.10	0.00	0.00	0.01	0.00	0.00	0.01
23	0.022	22.1	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.10	0.12	0.01	0.01	0.01	0.00	0.00	0.02
24	0.025	14.5	0.01	0.01	0.00	0.1	0.4	0.1	0.00	0.11	0.13	0.01	0.01	0.01	0.00	0.00	0.02
25	0.042	30.3	0.01	0.02	0.01	0.1	0.5	0.1	0.01	0.22	0.30	0.01	0.02	0.02	0.00	0.01	0.03
26	0.019	41.9	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.09	0.13	0.01	0.01	0.01	0.00	0.00	0.01
27	0.031	24.3	0.01	0.01	0.00	0.0	0.3	0.0	0.00	0.14	0.19	0.01	0.01	0.01	0.00	0.00	0.02
28	0.021	22.9	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.09	0.12	0.01	0.01	0.01	0.00	0.00	0.01
29	0.026	26.8	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.12	0.15	0.01	0.01	0.01	0.00	0.00	0.02
30	0.033	13.0	0.01	0.02	0.01	0.1	0.7	0.1	0.00	0.16	0.21	0.01	0.02	0.01	0.00	0.00	0.03
31	0.008	27.9	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
32	0.020	22.3	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.09	0.11	0.01	0.01	0.01	0.00	0.00	0.01
33	0.003	24.3	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
34	0.011	24.2	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.02
35	0.033	42.2	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.16	0.22	0.01	0.01	0.01	0.00	0.00	0.02
36	0.015	15.6	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.07	0.08	0.00	0.00	0.01	0.00	0.00	0.01
37	0.014	15.4	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.06	0.07	0.00	0.00	0.01	0.00	0.00	0.02
38	0.024	12.3	0.01	0.02	0.01	0.1	0.5	0.1	0.00	0.11	0.14	0.01	0.01	0.01	0.00	0.00	0.02
39	0.063	21.6	0.01	0.02	0.01	0.1	0.6	0.1	0.00	0.19	0.24	0.01	0.02	0.01	0.00	0.01	0.03
40	0.035	14.5	0.01	0.02	0.01	0.1	0.7	0.1	0.00	0.15	0.19	0.01	0.01	0.01	0.00	0.00	0.02
41	0.064	34.2	0.01	0.03	0.01	0.1	0.6	0.1	0.01	0.31	0.42	0.02	0.03	0.02	0.00	0.01	0.05
42	0.052	31.0	0.01	0.02	0.01	0.1	0.5	0.1	0.01	0.24	0.33	0.01	0.02	0.02	0.00	0.01	0.04
43	0.024	32.7	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.07	0.08	0.00	0.00	0.00	0.00	0.00	0.01
44	0.027	21.7	0.02	0.04	0.01	0.2	1.1	0.2	0.01	0.35	0.45	0.02	0.03	0.03	0.01	0.01	0.06
45	0.001	5.9	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	0.020	15.5	0.00	0.01	0.00	0.0	0.4	0.0	0.00	0.06	0.09	0.01	0.01	0.01	0.00	0.00	0.01
47	0.015	17.4	0.00	0.01	0.00	0.0	0.3	0.0	0.00	0.06	0.08	0.00	0.00	0.00	0.00	0.00	0.01
48	0.021	14.8	0.00	0.01	0.00	0.1	0.4	0.1	0.00	0.09	0.11	0.01	0.01	0.01	0.00	0.00	0.01
49	0.013	24.7	0.00	0.01	0.00	0.0	0.2	0.0	0.00	0.06	0.08	0.00	0.00	0.01	0.00	0.00	0.01
50	0.034	13.7	0.01	0.02	0.01	0.1	0.6	0.1	0.00	0.14	0.18	0.01	0.01	0.01	0.00	0.00	0.02

DATA ALTERNATIVE WITHOUT METRO

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			4-9			2-10			DAILY			DAILY			DAILY		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
51	0.012	21.7	0.00	0.01	0.00	0.0	0.2	0.05	0.07	0.00	0.01	0.00	0.01	0.00	0.00	0.01	
52	0.035	11.0	0.01	0.02	0.01	0.1	0.4	0.15	0.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	
53	0.132	24.0	0.02	0.04	0.02	0.3	1.7	0.59	0.77	0.02	0.02	0.02	0.06	0.04	0.01	0.02	
54	0.100	16.7	0.02	0.04	0.02	0.3	1.7	0.43	0.52	0.02	0.01	0.03	0.04	0.03	0.01	0.07	
55	0.045	28.2	0.01	0.02	0.01	0.1	0.5	0.20	0.27	0.01	0.01	0.02	0.02	0.01	0.00	0.03	
56	0.074	24.2	0.01	0.04	0.01	0.1	0.9	0.43	0.43	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
57	0.015	26.5	0.00	0.01	0.00	0.0	0.2	0.04	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	
58	0.103	21.4	0.02	0.04	0.01	0.1	1.0	0.48	0.65	0.01	0.01	0.03	0.04	0.03	0.01	0.07	
59	0.043	23.5	0.02	0.04	0.01	0.2	1.1	0.37	0.48	0.01	0.01	0.02	0.04	0.03	0.01	0.06	
60	0.050	14.7	0.01	0.03	0.01	0.1	0.9	0.21	0.27	0.01	0.01	0.02	0.02	0.02	0.00	0.03	
61	0.110	26.2	0.02	0.05	0.02	0.2	1.3	0.50	0.66	0.02	0.01	0.03	0.05	0.04	0.01	0.08	
62	0.209	44.7	0.03	0.08	0.02	0.2	1.6	1.04	1.41	0.02	0.03	0.06	0.09	0.07	0.01	0.14	
63	0.071	37.0	0.01	0.03	0.01	0.1	0.6	0.34	0.46	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
64	0.030	25.1	0.01	0.04	0.01	0.1	0.3	0.22	0.54	0.01	0.01	0.02	0.04	0.03	0.01	0.06	
65	0.032	42.7	0.01	0.03	0.01	0.1	0.7	0.45	0.61	0.01	0.01	0.02	0.04	0.03	0.01	0.06	
66	0.077	22.1	0.02	0.04	0.01	0.1	0.9	0.53	0.71	0.01	0.01	0.03	0.05	0.03	0.01	0.07	
67	0.024	25.3	0.02	0.05	0.01	0.2	1.2	0.62	0.54	0.01	0.01	0.03	0.04	0.03	0.01	0.07	
68	0.044	27.7	0.01	0.04	0.01	0.1	1.0	0.39	0.52	0.01	0.01	0.02	0.04	0.03	0.01	0.06	
69	0.053	14.2	0.01	0.03	0.01	0.2	1.0	0.22	0.28	0.01	0.01	0.02	0.02	0.02	0.00	0.04	
70	0.102	45.5	0.01	0.06	0.01	0.1	0.8	0.52	0.69	0.01	0.01	0.03	0.04	0.04	0.01	0.07	
71	0.120	17.1	0.03	0.07	0.02	0.3	2.0	0.62	0.82	0.02	0.02	0.04	0.07	0.05	0.01	0.11	
72	0.054	31.6	0.02	0.04	0.01	0.1	0.9	0.45	0.60	0.01	0.01	0.03	0.04	0.04	0.01	0.09	
73	0.124	12.5	0.03	0.08	0.03	0.4	2.3	0.53	0.69	0.01	0.01	0.03	0.05	0.04	0.01	0.07	
74	0.057	21.2	0.01	0.03	0.01	0.1	0.8	0.25	0.32	0.01	0.01	0.02	0.03	0.02	0.00	0.04	
75	0.152	15.5	0.03	0.08	0.03	0.4	2.3	0.64	0.82	0.02	0.02	0.04	0.07	0.05	0.01	0.11	
76	0.012	29.2	0.00	0.01	0.00	0.0	0.1	0.05	0.07	0.00	0.00	0.00	0.01	0.00	0.00	0.01	
77	0.037	30.2	0.02	0.04	0.01	0.1	1.0	0.45	0.60	0.01	0.01	0.03	0.04	0.03	0.01	0.07	
78	0.034	19.9	0.01	0.02	0.01	0.1	0.5	0.15	0.18	0.00	0.00	0.01	0.01	0.01	0.00	0.02	
79	0.024	24.3	0.00	0.01	0.00	0.0	0.3	0.11	0.15	0.00	0.00	0.00	0.01	0.01	0.00	0.02	
80	0.075	24.2	0.01	0.03	0.01	0.1	0.7	0.34	0.49	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
81	0.041	24.1	0.01	0.02	0.01	0.1	0.5	0.19	0.25	0.01	0.01	0.02	0.02	0.01	0.00	0.03	
82	0.042	22.5	0.01	0.02	0.00	0.0	0.4	0.20	0.24	0.01	0.01	0.02	0.02	0.01	0.00	0.03	
83	0.055	4.2	0.01	0.02	0.02	0.1	0.5	0.20	0.24	0.01	0.01	0.02	0.02	0.01	0.00	0.03	
84	0.075	34.3	0.01	0.03	0.01	0.1	0.7	0.29	0.39	0.01	0.01	0.02	0.03	0.02	0.00	0.04	
85	0.012	17.9	0.00	0.01	0.00	0.0	0.2	0.05	0.06	0.00	0.00	0.00	0.01	0.00	0.00	0.01	
86	0.027	13.1	0.01	0.02	0.01	0.1	0.5	0.11	0.15	0.00	0.00	0.01	0.01	0.01	0.00	0.02	
87	0.055	27.6	0.01	0.02	0.01	0.1	0.6	0.25	0.33	0.01	0.01	0.02	0.02	0.02	0.00	0.04	
88	0.020	22.5	0.01	0.02	0.01	0.1	0.6	0.24	0.34	0.01	0.01	0.02	0.02	0.02	0.00	0.04	
89	0.044	25.2	0.01	0.02	0.01	0.1	0.5	0.21	0.27	0.01	0.01	0.02	0.02	0.01	0.00	0.03	
90	0.001	3.0	0.00	0.00	0.00	0.0	0.0	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
91	0.019	26.5	0.00	0.01	0.00	0.0	0.2	0.09	0.12	0.00	0.00	0.00	0.01	0.01	0.00	0.01	
92	0.074	17.2	0.02	0.05	0.01	0.2	1.3	0.32	0.39	0.02	0.01	0.03	0.03	0.02	0.00	0.05	
93	0.144	4.7	0.04	0.10	0.04	0.4	2.4	0.70	0.99	0.02	0.02	0.04	0.07	0.05	0.01	0.11	
94	0.041	19.1	0.01	0.02	0.01	0.1	0.6	0.14	0.22	0.01	0.00	0.01	0.02	0.01	0.00	0.03	
95	0.075	25.2	0.01	0.04	0.01	0.1	0.9	0.34	0.45	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
96	0.052	15.5	0.01	0.03	0.01	0.1	0.9	0.22	0.27	0.01	0.01	0.02	0.02	0.02	0.00	0.04	
97	0.074	28.6	0.01	0.03	0.01	0.1	0.8	0.35	0.46	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
98	0.123	44.4	0.02	0.04	0.01	0.1	1.0	0.61	0.83	0.02	0.02	0.03	0.05	0.04	0.01	0.09	
99	0.075	24.6	0.01	0.04	0.01	0.1	0.7	0.22	0.25	0.01	0.01	0.02	0.03	0.02	0.00	0.05	
100	0.027	34.2	0.01	0.02	0.01	0.1	0.4	0.22	0.30	0.01	0.01	0.02	0.02	0.02	0.00	0.03	

DATA ALTERNATIVE WITHOUT METAL

ESTIMATED TRUCK EMISSIONS FOR 1992 (TONS)

DIST	VMT SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE					
		6-9			2-10			DAILY			DAILY			DAILY					
		LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD			
101	0.105	31.4	0.02	0.05	0.01	0.01	0.2	1.1	0.1	0.01	0.51	0.68	0.03	0.05	0.04	0.01	0.01	0.01	0.04
102	0.169	32.4	0.03	0.07	0.02	0.02	0.2	1.7	0.2	0.02	0.79	1.07	0.05	0.07	0.05	0.01	0.02	0.01	0.12
103	0.167	15.3	0.04	0.11	0.03	0.5	3.1	0.4	0.2	0.02	0.71	0.89	0.04	0.07	0.05	0.01	0.02	0.01	0.12
104	0.174	21.2	0.03	0.06	0.03	0.4	2.5	0.3	0.3	0.02	0.74	0.97	0.05	0.08	0.06	0.01	0.02	0.01	0.06
105	0.691	33.9	0.01	0.04	0.01	0.1	0.8	0.1	0.1	0.01	0.43	0.58	0.02	0.04	0.03	0.01	0.01	0.01	0.06
106	0.111	42.4	0.02	0.04	0.01	0.1	0.9	0.1	0.1	0.02	0.54	0.74	0.03	0.05	0.04	0.01	0.01	0.01	0.08
107	0.074	25.2	0.01	0.04	0.01	0.1	0.9	0.1	0.1	0.01	0.33	0.44	0.02	0.03	0.02	0.00	0.01	0.01	0.05
108	0.103	36.5	0.02	0.04	0.01	0.1	0.9	0.1	0.1	0.01	0.69	0.67	0.03	0.04	0.03	0.01	0.01	0.01	0.07
109	0.062	30.1	0.01	0.03	0.01	0.1	0.6	0.1	0.1	0.01	0.24	0.38	0.02	0.03	0.02	0.00	0.01	0.01	0.04
110	0.025	24.3	0.01	0.01	0.00	0.1	0.4	0.0	0.0	0.00	0.12	0.16	0.01	0.01	0.01	0.00	0.00	0.00	0.02
111	0.007	14.5	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
112	0.004	22.4	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.01
113	0.027	13.6	0.02	0.04	0.02	0.3	1.8	0.2	0.2	0.01	0.41	0.53	0.03	0.04	0.03	0.01	0.01	0.01	0.02
114	0.044	21.3	0.01	0.03	0.01	0.1	0.7	0.1	0.1	0.01	0.21	0.27	0.01	0.02	0.02	0.00	0.01	0.01	0.03
115	0.033	16.6	0.01	0.02	0.01	0.1	0.6	0.1	0.1	0.00	0.14	0.17	0.01	0.01	0.01	0.00	0.00	0.01	0.02
116	0.048	26.6	0.01	0.02	0.01	0.1	0.5	0.1	0.1	0.01	0.22	0.29	0.01	0.02	0.02	0.00	0.01	0.01	0.03
117	0.075	24.8	0.01	0.03	0.01	0.1	0.8	0.1	0.1	0.01	0.36	0.49	0.02	0.03	0.03	0.01	0.01	0.01	0.05
118	0.024	17.8	0.01	0.01	0.01	0.1	0.4	0.1	0.1	0.00	0.10	0.12	0.01	0.01	0.01	0.00	0.00	0.00	0.02
119	0.060	16.7	0.01	0.04	0.01	0.2	1.0	0.1	0.1	0.01	0.26	0.32	0.02	0.03	0.02	0.00	0.01	0.01	0.04
120	0.139	27.1	0.02	0.04	0.02	0.2	1.6	0.2	0.2	0.02	0.63	0.84	0.04	0.06	0.04	0.01	0.02	0.01	0.10
121	0.021	22.8	0.00	0.01	0.00	0.0	0.3	0.0	0.0	0.00	0.09	0.12	0.01	0.01	0.01	0.00	0.00	0.00	0.01
122	0.014	27.4	0.00	0.01	0.00	0.0	0.2	0.0	0.0	0.00	0.07	0.10	0.00	0.01	0.01	0.00	0.00	0.00	0.01
123	0.003	22.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
124	0.074	44.4	0.01	0.03	0.01	0.1	0.6	0.1	0.1	0.01	0.38	0.51	0.02	0.03	0.02	0.00	0.01	0.01	0.05
125	0.058	38.3	0.01	0.03	0.01	0.1	0.8	0.1	0.1	0.01	0.42	0.58	0.02	0.04	0.03	0.01	0.01	0.01	0.06
126	0.151	31.5	0.02	0.04	0.02	0.2	1.5	0.2	0.2	0.02	0.70	0.95	0.04	0.07	0.05	0.01	0.02	0.01	0.10
127	0.135	26.6	0.02	0.04	0.02	0.2	1.5	0.2	0.2	0.02	0.61	0.81	0.04	0.06	0.04	0.01	0.02	0.01	0.09
128	0.075	32.2	0.01	0.03	0.01	0.1	0.7	0.1	0.1	0.01	0.35	0.47	0.02	0.03	0.02	0.00	0.01	0.01	0.05
129	0.012	26.8	0.00	0.01	0.00	0.0	0.2	0.0	0.0	0.00	0.04	0.11	0.00	0.01	0.01	0.00	0.00	0.00	0.01
130	0.124	30.0	0.02	0.04	0.02	0.2	1.3	0.2	0.2	0.02	0.59	0.79	0.03	0.06	0.04	0.01	0.02	0.01	0.09
131	0.084	19.0	0.02	0.05	0.02	0.3	1.6	0.2	0.2	0.01	0.36	0.46	0.02	0.04	0.03	0.01	0.01	0.01	0.06
132	0.156	14.6	0.05	0.13	0.04	0.6	3.6	0.5	0.5	0.02	0.83	1.05	0.05	0.09	0.06	0.01	0.01	0.01	0.14
133	0.002	22.6	0.02	0.04	0.01	0.2	1.1	0.2	0.2	0.01	0.34	0.47	0.02	0.04	0.03	0.01	0.01	0.01	0.06
134	0.005	19.7	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.01
esa	7.651	26.4	1.38	3.70	1.17	14.3	95.4	12.7	0.93	34.72	45.67	2.04	3.34	2.66	0.49	0.99	0.99	0.99	5.29

WYATA ALTERNATIVE WITH METRO
 ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
1	0.003	25.2	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2	0.005	10.4	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
3	0.017	13.8	0.01	0.03	0.00	0.2	0.5	0.0	0.00	0.07	0.09	0.00	0.01	0.01	0.00	0.00	0.01
4	0.005	8.6	0.01	0.01	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
5	0.005	14.4	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
6	0.014	13.8	0.01	0.02	0.00	0.2	0.4	0.0	0.00	0.04	0.07	0.00	0.01	0.00	0.00	0.00	0.01
7	0.015	43.4	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.01
8	0.004	10.4	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
9	0.005	15.0	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
10	0.005	15.2	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
11	0.023	31.5	0.01	0.02	0.00	0.1	0.4	0.0	0.01	0.11	0.14	0.01	0.01	0.01	0.00	0.00	0.01
12	0.017	30.2	0.00	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
13	0.021	25.3	0.01	0.03	0.00	0.1	0.4	0.0	0.00	0.04	0.10	0.01	0.01	0.01	0.00	0.00	0.01
14	0.010	30.8	0.01	0.01	0.00	0.0	0.2	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01
15	0.017	22.4	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.10	0.00	0.01	0.01	0.00	0.00	0.01
16	0.017	22.4	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.10	0.00	0.01	0.01	0.00	0.00	0.01
17	0.014	27.5	0.01	0.02	0.00	0.1	0.2	0.0	0.00	0.04	0.11	0.00	0.01	0.01	0.00	0.00	0.01
18	0.041	27.1	0.03	0.05	0.01	0.2	0.7	0.1	0.01	0.19	0.23	0.01	0.02	0.01	0.00	0.01	0.03
19	0.024	24.5	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.01	0.00	0.01	0.03
20	0.040	24.4	0.02	0.05	0.00	0.2	0.7	0.1	0.01	0.18	0.22	0.01	0.02	0.01	0.00	0.01	0.03
21	0.027	22.4	0.02	0.03	0.00	0.2	0.6	0.0	0.01	0.12	0.15	0.01	0.01	0.01	0.00	0.00	0.02
22	0.015	24.2	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.07	0.09	0.00	0.01	0.00	0.00	0.00	0.01
23	0.014	24.9	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.10	0.00	0.01	0.01	0.00	0.00	0.01
24	0.022	24.9	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.10	0.13	0.01	0.01	0.01	0.00	0.00	0.01
25	0.005	14.2	0.00	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.01
27	0.024	23.5	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.01	0.00	0.00	0.02
28	0.027	21.1	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.01	0.00	0.00	0.02
29	0.011	20.5	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.05	0.06	0.00	0.01	0.00	0.00	0.00	0.01
30	0.027	23.3	0.02	0.03	0.00	0.2	0.6	0.0	0.01	0.12	0.14	0.01	0.01	0.01	0.00	0.00	0.02
31	0.027	31.0	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
32	0.014	24.1	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.07	0.09	0.00	0.01	0.00	0.00	0.00	0.01
33	0.003	24.9	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
34	0.003	24.9	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
35	0.025	22.3	0.01	0.02	0.00	0.1	0.3	0.0	0.01	0.13	0.14	0.01	0.01	0.01	0.00	0.00	0.02
36	0.005	23.2	0.01	0.01	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
37	0.013	15.3	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.01
38	0.024	23.1	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.01	0.00	0.00	0.02
39	0.041	23.5	0.03	0.05	0.01	0.3	0.6	0.1	0.01	0.19	0.22	0.01	0.02	0.01	0.00	0.01	0.03
40	0.023	22.5	0.02	0.04	0.00	0.2	0.5	0.0	0.01	0.13	0.14	0.01	0.01	0.01	0.00	0.00	0.02
41	0.021	24.7	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.10	0.12	0.01	0.01	0.01	0.00	0.00	0.01
42	0.045	21.0	0.03	0.05	0.01	0.2	0.4	0.1	0.01	0.23	0.24	0.01	0.02	0.01	0.00	0.01	0.03
43	0.027	23.0	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.12	0.14	0.01	0.01	0.01	0.00	0.00	0.02
44	0.004	20.7	0.04	0.07	0.01	0.3	1.0	0.1	0.02	0.30	0.37	0.02	0.03	0.03	0.00	0.01	0.04
45	0.005	17.1	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
46	0.007	20.4	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.01
47	0.013	24.5	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.07	0.00	0.01	0.00	0.00	0.00	0.01
48	0.017	24.9	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.09	0.00	0.01	0.01	0.00	0.00	0.01
49	0.010	25.9	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01
50	0.030	21.3	0.02	0.04	0.00	0.2	0.7	0.1	0.01	0.13	0.15	0.01	0.01	0.01	0.00	0.00	0.02

ALTERNATIVE WITH METRO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE			
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	
51	0.014	14.1	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.07	0.08	0.00	0.01	0.00	0.00	0.01	0.01	0.03
52	0.023	24.9	0.02	0.03	0.00	0.2	0.4	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.00	0.00	0.02
53	0.052	17.6	0.07	0.14	0.02	0.8	2.3	0.2	0.02	0.41	0.44	0.02	0.04	0.03	0.01	0.01	0.01	0.04
54	0.043	24.8	0.05	0.10	0.01	0.5	1.6	0.1	0.02	0.38	0.46	0.02	0.04	0.02	0.01	0.01	0.01	0.05
55	0.049	16.4	0.04	0.05	0.01	0.5	1.4	0.1	0.01	0.22	0.24	0.01	0.02	0.01	0.00	0.01	0.01	0.03
56	0.045	15.8	0.04	0.07	0.01	0.5	1.3	0.1	0.01	0.20	0.22	0.01	0.02	0.01	0.00	0.01	0.01	0.03
57	0.053	19.8	0.04	0.07	0.01	0.4	1.2	0.1	0.01	0.24	0.27	0.01	0.02	0.01	0.00	0.01	0.01	0.03
58	0.121	27.0	0.08	0.12	0.02	0.7	2.2	0.2	0.02	0.56	0.69	0.03	0.06	0.04	0.01	0.02	0.01	0.04
59	0.055	24.8	0.04	0.14	0.01	0.6	1.9	0.2	0.02	0.45	0.54	0.03	0.04	0.03	0.01	0.01	0.01	0.04
60	0.050	17.2	0.04	0.08	0.01	0.5	1.3	0.1	0.01	0.22	0.24	0.01	0.02	0.01	0.00	0.01	0.01	0.03
61	0.131	31.2	0.08	0.14	0.02	0.7	2.1	0.2	0.02	0.52	0.77	0.04	0.06	0.04	0.01	0.02	0.01	0.03
62	0.145	44.7	0.08	0.13	0.01	0.5	1.8	0.1	0.04	0.75	0.92	0.04	0.07	0.04	0.01	0.02	0.01	0.09
63	0.050	41.4	0.05	0.02	0.01	0.3	1.1	0.1	0.02	0.45	0.56	0.02	0.04	0.03	0.01	0.01	0.01	0.06
64	0.024	43.2	0.05	0.02	0.01	0.3	1.0	0.1	0.03	0.49	0.60	0.03	0.04	0.03	0.01	0.01	0.01	0.06
65	0.085	45.7	0.05	0.02	0.01	0.3	1.2	0.1	0.02	0.44	0.54	0.02	0.04	0.03	0.01	0.01	0.01	0.06
66	0.037	44.9	0.05	0.02	0.01	0.3	1.1	0.1	0.02	0.44	0.55	0.02	0.04	0.03	0.01	0.01	0.01	0.06
67	0.077	38.6	0.04	0.07	0.01	0.3	1.0	0.1	0.02	0.38	0.47	0.02	0.04	0.03	0.01	0.01	0.01	0.05
68	0.129	38.2	0.07	0.12	0.01	0.5	1.7	0.1	0.03	0.64	0.79	0.03	0.06	0.04	0.01	0.02	0.01	0.08
69	0.029	34.0	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.19	0.23	0.01	0.02	0.01	0.00	0.01	0.01	0.03
70	0.033	50.4	0.02	0.03	0.00	0.1	0.5	0.0	0.00	0.20	0.24	0.01	0.02	0.01	0.00	0.00	0.01	0.03
71	0.101	35.7	0.04	0.10	0.01	0.4	1.4	0.1	0.03	0.49	0.61	0.03	0.05	0.03	0.01	0.01	0.01	0.07
72	0.054	25.7	0.05	0.02	0.01	0.4	1.2	0.1	0.02	0.42	0.52	0.02	0.04	0.03	0.01	0.01	0.01	0.06
73	0.103	20.5	0.07	0.14	0.02	0.4	2.3	0.2	0.02	0.66	0.83	0.03	0.05	0.03	0.01	0.01	0.01	0.06
74	0.047	26.5	0.03	0.04	0.01	0.3	0.9	0.1	0.01	0.22	0.26	0.01	0.02	0.01	0.00	0.01	0.01	0.03
75	0.102	24.8	0.04	0.10	0.01	0.5	1.5	0.1	0.03	0.50	0.62	0.03	0.05	0.03	0.01	0.01	0.01	0.07
76	0.064	33.0	0.03	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77	0.043	27.4	0.03	0.05	0.01	0.2	0.7	0.1	0.01	0.20	0.24	0.01	0.02	0.01	0.00	0.01	0.01	0.03
78	0.032	33.0	0.04	0.04	0.01	0.3	0.9	0.1	0.02	0.30	0.37	0.02	0.03	0.02	0.00	0.01	0.01	0.04
79	0.020	25.0	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.13	0.15	0.01	0.01	0.01	0.00	0.00	0.00	0.02
80	0.044	23.1	0.03	0.04	0.01	0.3	1.0	0.1	0.01	0.21	0.25	0.01	0.02	0.01	0.00	0.01	0.01	0.03
81	0.032	24.5	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.17	0.21	0.01	0.02	0.01	0.00	0.00	0.00	0.02
82	0.029	34.5	0.03	0.05	0.01	0.2	0.7	0.0	0.01	0.24	0.30	0.01	0.02	0.01	0.00	0.01	0.01	0.03
83	0.031	16.1	0.02	0.05	0.01	0.3	0.9	0.1	0.01	0.24	0.30	0.01	0.02	0.01	0.00	0.00	0.01	0.02
84	0.044	24.6	0.03	0.05	0.01	0.2	0.7	0.1	0.01	0.21	0.26	0.01	0.02	0.01	0.00	0.01	0.01	0.03
85	0.070	22.5	0.05	0.05	0.01	0.5	1.5	0.1	0.02	0.31	0.37	0.02	0.03	0.02	0.00	0.01	0.01	0.05
86	0.017	11.7	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.08	0.09	0.00	0.00	0.01	0.00	0.00	0.00	0.01
87	0.025	33.2	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.12	0.15	0.01	0.01	0.01	0.00	0.00	0.00	0.02
88	0.029	36.0	0.03	0.05	0.01	0.2	0.7	0.0	0.01	0.24	0.29	0.01	0.02	0.01	0.00	0.01	0.01	0.03
89	0.031	23.0	0.02	0.04	0.00	0.2	0.6	0.1	0.01	0.14	0.16	0.01	0.01	0.01	0.00	0.00	0.00	0.02
90	0.001	3.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
91	0.017	22.8	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.08	0.10	0.00	0.00	0.01	0.00	0.00	0.00	0.01
92	0.022	20.0	0.04	0.02	0.01	0.5	1.5	0.1	0.01	0.28	0.32	0.02	0.03	0.02	0.00	0.01	0.01	0.04
93	0.129	17.7	0.10	0.19	0.02	1.2	3.3	0.3	0.03	0.57	0.62	0.03	0.06	0.04	0.01	0.02	0.01	0.08
94	0.027	11.1	0.02	0.04	0.01	0.2	0.7	0.1	0.01	0.12	0.14	0.01	0.01	0.01	0.00	0.00	0.00	0.02
95	0.049	24.8	0.04	0.04	0.01	0.3	0.9	0.1	0.02	0.34	0.42	0.02	0.03	0.02	0.00	0.01	0.01	0.04
96	0.034	16.2	0.03	0.05	0.01	0.3	0.9	0.1	0.01	0.15	0.17	0.01	0.02	0.01	0.00	0.00	0.00	0.02
97	0.020	10.5	0.02	0.03	0.00	0.2	0.6	0.0	0.00	0.09	0.11	0.01	0.01	0.01	0.00	0.00	0.00	0.01
98	0.009	20.7	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.01
99	0.019	14.9	0.02	0.03	0.00	0.2	0.5	0.0	0.00	0.08	0.09	0.00	0.01	0.01	0.00	0.00	0.00	0.01
100	0.071	36.2	0.04	0.07	0.01	0.3	1.0	0.1	0.02	0.34	0.43	0.02	0.03	0.02	0.00	0.01	0.01	0.05

WYATA ALTERNATIVE WITH METRO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SQ	HYDROCARBONS			CAPRAN MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
101	0.054	14.0	0.04	0.03	0.01	0.5	1.6	0.1	0.01	0.25	0.22	0.03	0.02	0.00	0.01	0.04	
102	0.052	14.1	0.04	0.03	0.01	0.5	1.3	0.1	0.01	0.23	0.25	0.02	0.01	0.00	0.01	0.03	
103	0.064	16.7	0.03	0.07	0.01	0.4	1.2	0.1	0.01	0.19	0.21	0.01	0.02	0.00	0.01	0.03	
104	0.054	17.5	0.05	0.09	0.01	0.4	1.3	0.1	0.02	0.47	0.59	0.04	0.03	0.01	0.01	0.06	
105	0.025	17.1	0.02	0.05	0.01	0.3	0.8	0.1	0.01	0.13	0.16	0.01	0.01	0.00	0.00	0.02	
106	0.024	22.9	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.13	0.15	0.01	0.01	0.00	0.00	0.02	
107	0.031	30.0	0.02	0.03	0.00	0.1	0.4	0.0	0.01	0.15	0.19	0.01	0.01	0.00	0.00	0.02	
108	0.027	20.0	0.02	0.04	0.00	0.2	0.6	0.1	0.01	0.12	0.16	0.01	0.01	0.00	0.00	0.02	
109	0.023	28.6	0.01	0.02	0.00	0.1	0.3	0.0	0.01	0.11	0.14	0.01	0.01	0.00	0.00	0.02	
110	0.022	27.7	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.10	0.13	0.01	0.01	0.00	0.00	0.01	
111	0.004	22.0	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	
112	0.004	26.4	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	
113	0.053	22.3	0.04	0.07	0.01	0.4	1.1	0.1	0.01	0.24	0.28	0.01	0.02	0.00	0.01	0.03	
114	0.035	19.0	0.03	0.05	0.01	0.3	0.8	0.1	0.01	0.16	0.18	0.01	0.02	0.01	0.00	0.02	
115	0.028	25.9	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.13	0.15	0.01	0.01	0.00	0.00	0.02	
116	0.020	30.0	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.19	0.23	0.01	0.02	0.01	0.00	0.03	
117	0.030	11.5	0.02	0.03	0.01	0.2	0.5	0.1	0.01	0.14	0.16	0.01	0.01	0.00	0.00	0.02	
118	0.011	21.6	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.01	
119	0.024	20.0	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.12	0.14	0.01	0.01	0.00	0.00	0.02	
120	0.070	20.2	0.05	0.10	0.01	0.5	1.6	0.1	0.02	0.31	0.36	0.02	0.03	0.00	0.01	0.05	
121	0.015	20.2	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.07	0.08	0.00	0.01	0.00	0.00	0.01	
122	0.010	23.4	0.01	0.01	0.00	0.0	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
123	0.001	13.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	
124	0.012	14.4	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.05	0.06	0.00	0.01	0.00	0.00	0.01	
125	0.031	34.3	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.15	0.19	0.01	0.01	0.00	0.00	0.01	
126	0.097	42.8	0.05	0.09	0.01	0.3	1.2	0.1	0.03	0.49	0.61	0.03	0.04	0.01	0.01	0.06	
127	0.044	22.8	0.03	0.06	0.01	0.3	0.9	0.1	0.01	0.21	0.24	0.01	0.02	0.01	0.00	0.03	
128	0.034	21.0	0.03	0.06	0.01	0.3	0.8	0.1	0.01	0.17	0.20	0.01	0.02	0.01	0.00	0.02	
129	0.032	50.0	0.02	0.03	0.00	0.1	0.4	0.0	0.01	0.17	0.20	0.01	0.01	0.00	0.00	0.02	
130	0.024	26.2	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.12	0.15	0.01	0.01	0.00	0.00	0.02	
131	0.052	30.5	0.03	0.05	0.01	0.3	0.8	0.1	0.01	0.25	0.30	0.01	0.02	0.00	0.01	0.03	
132	0.133	17.8	0.10	0.20	0.02	1.2	3.4	0.3	0.03	0.59	0.64	0.04	0.06	0.01	0.02	0.09	
133	0.054	25.5	0.04	0.07	0.01	0.4	1.0	0.1	0.01	0.25	0.30	0.01	0.02	0.00	0.01	0.03	
134	0.003	33.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	
669	5.174	28.4	3.31	6.12	0.71	32.6	96.4	7.6	1.22	24.32	29.04	1.38	2.35	1.56	0.70	3.35	

DATA ALTERNATIVE WITHOUT METSO
ESTIMATED TRUCK EMISSIONS FOR 1980 TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
1	0.003	24.3	0.00	0.00	0.00	0.0	0.1	0.0	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2	0.005	19.3	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
3	0.017	13.5	0.01	0.03	0.00	0.2	0.5	0.0	0.00	0.07	0.09	0.00	0.01	0.00	0.00	0.00	0.01
4	0.002	24.2	0.01	0.01	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
5	0.002	17.9	0.01	0.01	0.00	0.2	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
6	0.014	13.2	0.01	0.02	0.00	0.2	0.4	0.0	0.00	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.01
7	0.015	42.6	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.01
8	0.024	10.4	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
9	0.004	14.7	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
10	0.003	14.3	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01
11	0.023	30.3	0.01	0.02	0.00	0.1	0.3	0.0	0.01	0.11	0.13	0.00	0.01	0.01	0.00	0.00	0.01
12	0.004	34.9	0.00	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
13	0.017	26.0	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.10	0.00	0.00	0.01	0.00	0.00	0.01
14	0.021	24.9	0.01	0.03	0.00	0.1	0.4	0.0	0.00	0.10	0.12	0.00	0.00	0.01	0.00	0.00	0.01
15	0.010	24.7	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
16	0.017	31.7	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.10	0.00	0.00	0.01	0.00	0.00	0.01
17	0.014	33.7	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.09	0.10	0.00	0.00	0.01	0.00	0.00	0.01
18	0.041	24.0	0.03	0.05	0.01	0.3	0.9	0.1	0.01	0.19	0.22	0.01	0.01	0.00	0.00	0.00	0.03
19	0.024	24.1	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.00	0.02
20	0.040	24.0	0.03	0.05	0.01	0.2	0.7	0.1	0.01	0.14	0.22	0.01	0.01	0.00	0.00	0.00	0.03
21	0.027	21.9	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.12	0.14	0.01	0.01	0.00	0.00	0.00	0.02
22	0.015	23.6	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.01
23	0.014	24.3	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.01
24	0.022	25.8	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.10	0.12	0.01	0.01	0.00	0.00	0.00	0.01
25	0.023	24.6	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.10	0.12	0.01	0.01	0.00	0.00	0.00	0.01
26	0.004	17.3	0.00	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
27	0.024	21.7	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.00	0.00
28	0.024	21.1	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.00	0.02
29	0.011	14.5	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01
30	0.027	20.4	0.02	0.04	0.00	0.2	0.4	0.1	0.01	0.12	0.14	0.01	0.01	0.00	0.00	0.00	0.02
31	0.007	20.6	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
32	0.014	24.1	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.00	0.01
33	0.003	24.8	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
34	0.004	27.9	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
35	0.025	42.1	0.01	0.02	0.00	0.1	0.3	0.0	0.01	0.13	0.14	0.01	0.01	0.00	0.00	0.00	0.02
36	0.005	23.0	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
37	0.013	17.9	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.01
38	0.024	21.5	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.00	0.02
39	0.041	22.4	0.03	0.05	0.01	0.3	0.9	0.1	0.01	0.19	0.22	0.01	0.01	0.00	0.00	0.00	0.03
40	0.020	21.6	0.02	0.04	0.00	0.2	0.6	0.1	0.01	0.13	0.15	0.01	0.01	0.00	0.00	0.00	0.02
41	0.021	25.4	0.01	0.03	0.00	0.1	0.4	0.0	0.00	0.10	0.12	0.01	0.01	0.00	0.00	0.00	0.01
42	0.040	30.4	0.03	0.05	0.01	0.3	0.9	0.1	0.01	0.23	0.24	0.01	0.01	0.00	0.00	0.00	0.03
43	0.027	22.7	0.02	0.04	0.00	0.2	0.5	0.0	0.01	0.12	0.14	0.01	0.01	0.00	0.00	0.00	0.02
44	0.054	20.3	0.04	0.07	0.01	0.4	1.1	0.1	0.02	0.30	0.37	0.02	0.03	0.00	0.00	0.00	0.04
45	0.009	14.8	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.01
46	0.007	20.0	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00
47	0.013	23.9	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.01
48	0.017	23.5	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.08	0.09	0.00	0.00	0.00	0.00	0.00	0.01
49	0.010	25.9	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01
50	0.030	17.7	0.02	0.04	0.01	0.3	0.8	0.1	0.01	0.13	0.14	0.01	0.01	0.00	0.00	0.00	0.02

WYATA ALTERNATIVE WITHOUT MFTPO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS			CAPRON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			4-9			2-10			DAILY			DAILY			DAILY		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
51	0.014	14.5	0.01	0.02	0.00	0.2	0.4	0.0	0.00	0.07	0.08	0.00	0.01	0.00	0.00	0.01	
52	0.023	24.7	0.02	0.03	0.00	0.2	0.4	0.0	0.01	0.11	0.13	0.01	0.01	0.00	0.00	0.02	
53	0.042	14.5	0.07	0.14	0.02	0.9	2.4	0.0	0.02	0.40	0.45	0.02	0.02	0.01	0.00	0.06	
54	0.083	24.7	0.05	0.10	0.01	0.5	1.6	0.1	0.02	0.39	0.46	0.02	0.04	0.02	0.01	0.05	
55	0.040	13.0	0.04	0.08	0.01	0.5	1.6	0.1	0.01	0.21	0.25	0.01	0.02	0.00	0.01	0.03	
57	0.045	14.4	0.04	0.07	0.01	0.5	1.3	0.1	0.01	0.20	0.23	0.01	0.02	0.00	0.01	0.03	
58	0.053	16.1	0.04	0.08	0.01	0.5	1.5	0.1	0.01	0.23	0.26	0.01	0.02	0.00	0.01	0.03	
59	0.021	26.3	0.03	0.14	0.02	0.8	2.3	0.2	0.03	0.54	0.58	0.03	0.06	0.04	0.01	0.04	
60	0.050	16.2	0.04	0.08	0.01	0.6	1.9	0.2	0.02	0.45	0.54	0.03	0.06	0.04	0.01	0.06	
61	0.113	30.9	0.09	0.14	0.02	0.7	2.1	0.2	0.03	0.62	0.77	0.04	0.06	0.04	0.01	0.03	
62	0.144	43.7	0.09	0.14	0.01	0.5	1.8	0.1	0.04	0.74	0.92	0.04	0.07	0.04	0.01	0.09	
63	0.089	41.1	0.05	0.09	0.01	0.3	1.1	0.1	0.02	0.45	0.56	0.02	0.04	0.03	0.01	0.06	
64	0.094	43.1	0.05	0.09	0.01	0.3	1.2	0.1	0.02	0.49	0.60	0.03	0.04	0.03	0.01	0.06	
65	0.095	5.5	0.05	0.04	0.01	0.3	1.0	0.1	0.02	0.44	0.54	0.02	0.04	0.03	0.01	0.06	
66	0.027	24.4	0.05	0.04	0.01	0.3	1.1	0.1	0.02	0.44	0.55	0.02	0.04	0.03	0.01	0.06	
67	0.077	37.2	0.04	0.07	0.01	0.3	1.1	0.1	0.02	0.38	0.47	0.02	0.03	0.02	0.00	0.05	
68	0.120	38.2	0.07	0.12	0.01	0.5	1.7	0.0	0.03	0.64	0.79	0.03	0.06	0.04	0.01	0.09	
69	0.039	31.7	0.02	0.04	0.00	0.2	0.6	0.0	0.01	0.19	0.23	0.01	0.02	0.01	0.00	0.03	
70	0.030	50.4	0.02	0.03	0.00	0.1	0.5	0.0	0.01	0.20	0.25	0.01	0.02	0.01	0.00	0.03	
71	0.101	35.6	0.06	0.10	0.01	0.4	1.4	0.1	0.02	0.49	0.61	0.03	0.05	0.03	0.01	0.07	
72	0.044	35.4	0.05	0.09	0.01	0.4	1.2	0.1	0.02	0.42	0.52	0.02	0.04	0.03	0.01	0.06	
73	0.103	20.3	0.07	0.14	0.02	0.9	2.4	0.2	0.02	0.46	0.53	0.03	0.05	0.03	0.01	0.07	
74	0.047	24.2	0.03	0.06	0.01	0.3	0.9	0.1	0.01	0.22	0.24	0.01	0.02	0.01	0.00	0.03	
75	0.102	33.0	0.06	0.11	0.01	0.5	1.5	0.1	0.02	0.49	0.61	0.03	0.05	0.03	0.01	0.07	
76	0.034	33.0	0.00	0.01	0.00	0.0	0.1	0.0	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	
77	0.043	25.6	0.03	0.05	0.01	0.3	0.8	0.1	0.01	0.20	0.24	0.01	0.02	0.01	0.00	0.03	
78	0.042	31.4	0.04	0.07	0.01	0.3	1.0	0.1	0.01	0.30	0.36	0.02	0.03	0.02	0.00	0.04	
79	0.024	25.4	0.02	0.03	0.00	0.2	0.5	0.0	0.01	0.13	0.15	0.01	0.01	0.01	0.00	0.02	
80	0.044	22.0	0.03	0.04	0.01	0.4	1.0	0.1	0.01	0.21	0.25	0.01	0.02	0.01	0.00	0.03	
81	0.037	22.3	0.02	0.04	0.00	0.2	0.6	0.0	0.00	0.17	0.21	0.01	0.02	0.01	0.00	0.02	
82	0.049	34.5	0.03	0.05	0.01	0.3	0.7	0.0	0.01	0.24	0.30	0.01	0.02	0.01	0.00	0.03	
83	0.031	15.9	0.02	0.05	0.01	0.3	0.9	0.1	0.01	0.14	0.15	0.01	0.01	0.01	0.00	0.02	
84	0.044	20.5	0.03	0.05	0.01	0.2	0.7	0.1	0.01	0.21	0.25	0.01	0.02	0.01	0.00	0.03	
85	0.070	22.5	0.05	0.09	0.01	0.5	1.5	0.1	0.02	0.31	0.37	0.02	0.03	0.02	0.00	0.05	
86	0.017	11.6	0.01	0.02	0.00	0.1	0.4	0.0	0.00	0.09	0.09	0.00	0.01	0.01	0.00	0.01	
87	0.025	32.4	0.01	0.03	0.00	0.1	0.4	0.0	0.01	0.12	0.15	0.01	0.01	0.00	0.00	0.02	
88	0.044	34.0	0.03	0.05	0.01	0.2	0.7	0.0	0.01	0.24	0.29	0.01	0.02	0.01	0.00	0.03	
89	0.031	22.9	0.02	0.04	0.00	0.2	0.6	0.1	0.01	0.14	0.16	0.01	0.01	0.01	0.00	0.02	
90	0.001	3.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	
91	0.017	24.8	0.01	0.02	0.00	0.1	0.3	0.0	0.00	0.08	0.10	0.00	0.01	0.00	0.00	0.01	
92	0.042	19.7	0.04	0.07	0.01	0.5	1.5	0.1	0.01	0.24	0.31	0.02	0.03	0.02	0.00	0.04	
93	0.129	15.9	0.10	0.20	0.02	1.3	3.6	0.3	0.03	0.56	0.63	0.03	0.06	0.04	0.01	0.04	
94	0.027	11.1	0.02	0.04	0.01	0.3	0.7	0.1	0.01	0.12	0.14	0.01	0.01	0.01	0.00	0.02	
95	0.049	34.3	0.04	0.07	0.01	0.3	1.0	0.1	0.02	0.33	0.42	0.02	0.03	0.02	0.00	0.04	
96	0.034	14.0	0.03	0.05	0.01	0.3	0.9	0.1	0.01	0.15	0.17	0.01	0.02	0.01	0.00	0.02	
97	0.020	10.0	0.02	0.03	0.00	0.2	0.6	0.0	0.00	0.09	0.11	0.01	0.01	0.01	0.00	0.01	
98	0.009	20.0	0.01	0.01	0.00	0.1	0.2	0.0	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
99	0.019	14.8	0.02	0.03	0.00	0.2	0.5	0.0	0.00	0.08	0.09	0.00	0.01	0.00	0.00	0.01	
100	0.071	35.8	0.04	0.07	0.01	0.3	1.0	0.1	0.02	0.34	0.43	0.02	0.03	0.02	0.00	0.05	

WATA ALTERNATIVE WITHOUT METRO

ESTIMATED TRUCK EMISSIONS FOR 1980 (TONS)

DIST	VMT	SP	HYDROCARBONS			CARBON MONOXIDE			NITROGEN DIOXIDE			PARTICULATE MATTER			SULPHUR DIOXIDE		
			LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD	LT	HD	HDD
101	0.054	15.2	0.04	0.00	0.01	0.6	1.6	0.01	0.01	0.25	0.28	0.02	0.03	0.00	0.01	0.04	
102	0.052	14.0	0.04	0.02	0.01	0.5	1.3	0.01	0.01	0.23	0.25	0.01	0.02	0.00	0.01	0.03	
103	0.044	14.7	0.03	0.07	0.01	0.4	1.2	0.01	0.01	0.19	0.21	0.01	0.02	0.00	0.01	0.03	
104	0.094	17.3	0.05	0.03	0.01	0.4	1.3	0.01	0.02	0.47	0.50	0.03	0.04	0.01	0.01	0.06	
105	0.023	16.6	0.02	0.05	0.01	0.3	0.8	0.01	0.01	0.13	0.14	0.01	0.01	0.00	0.00	0.02	
106	0.024	22.0	0.02	0.04	0.00	0.2	0.6	0.00	0.01	0.13	0.15	0.01	0.01	0.00	0.00	0.02	
107	0.031	14.0	0.02	0.03	0.00	0.1	0.4	0.00	0.01	0.15	0.19	0.01	0.01	0.00	0.00	0.02	
108	0.027	20.5	0.02	0.04	0.00	0.2	0.6	0.00	0.01	0.12	0.14	0.01	0.01	0.00	0.00	0.02	
109	0.023	34.5	0.01	0.02	0.00	0.1	0.3	0.00	0.01	0.11	0.14	0.01	0.01	0.00	0.00	0.02	
110	0.022	27.7	0.01	0.03	0.00	0.1	0.4	0.00	0.01	0.10	0.13	0.01	0.01	0.00	0.00	0.01	
111	0.034	22.0	0.00	0.01	0.00	0.0	0.1	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	
112	0.003	24.4	0.01	0.01	0.00	0.1	0.2	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	
113	0.053	19.9	0.04	0.07	0.01	0.3	1.2	0.01	0.01	0.24	0.27	0.01	0.02	0.00	0.01	0.03	
114	0.035	19.3	0.03	0.05	0.01	0.3	0.9	0.01	0.01	0.16	0.18	0.01	0.02	0.00	0.00	0.02	
115	0.028	25.4	0.02	0.03	0.00	0.2	0.5	0.00	0.01	0.13	0.15	0.01	0.01	0.00	0.00	0.02	
116	0.046	30.0	0.02	0.04	0.00	0.2	0.6	0.00	0.01	0.19	0.23	0.01	0.02	0.00	0.01	0.03	
117	0.030	10.8	0.02	0.03	0.01	0.2	0.5	0.01	0.01	0.14	0.16	0.01	0.01	0.00	0.00	0.02	
118	0.011	21.4	0.01	0.01	0.00	0.1	0.2	0.00	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.01	
119	0.024	20.6	0.02	0.04	0.00	0.2	0.5	0.01	0.01	0.12	0.13	0.01	0.01	0.00	0.00	0.02	
120	0.077	19.0	0.05	0.10	0.01	0.6	1.7	0.01	0.02	0.31	0.35	0.02	0.03	0.00	0.01	0.05	
121	0.015	20.2	0.01	0.02	0.00	0.1	0.3	0.00	0.00	0.07	0.08	0.00	0.01	0.00	0.00	0.01	
122	0.010	23.4	0.01	0.01	0.00	0.0	0.2	0.00	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.01	
123	0.001	13.0	0.00	0.00	0.00	0.0	0.0	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	
124	0.012	17.9	0.01	0.02	0.00	0.1	0.3	0.00	0.00	0.05	0.06	0.00	0.01	0.00	0.00	0.01	
125	0.031	34.3	0.02	0.03	0.00	0.1	0.5	0.00	0.01	0.15	0.19	0.01	0.01	0.00	0.00	0.02	
126	0.047	32.8	0.05	0.09	0.01	0.3	1.2	0.01	0.03	0.40	0.61	0.03	0.04	0.01	0.01	0.06	
127	0.044	22.8	0.03	0.04	0.01	0.3	0.9	0.01	0.01	0.21	0.24	0.01	0.02	0.00	0.01	0.03	
128	0.034	20.6	0.03	0.05	0.01	0.3	0.8	0.01	0.01	0.17	0.20	0.01	0.02	0.00	0.01	0.02	
129	0.032	50.0	0.02	0.03	0.00	0.1	0.4	0.00	0.01	0.17	0.20	0.01	0.01	0.00	0.00	0.02	
130	0.026	26.9	0.02	0.03	0.00	0.2	0.5	0.00	0.01	0.12	0.15	0.01	0.01	0.00	0.00	0.02	
131	0.052	30.5	0.03	0.05	0.01	0.3	0.8	0.01	0.01	0.25	0.30	0.01	0.02	0.00	0.01	0.03	
132	0.133	17.8	0.10	0.20	0.02	1.2	3.4	0.03	0.03	0.50	0.64	0.04	0.06	0.01	0.02	0.09	
133	0.054	25.5	0.04	0.07	0.01	0.4	1.0	0.01	0.01	0.25	0.30	0.01	0.02	0.00	0.01	0.03	
134	0.003	33.0	0.00	0.00	0.00	0.0	0.0	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	
Σ	5.174	27.7	3.35	6.23	0.72	33.6	98.2	7.8	1.21	24.23	28.92	1.38	2.35	0.33	0.70	3.35	

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