

City of Alexandria, Virginia

14
11-23-99

MEMORANDUM

DATE: NOVEMBER 19, 1999

TO: THE HONORABLE MAYOR AND MEMBERS OF THE CITY COUNCIL

FROM: VOLA LAWSON, CITY MANAGER *Vola Lawson*

SUBJECT: CONSIDERATION OF CITY COMMENTS ON THE *DRAFT CRYSTAL CITY/POTOMAC YARD AREA TRANSPORTATION STUDY* PREPARED BY THE VIRGINIA DEPARTMENT OF TRANSPORTATION.

ISSUE: Consideration of City comments on the *Draft Crystal City/Potomac Yard Area Transportation Study* prepared by the Virginia Department of Transportation (VDOT).

RECOMMENDATION: That City Council:

- (1) receive the *Draft Crystal City/Potomac Yard Area Transportation Study*; and
- (2) authorize staff to forward study comments to VDOT prior to the submission of the final report to the General Assembly in December.

BACKGROUND: In February 1999, the Virginia General Assembly passed Senate Joint Resolution 406 (SJR 406) and House Joint Resolution 567 (HJR 567) directing the Secretary of Transportation to study the transportation improvements needed to support the proposed development of Potomac Yard in Arlington County and the City of Alexandria. The resolutions requested completion of the study in time for consideration in the 2000 General Assembly session. The purpose of performing such a study is to identify and validate the need for specific transportation projects for consideration of future state funding. Although completion of the study does not in and of itself guarantee state funding, it does assist in the demonstration of legitimate public need.

In July 1999 the Virginia Department of Transportation (VDOT) initiated a legislative study to analyze the short and long-term transportation needs of the Potomac Yard corridor. VDOT entered into a contract with Patton, Harris, Rust and Associates to perform an evaluation of highway and transit infrastructure needs, including cost estimates and identification of potential funding sources for recommended improvements. With only a four month study period, VDOT decided to utilize the data contained in existing traffic studies rather than collecting primary field data in order to forecast travel demand and to provide cost/benefit analysis of potential improvements.

A Technical Advisory Committee was organized to provide the affected agencies and organizations with the maximum opportunity for input into the study. The committee met five times between August 1999 and October 1999. The committee was composed of representatives from the following organizations: VDOT Central Office; VDOT Northern Virginia District; Patton, Harris, Rust and Associates; Arlington County Department of Public Works; City of Alexandria Department of Transportation and Environmental Services; Washington Area Metropolitan Transit Authority; Northern Virginia Transportation Commission; National Park Service; Northern Virginia Planning District Commission; Metropolitan Washington Airports Authority; Charles E. Smith Realty Companies; Commonwealth Atlantic Properties; Wells and Associates and the Virginia Department of Rail and Public Transportation.

A citizen outreach meeting was also held to obtain input on citizen issues and concerns pertaining to the development of Potomac Yard. The meeting had a small turnout and most of the comments received focused on adequate bike and pedestrian access as well as concerns about the possible widening of Route 1 in Alexandria.

DISCUSSION: In October, Patton, Harris, Rust and Associates circulated a draft report to the members of the study committee (Attachment 1). The committee was asked for comments on the findings and recommendations prior to the preparation of the final report that will be submitted for public comment and forwarded to the General Assembly in December. A number of comments have been submitted by the other members of the study committee (Attachment 2).

The findings of the report are summarized as follows:

Highway Improvements

- 1) The construction of Potomac Avenue should be completed prior to the completion of the Potomac Yard Development as required by the City of Alexandria's development plan. Arlington County's review of the land use application should also include a phasing plan that has a maximum level of development that is allowed prior to the completion of Potomac Avenue.
- 2) Periodic signalization studies should be done to coordinate Arlington and Alexandria signal systems.
- 3) The straightening of Monroe Avenue Bridge is recommended due to safety concerns at the Route 1/Monroe Avenue intersection (estimated cost; \$15,000,000).

Transit Improvements

- 4) A shuttle bus service from the site to existing Metro Stations is recommended until a higher level of transit is in place (estimated cost; \$1,300,000).
- 5) The implementation of a light rail or equivalent service is recommended as the only option that would theoretically lower traffic volumes to an acceptable level of service (estimated cost; \$300,000,000). According to the findings, the other options that were

analyzed, including increased bus service and a new metro station at the site, failed to lower traffic volume to below cordon capacities.

General Community Issues

6) A study is recommended to determine if the transit recommendations of this study will benefit the roadway network on the Northeast and Old Town areas of Alexandria.

7) A study of affected neighborhoods such as Del-Ray, Oakville Triangle, Mt. Jefferson, Lynhaven, Arlandria, Oakcrest and Aurora Hills should be conducted as perceived cut-through traffic issues are raised to the City of Alexandria and Arlington County.

Site Issues

8) Circulation within the site needs to be evaluated by the City of Alexandria and Arlington County to ensure safe and efficient circulation within the site.

9) Arlington County should ensure that the Traffic Management Plan (TMP) submitted by CAP is consistent with the City of Alexandria's TMP requirements.

Pedestrian/Bicycle Issues

10) Development plans should ensure contiguous bicycle and pedestrian access throughout the site in the North/South and the East/West directions and should connect to the existing trail systems around the site.

Staff Comments on the Findings

Overall, the analysis conducted in the study confirmed the City's projections of development related traffic and background traffic impacts and re-affirmed the need for significant investment in the transportation infrastructure required to support the development of Potomac Yard in both Alexandria and Arlington. These findings are consistent with the conditions assigned to the site in September by City Council (straighten the Monroe Street bridge, build a spine road, identify/reserve land for future transit) and should serve as a basis to pursue the financial packages needed in combined City, state, federal and developer contributions to make the improvements economically feasible in the future.

In reviewing the roadway capacity and projected travel demand, the study concludes that traffic conditions will worsen in this corridor unless significant investment in transit occurs. The study provides a preliminary analysis of Metrorail, light rail, bus and shuttle options and suggests that light rail, or its equivalent, appears to provide the most significant transit improvement. However, the study also noted that light rail would have the highest per passenger cost of any of the analyzed transit options. Given the time constraints of the study period, these options did not receive the level of analysis required to fully calculate to the degree necessary the costs and benefits for each transit mode. To this end, the report recommends additional study of transit options that would address the issues of headways, alignment, type of vehicles, ridership, etc., that allow for more refined modal comparisons that would be needed to evaluate the value of the

significant investment required for transit improvements.

STAFF:

Dave Ruller, Acting Director, Transportation and Environmental Services
Betsy Massie, Division Chief, Office of Transit Services and Programs
Tanya Husick, Transportation Planner, Office of Transit Services and Programs

ATTACHMENTS:

Attachment 1 - Draft Crystal City/Potomac Yard Area Transportation Study
Attachment 2 - Summary of written Technical Advisory Committee comments

DRAFT

**CRYSTAL CITY/POTOMAC YARD AREA
TRANSPORTATION STUDY**

SJR 406 [HJR 567] REPORT

**PREPARED BY THE
VIRGINIA DEPARTMENT OF TRANSPORTATION**

October 1999

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PREFACE

The Secretary of Transportation was requested to study transportation improvements affecting the Crystal City and Potomac Yard areas of Arlington County and the City of Alexandria in a resolution agreed to by the Virginia State Senate and State House of Delegates on February 4, 1999 and February 15, 1999, respectively. As resolved in Senate Joint Resolution 406 (SJR 406) and House Joint Resolution 567 (HJR 567), shown in Appendix A, this report summarizes recommendations for short-term and long-term transportation improvements or further study affecting the Crystal City and Potomac Yard areas of Arlington and Alexandria. Planning level costs and potential funding sources are also identified.

A Technical Advisory Committee was organized to afford the maximum opportunity for input and coordination in the development of this plan. The Committee was comprised of representatives from local and state agencies, affected transit agencies and private organizations whose interests and proximity necessitated participation.

SJR 406 [HJR 567] TECHNICAL ADVISORY COMMITTEE PARTICIPANTS:

Chris Detmer, VDOT, Central Office, Project Manager
R. Trent Ebersole, P.E., Patton Harris Rust and Associates
Abraham Lerner, Patton Harris Rust and Associates
Doug Kennedy, Patton Harris Rust and Associates
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Jennifer Straub, Northern Virginia Transportation Commission
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Kevin Washington, Christopher Consultants, CAP
Gary Kuykendall, Virginia Department of Rail and Public Transportation

ACKNOWLEDGEMENTS

The Transportation Planning Division of the Virginia Department of Transportation was responsible for the preparation of this report, which was authored by R. Trent Ebersole of Patton Harris Rust and Associates.

EXECUTIVE SUMMARY

The purpose of this study was to examine the short and long-term transportation improvements in the vicinity of the Potomac Yard area of Arlington County and the City of Alexandria; and to evaluate the regional traffic implications of the proposed planned development of Potomac Yard. The study methodologies included a review of previously conducted traffic studies, cordon analysis of highway capacity, intersection level of service analysis, travel demand forecasting and a cost/benefit analysis of potential transit improvements.

This report assembles the recommendations of the technical analysis and the summary viewpoints of the Technical Advisory Committee into five categories: Highway Recommendations, Transit Needs, Community Concerns, Site Concerns and Pedestrian and Bicycle Activities.

In addition, this report summarizes the issues pertaining to the development of Potomac Yard and solutions to address the transportation items identified in the Senate and House Joint Resolutions. Study findings and recommendations are included below:

SJR 406 [HJR 567] STUDY FINDINGS

The study findings are based on the review of previous studies, Technical Advisory Committee member input, citizen input and technical analysis. Some of the key findings include:

- The overall cordon capacity will be insufficient to completely accommodate projected traffic with the proposed Potomac Yard development. The light rail option is the only option that would lower traffic volumes to below the theoretical capacity of the inner cordon and outer cordon. The other alternatives fail to lower the traffic volumes below the cordon capacities.
- In the project corridor, it was determined that the critical link in the existing roadway network is the southern approach to the site on Route 1. There is an existing capacity deficiency south of where the proposed Potomac Avenue would connect into the existing roadway network that will worsen with the development of the site.
- The intersection of Route 1 and South Glebe Road will operate at an unacceptable level of service with the development of the Potomac Yard site. With transit solutions implemented, the Level of Service could be improved to LOS "E", which does not meet VDOT goals, however a grade-separated interchange would not be required.
- The site spine road (Potomac Avenue) will be required for capacity to accommodate the site and background traffic before the Potomac Yard development is completed. Phasing of Potomac Avenue should ensure that the entire roadway is constructed prior to the completion of the land development. The land use plan approved by the City of Alexandria includes a phasing plan for the construction of Potomac Avenue with development thresholds of 3,250,000 square feet of new development (excluding hotels) at the Potomac Yard site west of the railroad tracks whether in the Alexandria or Arlington portion of the site. Arlington County's review of the Potomac Yard land use application should also consider the amount

of Potomac Yard development that can be supported without the completion of Potomac Avenue.

SJR 406 [HJR 567] STUDY RECOMMENDATIONS

The SJR 406 [HJR 567] Study final recommendations are as follows:

Highway Improvements

1. The construction of Potomac Avenue should be completed prior to the completion of the Potomac Yard Development. A phasing plan has been approved by the City of Alexandria in conjunction with the developer's development concept plan. The concept plan limits development to 3,250,000 square feet of new development (excluding hotels) at the Potomac Yard site west of the railroad tracks prior to the completion of Potomac Avenue. Arlington County's review of the land use application should also ensure a maximum level of development on the Arlington portion of Potomac Yard prior the completion of Potomac Avenue.
2. Periodic signal optimization studies should be conducted to ensure the implementation of safe and efficient signal timings. Arlington is currently operating Split Cycle Offset Optimization Technique (SCOOT) within the area which should optimize the signal system. Coordination of Alexandria's signal system with Arlington's SCOOT system could further improve the corridor.
3. The straightening (re-alignment) of the Monroe Avenue Bridge is recommended due to safety concerns at the Route 1/Monroe Avenue intersection.

Transit Needs

4. A shuttle bus service from the site to the existing Metro Stations is recommended until a higher level of transit is in place. The implementation of a light rail or equivalent service is recommended to prevent undesirable traffic conditions in the future. An additional study should be conducted to determine the appropriate system parameters such as the vehicle type, alignment, station locations and operating headways and should consider costs. The reservation for a Metro Station at Potomac Yard should be maintained, so as not to preclude future transit options for the vicinity. The ability to provide alternative site access via Metro or other rail systems should be preserved in the development plans to allow flexibility as transit technologies evolve.

Community Concerns

5. Traffic studies should be required for new development in Crystal City to be reviewed by Arlington County. Studies should include the impacts of additional traffic as well as diversions resulting from modifications to the roadway network.

6. A study is recommended to determine if the transit recommendations of this study will benefit the roadway network of the Northeast and Old Town areas of Alexandria.
7. A study of affected neighborhoods such as Del-Ray, Oakville Triangle, Mt. Jefferson, Lynhaven, Arlandria, Oakcrest and Aurora Hills should be conducted as perceived cut-through traffic issues are raised to the City of Alexandria and Arlington County by these communities. These studies should consider existing VDOT policies and operational solutions to identify and address cut-through traffic.

Site Concerns

8. Circulation within the site needs to be evaluated by the City of Alexandria and Arlington County. The plans submitted by the developer should ensure safe and efficient circulation within the site.
9. Arlington County should review Commonwealth Atlantic Properties future Transportation Management Plan (TMP) submittal to ensure it is consistent with the City of Alexandria's approved TMP.

Pedestrian and Bicycle Activities

10. Development plans for the Potomac Yard site should consider the Arlington and Alexandria trail plans. Contiguous bicycle and pedestrian access should be provided through the site in the north/south and east/west directions connecting the existing trail systems around the site.

RECOMMENDATION COST ESTIMATES:

Planning cost estimates and funding sources for the improvement recommendations are summarized as follows:

Recommendation Cost Estimates			
<u>Recommendation</u>	<u>Initial Capital Cost</u>	<u>Annulized Cost</u>	<u>Funding Source</u>
Shuttle Bus service for Potomac Yard site	\$1,300,000	\$550,000	Developer
Light Rail between Braddock Road Pentagon Metro Stations (1)	\$300,000,000	\$25,410,000	Multiple potential sources identified
Monroe Avenue Bridge straightening (2)	\$15,000,000	NA	Alexandria, VDOT

Notes: (1) Further study recommended to determine parameters, most cost effective equivalent service and funding source
 (2) \$ 15 million is additional cost over developer's proffer commitment

CONCLUSION:

Based on the technical analysis conducted, the build-out of Potomac Yard will require significant transit infrastructure improvements to maintain roadway capacity at acceptable levels of service. The provision for a light rail transit service from the Pentagon METRO station to the Braddock Road METRO station through the subject site is the most effective transit recommendation to provide alternative service for the future development. Furthermore, highway improvements and a continuation of the proffered Shuttle Bus service, evaluated in the context of future development and traffic growth in the Route 1 and Glebe Road corridors, will not support the increase in traffic. The site development does include a significant improvement for the northbound Route 1 corridor, through the construction of Potomac Avenue from Slaters Lane to Crystal Drive. The study also identified several issues which should be considered for further analysis, such as site phasing, cut-through traffic, Route 1 traffic signal progression, I-395 High Occupancy Vehicle (HOV) ramp, and the extension of Potomac Avenue/Crystal Drive.

SJR 406 [HJR 567] STUDY PROCESS

IDENTIFICATION OF HIGHWAY AND/OR TRANSIT NEEDS PROCESS

To recommend short and long-term transportation improvements in the Crystal City and Potomac Yard areas of Arlington County and the City of Alexandria, an analytical process was developed for this study to determine the potential need for highway and/or transit improvements.

The analytical process, briefly stated, contained the following steps:

- A review of previous traffic studies was conducted to understand issues and context. Previously developed highway and transit improvements were also identified.
- A study area boundary was defined.
- Issues specifically concerning the site or affecting areas of Crystal City and Alexandria beyond the site's immediate interaction with the existing roadway network were identified with recommendations for further action, if necessary.
- Cordons were selected to evaluate the overall capacity of the roadway network and determine the effectiveness of the previously developed highway and/or transit improvements.
- Current traffic counts were identified.
- A projection of trip generation for the proposed Potomac Yard development was prepared.
- A regional trip distribution was determined.
- Several transit improvement options were developed.
- The appropriate mode splits for the transit options were derived from available resources.
- The volume to capacity (v/c) ratios were calculated at the cordon boundaries for baseline and transit scenarios for comparison.
- Capacity analyses were conducted for intersections within the inner cordon area to determine the necessity of Potomac Avenue to support the proposed development.
- Costs were estimated for the recommended highway improvements and each transit option for comparison.
- A cost/benefit relationship was developed for the transit options
- Transit benefits were estimated in terms of daily ridership.

The steps listed above involved both technical and policy element considerations. The following sections describe the study methodology in more detail and are organized as follows:

1. Study Area
2. Capacity
3. Trip Generation
4. Potential Highway Improvements
5. Potential Transit Needs

1. Study Area:

The study area, shown in Figure 1, was evaluated at two cordon locations. Capacity and traffic volumes were evaluated at the locations where the cordon boundaries intersect major roadways. The inner-cordon was intended to evaluate the capacity constraints of improvement scenarios at the locations where the Potomac Yard Site interacts with the existing roadway network. The outer-cordon was included to evaluate locations slightly beyond the site limits such as the South Glebe Road approach to I-395. The identification of the study area was influenced by the available information and committee discussions. The cordons were defined as follows:

- Inner Cordon - Route 1 south of Slaters Lane,
Route 1 north of 27th Street,
South Glebe west of Route 1,
Reed Avenue west of Route 1,
Monroe Avenue west of Route 1

- Outer Cordon - Route 1 south Slaters Lane,
Route 1 north of 23rd Street,
South Glebe Road east of I-395,
Russell Road south of Monroe Avenue,
Commonwealth Avenue south of Monroe Avenue,
Mount Vernon Road south of Monroe Avenue

To identify the potential benefit of roadway improvements within the inner cordon and the termini of the spine road, specific intersections were analyzed. The following intersections were included:

1. Route 1/Monroe Avenue,
2. Route 1/East Glebe Road,
3. Route 1/South Glebe Road
4. Route 1/Slaters Lane/Potomac Avenue,
5. Potomac Avenue/27th Street/Crystal Drive

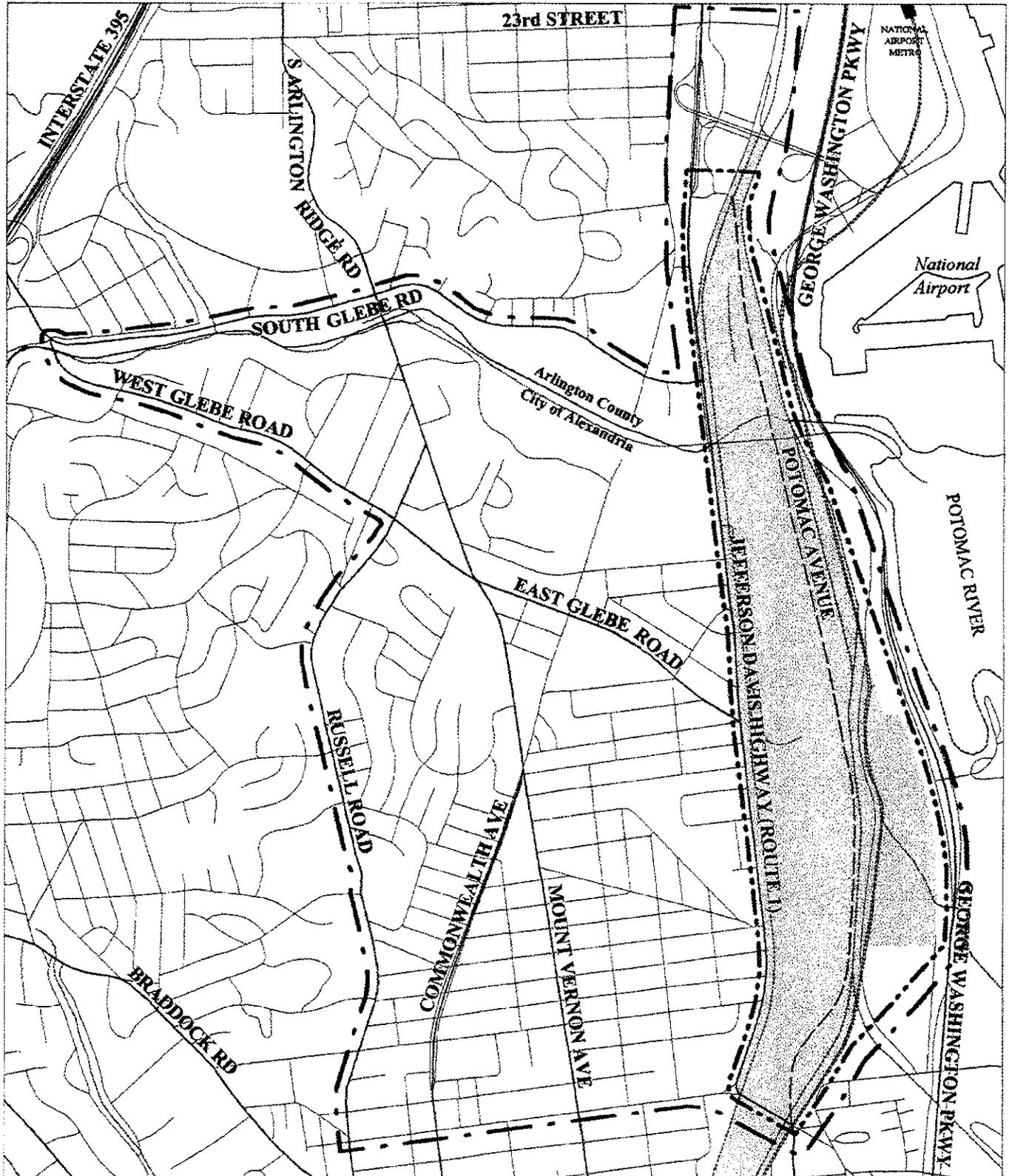
2. Capacity:

The relationship of traffic volume to roadway capacity is defined as the volume to capacity ratio (v/c). The v/c ratios at the designated cordon locations and the capacity analyses of key intersections were used to evaluate the roadway system.

The capacity of the existing roadway network was calculated based on the number of lanes, characteristics of access and theoretical capacities described in the *1997 Highway Capacity Manual* (HCM). The total existing inner cordon capacity approaching Potomac Yard is 18,400 vehicles per hour (vph). The total existing capacity for the outer cordon is 19,500 vph. The capacity analyses for the key intersections in the corridor were computed based on the signalized intersection module of the HCM.

FIGURE 1

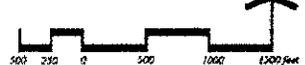
Potomac Yard Vicinity
 Study Cordons



Legend

Boundaries	Transportation	Other
Potomac Yard	Major Roads	Rail Lines
County Boundary	Proposed Roads	Metro Stops
	Streets	Streams
		Outer Cordon
		Inner Cordon

Scale Bar:



Date	Project	File No.	Figure No.
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3. Trip Generation:

The number of vehicle trips that will be generated by the Potomac Yard site was estimated based on vehicle trip generation rates published in *Trip Generation, 6th Edition* by the Institute of Transportation Engineers (ITE) and land use assumptions proposed by Commonwealth Atlantic Properties. The Alexandria City Council has approved the following additional development program for Potomac Yard:

1. 1,900,000 square feet of office
2. 135,000 square feet of retail
3. 625 room hotel
4. 1,927 residential dwelling units

A zoning application for the following development program is anticipated to be decided upon by Arlington County in the following year and was included as background development for the application in Alexandria:

1. 2,840,000 square feet of office
2. 100,000 square feet of retail
3. 625 room hotel
4. 800 residential dwelling units

The number of person trips was calculated based on the vehicle trips and average vehicle occupancy (AVO) rates characteristic of land uses represented in the ITE Trip Generation data.

Due to the size and mixed-use nature of the proposed site, it was anticipated that a portion of the trips generated by the site will have origins and destinations within the site, reducing the number of trips external to the Potomac Yard site. The consideration of internal trips was based on ITE data and policies of the Virginia Department of Transportation (VDOT). The proportion of trips calculated to be internal ranged from 14 percent of the AM peak hour trip generation to 24 percent of the daily trips.

The external person trips generated by the proposed development was assigned to the roadway network based on regional distributions that were assumed in the traffic analysis conducted in support of the zoning applications submitted to The City of Alexandria and Arlington County. A total of 65,313 daily, 7,011 AM peak hour and 8,963 PM peak hour external person trips were projected to be generated by the Potomac Yard site.

These traffic assignments were combined with existing traffic volumes, also derived from the developers' studies, and 0.5 annual percent regional traffic growth calculated based on data from the Metropolitan Washington Council of Governments (MWCOG).

Reductions of external person trips were calculated to account for the projected non-auto transportation mode split.

The sources reviewed to determine non-auto ridership values include:

1. Development Related Ridership Survey II, JHK & Associates, December 1989;
2. Annual Report Silver Spring Transportation Management District Annual Report, Montgomery County, 1997;
3. Travel Characteristics at Large-Scale Suburban Activity Centers, National Cooperative on Highway Research Project (NCHRP) Report 323, October 1989;
4. Engineering Proving Grounds Mode Travel Assessment, JHK & Associates (unpublished), 1995;
5. 1998 Beltway Cordon Count, Metropolitan Washington Council of Governments, May 1999; and
6. Patronage Impacts of Changes in Transit Fares and Services, Ecosometrics, Inc.

4. Potential Highway Improvements:

The Technical Advisory Committee discussed several highway improvement options, which are highlighted in Figure 2. The need for the Potomac Yard spine road (Potomac Avenue) to support the proposed development on the Potomac Yard site was one of the issues discussed. The potential for widening the major corridor roads, including Route 1 in Alexandria and South Glebe Road in Arlington, was also included in the discussions. Finally, the straightening of the Monroe Avenue Bridge was considered as well as the potential benefits of a direct HOV ramp from I-395 to South Glebe Road.

5. Potential Transit Needs:

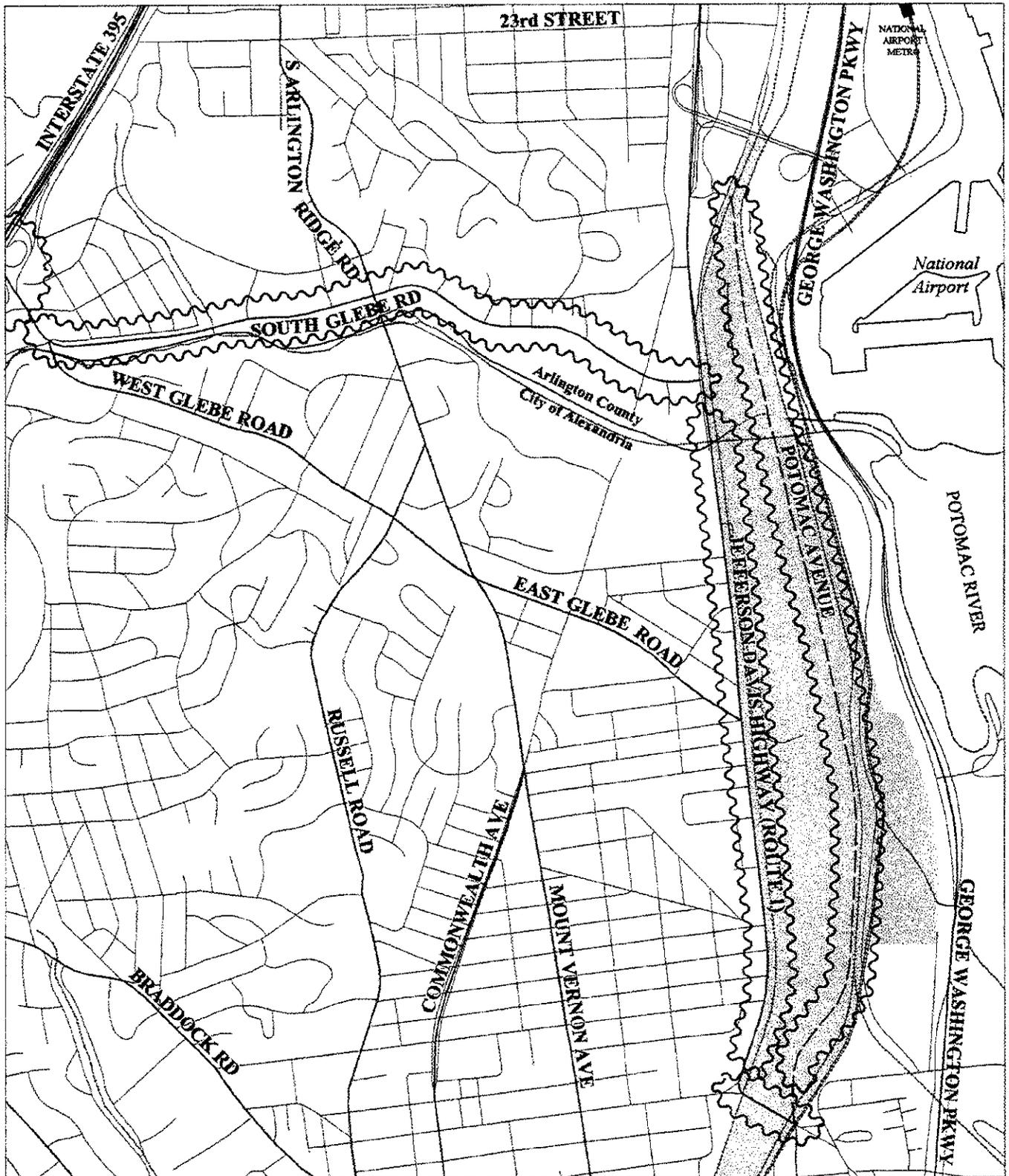
For the purposes of this study, calculated deficiencies in the roadway capacity were used to determine the level of transit, if any, that would be needed to maintain adequate volume to capacity ratios (v/c) in the study area. Furthermore, a cost/benefit analysis was conducted to determine the viability of these transit options. Costs may vary significantly with specific parameters that would be determined during a more detailed study of the preferred option. However, the planning level costs used in this study fall within a range that are intended to depict a reasonable magnitude of the costs. The cost/benefit analysis of the specific parameters should be included in the recommended follow-up study. Potential funding sources have also been identified; however, no recommendations are provided regarding the funding responsibility of individual organizations.

TECHNICAL ADVISORY COMMITTEE PROCESS

The purpose of the SJR 406 [HJR 567] Committee was to provide an opportunity for the discussion of various agency viewpoints as well as compile transportation issues affecting the Crystal City and Potomac Yard areas of Arlington and Alexandria. In addition, the committee provided feedback on the technical analysis conducted to determine the adequacy of the roadway. The purpose of the SJR 406 [HJR 567] Committee was to provide an opportunity for the discussion of various agency viewpoints as well as compile transportation issues affecting the

FIGURE 2

Potomac Yard Vicinity
 Highway Improvement Options



Legend

- | | | |
|-------------------|-----------------------|---------------------------------|
| Boundaries | Transportation | Other |
| Potomac Yard | Major Roads | Rail Lines |
| County Boundary | Proposed Roads | Metro Stops |
| | Streets | Potential Improvement Locations |
| | | Streams |

Scale Bar:



Date	Project	File No.	Figure No.
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Figure 2
2 - Potential Highway Improvement Locations

Crystal City and Potomac Yard areas of Arlington and Alexandria. In addition, the committee capacity through the potential development corridor and the potential need for transit. To achieve the goal of developing recommendations and a final report by November 1999, the Committee participated in a series of five meetings held at the VDOT Northern Virginia District Office and Arlington County offices.

CITIZEN INPUT

A Citizen Outreach Meeting was held to obtain input on citizen issues and concerns pertaining to the development of Potomac Yard. Many of the comments received focused on citizen concern about adequate bike and pedestrian access and the widening of Route 1 in Alexandria.

SJR 406 [HJR 567] STUDY FINDINGS:

Through a combination of reviewing previously prepared studies, Technical Advisory Committee discussions, and analysis, the following findings were reached:

- The overall cordon capacity will be insufficient to completely accommodate projected traffic with the proposed Potomac Yard development. The light rail option is the only option that would lower traffic volumes to below the theoretical capacity of the inner cordon and outer cordon. The other options fail to lower the traffic volumes below the cordon capacities.
- In the project corridor, it was determined that the weakest link in the existing roadway network is the southern approach to the site on Route 1. There is an existing capacity deficiency south of where the proposed Potomac Avenue would connect into the existing roadway network that will worsen with the development of the site.
- The intersection of Route 1 and South Glebe Road will operate at an unacceptable level of service with the development of the Potomac Yard site. With transit solutions implemented, the Level of Service could be improved to LOS "E", which does not meet VDOT goals, however a grade-separated interchange would not be required.
- The site spine road (Potomac Avenue) will be required for capacity to accommodate the site and background traffic before the Potomac Yard development is completed. Phasing of Potomac Avenue should ensure that the entire roadway is constructed prior to the completion of the land development. The land use plan approved by the City of Alexandria includes a phasing plan for the construction of Potomac Avenue with development thresholds of 3,250,000 square feet of new development (excluding hotels) at the Potomac Yard site west of the railroad tracks whether in the Alexandria or Arlington portion of the site. Arlington County's review of the Potomac Yard land use application should also consider the amount of Potomac Yard development that can be supported without the completion of Potomac Avenue.

RECOMMENDATIONS

The following are the final recommendations of the Technical Advisory Committee and represent an overall plan to address roadway, transit, and pedestrian deficiencies in the Potomac Yard/Crystal City area. The recommendations are grouped as follows:

1. Highway Improvements
2. Transit Needs
3. Community Concerns
4. Site Concerns
5. Pedestrian and Bicycle Activities

Each recommendation identifies the issue, evaluates the issue based on projected conditions and costs, if applicable, identifies the study recommendation and lists potential funding sources, if applicable.

1. HIGHWAY IMPROVEMENTS

1.a. – Potomac Avenue:

Issue: Route 1 adjacent to the Potomac Yard site is a four-lane section, which widens to six lanes south of the site approaching Old Town Alexandria and at the north end of the site entering Arlington.

Evaluation: With the added traffic resulting from the complete development of the Potomac Yard site, the Route 1 intersections adjacent to the Potomac Yard development would operate significantly beyond their capacities during the peak hours. There is concern that staged construction of Potomac Avenue, along the frontage of land bays as they are developed, will leave crucial gaps in the roadway preventing its intended function. The completion of the proposed Potomac Avenue will accommodate north-south site traffic and a diversion of background traffic away from the four-lane Route 1 section. The Development concept plan approved by the City of Alexandria includes a maximum development that can be completed prior to the completion of Potomac Avenue. The maximum development without Potomac Avenue is summarized as follows:

1. 800,000 square feet of office in the Coordinated Development District (CDD) west of the relocated rail lines.
2. 1,750,000 square feet of any new development in this portion of the CDD.
3. 3,250,000 square feet of any new development in this portion of the CDD and/or in the Arlington County portion of Potomac Yard.

Study Recommendation: Potomac Avenue (Spine Road) should be completed before the Potomac Yard development is completed to prevent undesirable conditions on the four-lane section of Route 1 in Alexandria. The phasing plan approved by the City of Alexandria in conjunction with the land use plan indicates that Potomac Avenue will be completed prior to the completion of 3,250,000,000 square feet of new development (excluding hotels) at the Potomac

Yard site. Arlington County's review of the land use application should also consider the appropriate phasing of development within the Arlington portion of Potomac Yard to ensure that Route 1 in Alexandria and the Route 1/South Glebe Road intersection will not operate below adequate Levels of Service.

Potential Funding Sources: The development proffers associated with the plans for the Potomac Yard property indicate that Potomac Avenue will be constructed by Commonwealth Atlantic Properties.

1.b. – Route 1 Widening:

Issue: The widening of Route 1 in Alexandria to a six-lane section adjacent to the Potomac Yard property was discussed.

Evaluation: This option has been reviewed by the City of Alexandria in the past and has been determined to be counter-productive in their desire to make Route 1 a pedestrian friendly corridor. The widening of Route 1 in this vicinity has also been met with stringent citizen opposition.

Study Recommendation: The widening of Route 1 in Alexandria is not recommended as an option to improve traffic flow in the study area. Route 1 will remain constrained north and south of the widening project and the proposed Potomac Avenue will not provide additional capacity on the constrained sections of Route 1.

1.c. – South Glebe Road Widening:

Issue: The Technical Advisory Committee also considered the widening of South Glebe Road in Arlington.

Evaluation: Committee discussions indicated that although the Arlington County Comprehensive plan does not include this potential widening, the option should be considered. Considerations associated with this option include the anticipated citizen opposition and restrictions on available right-of-way at the Metrobus garage and the water treatment plant. Possible constraints also are located at Mount Vernon Avenue, South 27th Street and I-395. While the cordon analysis indicates that South Glebe Road is not the critical approach to the area, spot improvements may be necessary to ensure adequate traffic operations along this roadway.

Study Recommendation: The widening of South Glebe Road between Route 1 and I-395 is not recommended as an option to improve traffic flow in the study area. However, an additional study is recommended to evaluate the benefits of turn lane improvements.

1.d. – New I-395/South Glebe Road HOV Ramp:

Issue: Construction of an HOV ramp from I-395 to South Glebe Road was introduced by members of the Technical Advisory Committee as a potential way to improve traffic on South Glebe Road.

Evaluation: The potential HOV ramp at I-395 was considered because it could potentially increase the average vehicle occupancy on South Glebe Road by providing an incentive for more carpools. As with the potential widening of South Glebe Road, the benefit to the Potomac Yard area is limited with this option since South Glebe Road is not the critical link. However, improving the v/c ratio on South Glebe Road without impacting the adjacent neighborhoods with additional traffic would be a reasonable improvement. Since a Transportation Management Plan (TMP) has been proffered by the Commonwealth Atlantic Properties, the construction of an HOV ramp is not anticipated to significantly increase carpooling to that property. Based on Committee discussions, the preferred path for carpools destined for Crystal City is through the Pentagon area. Analysis conducted by the Department indicates that approximately 400 vehicles per hour (vph) would use the HOV ramp during the peak hours. However, the analysis was inconclusive regarding the portion of these carpools that would be new carpool trips, the dispersion of the carpool trips or the destination of the new carpool trips. The planning level cost estimates for an HOV ramp at this location would be from \$5 million to \$15 million.

Study Recommendation: Based on the Departments' analysis, capacity of South Glebe Road and the projected cost, the HOV ramp is not recommended as a priority improvement. A more detailed study is recommended to determine the potential benefit of an HOV ramp for the entire Arlington County area as future development occurs.

1.e. – Grade-separation at Route 1/South Glebe Road Intersection:

Issue: The Technical Advisory Committee discussed the potential need for a grade-separated intersection at Route 1/South Glebe Road due to concerns over the number of northbound vehicles on Route 1 that will turn left onto South Glebe Rd.

Evaluation: The developer has proposed an at grade intersection at Route 1/South Glebe Road. With the completion of the Arlington portion of Potomac Yard, including Potomac Avenue and transit improvements, the intersection will maintain operations of LOS 'E'. This Level of Service does not meet the VDOT goal, however, does not warrant a grade-separated interchange either.

Study Recommendation: Funds that might be appropriated for an improvement of this type would be better used for improvements that will have a positive impact on the entire study area. However, if significant additional development is constructed in the area, the issue of grade separation should be revisited.

1.f. – Signal Optimization

Issue: The Technical Advisory Committee raised the issue that optimization of the traffic signals in the corridor could increase the roadway capacity.

Evaluation: The roadway link capacities assumed in this study are based on average conditions. Variations in traffic volumes from the forecasts in a planning study could dictate signal plan results. Other factors such as inter-jurisdictional coordination or implementation of new signal systems will also affect the needs of the optimization plan. Arlington is currently operating Split Cycle Offset Optimization Technique (SCOOT) within the area which should optimize the signal system. Sixty of the County's 225 signals run under the SCOOT system. The remainder of Arlington's signals operate under the Monarch traffic management system that uses pre-determined timing plans. Coordination of Alexandria's signal system with Arlington's SCOOT system could further improve the corridor. Implemented signal system plans typically include incident management and response recovery.

Study Recommendation: Signal optimization plans should to be developed based on actual traffic conditions in the future. Periodic studies should be conducted to ensure that the safest and most efficient signal timings are implemented. Updates to signal timing plans for signal systems are especially important when significant changes in traffic patterns are anticipated from sources such as development of landbays within the Potomac Yard site.

1.g. – Monroe Bridge Straightening

Issue: The City of Alexandria, area residents and commuters have indicated a desire to straighten the alignment of the bridge for safety reasons.

Evaluation: Commonwealth Atlantic Properties has submitted a design alternative to improve the alignment if additional funding is secured. The straightening of the bridge is not anticipated to have significant impact on the Route 1 capacity, however realignment is desirable from a traffic safety standpoint. A potential negative impact would be a reduction of capacity or increased travel time for east/west traffic from Slaters Lane to areas west of Route 1. The estimated cost for constructing the Monroe Avenue Bridge is \$15 million more than the roadway improvements proffered by the developer. In addition, some citizens are concerned that Route 1 might be widened in conjunction with the bridge modifications. Widening Route 1 in Alexandria is undesirable for the citizens in the area. Citizens have referenced legal actions taken in the past to prevent modifications to the bridge.

Study Recommendation: Due to the safety concerns at the Route 1/Monroe Avenue intersection, the straightening of the bridge is recommended. The major constraint is the availability of funds.

Potential Funding Sources: Funds for the straightening will need to be appropriated by the City of Alexandria. Alexandria may apply for funds from sources such as the VDOT Urban Construction Funds or at the urban level for a share of Federal Surface Transportation Program funds (10% allocated for safety improvements).

2. TRANSIT NEEDS

Issue:

Since Potomac Avenue will not provide additional capacity on Route 1 south of Slaters Lane there is a lack of capacity approaching the site from the south. The v/c ratio deficiency is anticipated to worsen to 1.10 by the year 2010 as shown on Figure 3.

The highway improvements discussed are either infeasible or fail to provide additional capacity where it is most needed for the cordons. Therefore, mass transit will be required in the corridor to reduce vehicle trips. The baseline transit scenario includes the Metrobus service (Route 9) currently operating in the corridor. For the critical PM peak hour outer-cordon, the overall v/c ratio is projected to be 1.07 in the year 2010 without transit solutions. This indicates that the traffic volumes will be seven percent higher than the available roadway capacity.

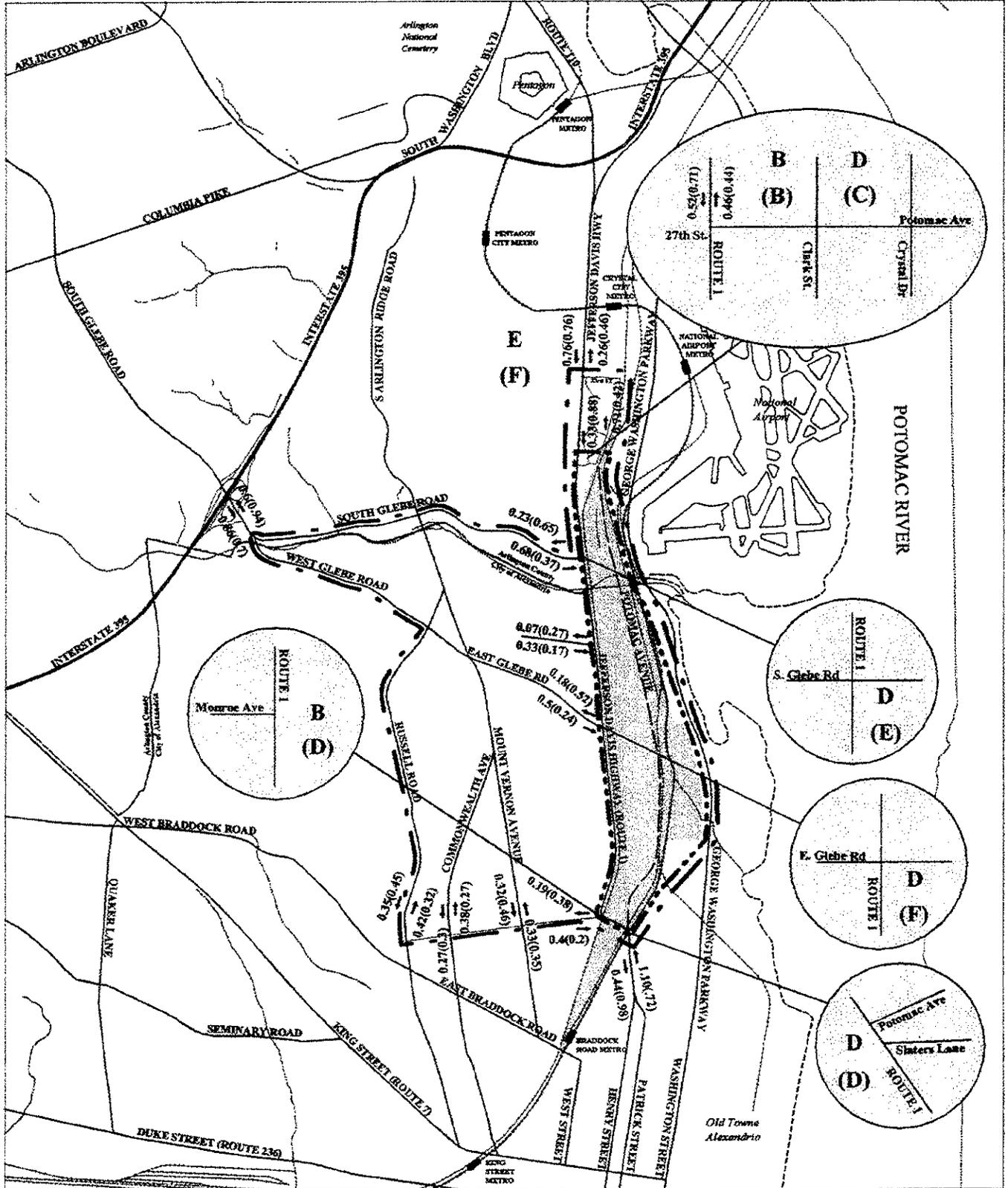
Evaluation:

For the evaluation of transit needs, four transit strategies were compared based on the improvement to roadway operations through the year 2010. The baseline scenario used for comparison assumes the current Metrobus Route 9 service. Transit improvement Option 1 assumes the shuttle bus service that is proffered in the developer's Transportation Management Plan (TMP). A new Virginia Rail Expressway (VRE) station was assumed for Option 2. A new Metro station was considered for Option 3 and a light rail system connecting the existing Braddock Road and Pentagon Metro stations was considered for Option 4.

Option 1 – Shuttle Bus: The first level of additional transit assumed consisted of a shuttle bus service for Potomac Yard. A shuttle bus service is proffered by the developer as part of the Alexandria TMP. Headways assumed in the analysis reflect current headways used by Arlington County for their shuttle bus operations. The critical PM peak hour outer-cordon will have a v/c ratio of 1.06 with the implementation of this option. The critical roadway link (Route 1 south of Slaters Lane) will have a v/c ratio of 1.08 without or with the construction of Potomac Avenue as shown in Figures 4 and 5, respectively. The annual cost to provide the shuttle bus service, including annualized capital cost, is estimated to be \$550,000 per year as shown in Table 1. The initial capital cost is estimated to be \$1,300,000.

FIGURE 3

Route 1 Corridor
 Year 2010 Baseline Conditions
 Levels of Service & V/C Ratios



Legend

Boundaries	Transportation	Other	Levels of Service (am, pm)
Potomac Yard	Major Roads	Rail Lines	C(C)
County Boundary	Proposed Roads	Metro Stops	XXX(L,XX)
	Streets	Outer Cordon	V/C Ratio (am, pm)
		Inner Cordon	

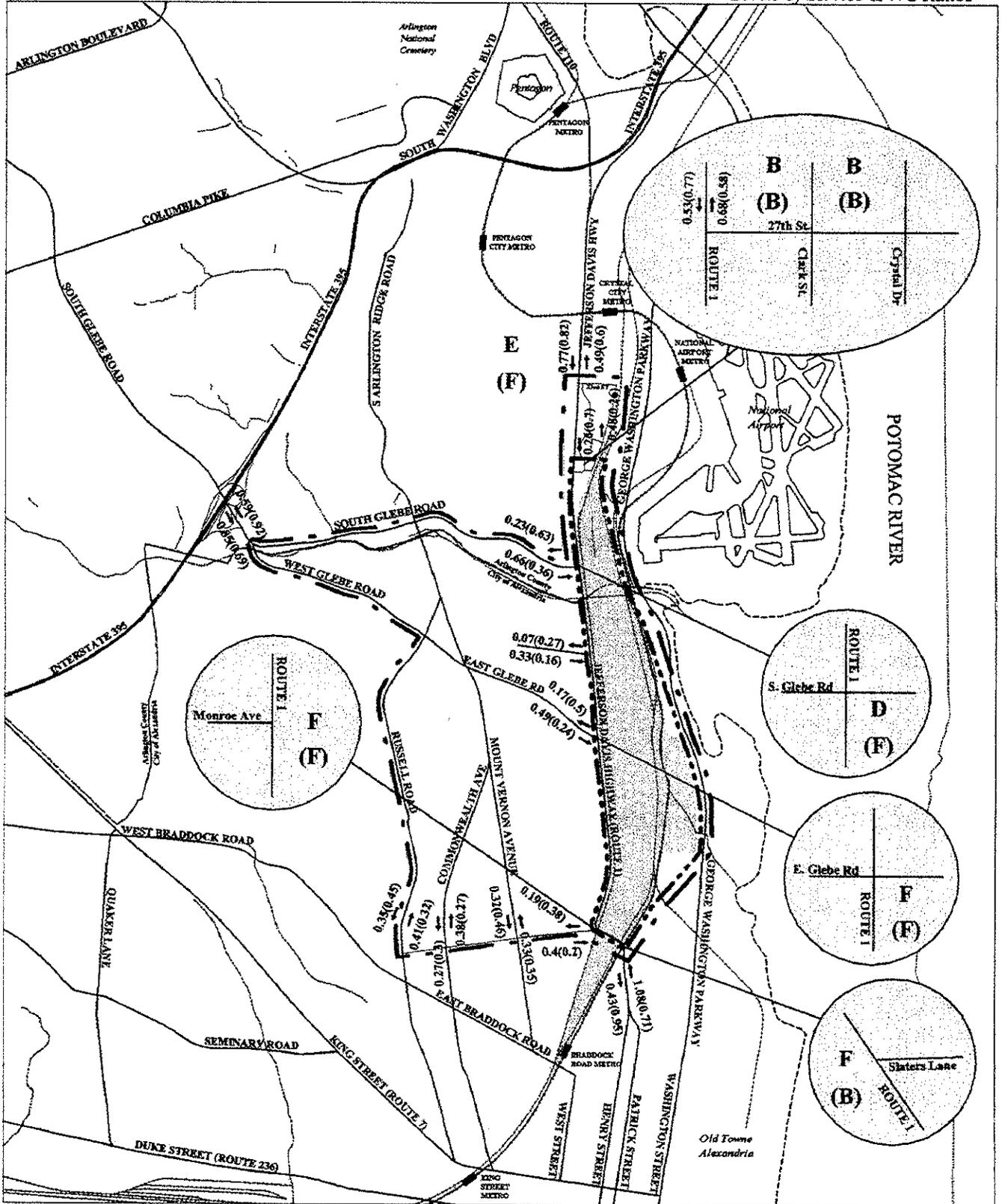
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Date	Project	File No.	Figure No.
11/99	06-02-02	10149-3-2	3

FIGURE 4

Route 1 Corridor
 Year 2010 Potomac Yard Shuttle
 Bus Option without Potomac Ave
 Levels of Service & V/C Ratios



Legend

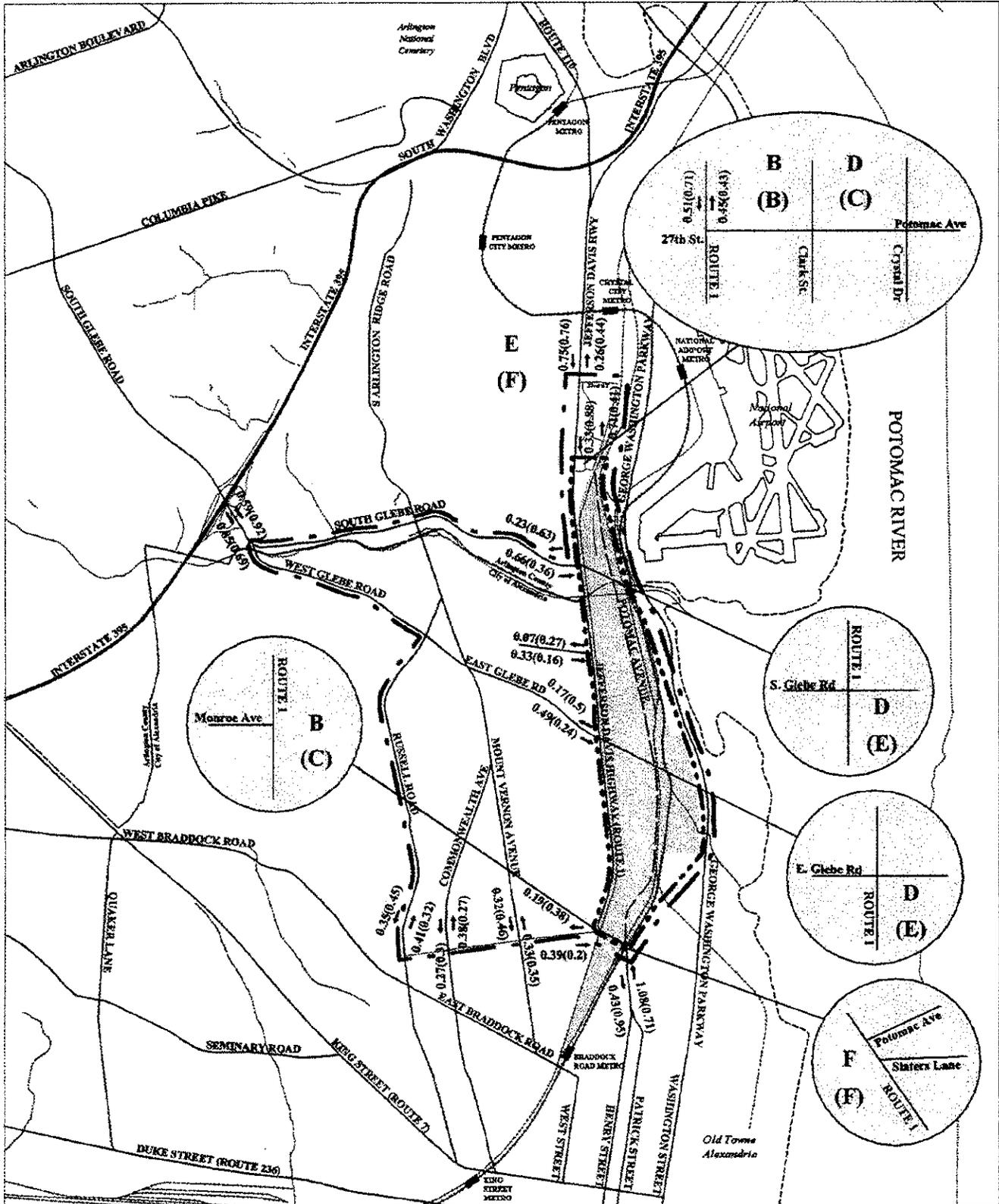
Boundaries	Transportation	Other	Levels of Service (am, pm)
Potomac Yard	Major Roads	Rail Lines	C(C)
County Boundary	Proposed Roads	Metro Stops	x.xx(x.xx)
	Streets	Outer Cordon	V/C Ratio (am, pm)
		Inner Cordon	
		Streams	



Date	Project	File No.	Figure No.
11/99	00-02-02	10149-3-2	4

FIGURE 5

Route 1 Corridor
 Year 2010 Potomac Yard Shuttle
 Bus Option with Potomac Ave
 Levels of Service & V/C Ratios



Legend

- | | | |
|-------------------|-----------------------|--------------|
| Boundaries | Transportation | Other |
| Potomac Yard | Major Roads | Rail Lines |
| County Boundary | Proposed Roads | Metro Stops |
| | Streets | Streams |
| | | Outer Cordon |
| | | Inner Cordon |
- C(C)** Levels of Service (am, pm)
X.XX(X.XX) V/C Ratio (am, pm)

Scale Bar:



Date	Project	File No.	Figure No.
11/99	98-82-82	10149-3-2	5

Option 2 - VRE: An option was considered for expanding the Virginia Railway Express (VRE) system by adding a new station on the Potomac Yard site. The VRE station would be supplemented by a shuttle bus system. Preliminary analysis for this option was conducted, however, based on VRE modeling, a new station would increase VRE travel times to Crystal City and Washington D.C. destinations. VRE would prefer to investigate the relocation the Crystal City station farther south where it could serve Crystal City, Potomac Yard and National Airport. Accordingly, the Potomac Yard VRE station was eliminated as an option in this study. The cost of providing service to a Potomac Yard VRE station was not available for this analysis.

**Table 1
Cost Estimates**

	Cost Increase				
	Baseline Metrobus	Shuttle Bus (2)	VRE(3)	Metro (4)	Light Rail (5)
<u>Operating cost (1)</u>					
Annual cost	NA	\$400,000	*	\$670,000	\$6,840,000
<u>Annualized Capital Cost</u>					
Cost (\$million)	NA	\$150,000	*	\$3,370,000	\$18,570,000
Total Annual Cost Increase (6)	NA	\$550,000	*	\$4,040,000	\$25,410,000

- Notes: 1. Operating costs based on average revenue hours data
 2. Shuttle Bus costs based on 1997 National Transit Profile data and FTA vehicle catalogs
 3. * Operating costs for VRE service were not available.
 4. Metro Costs based on 1997 National Transit Profile data and PHR&A's assumption on station operating costs
 5. Light Rail Costs based on 1997 National Transit Profile data and WMATA's Transit Service Expansion Plan
 6. Costs are assumed to be increased cost over existing Metrobus service costs
 NA: Not Applicable

Option 3 – Metro Station: Another option includes the potential new Metro Rail Station with supplemental shuttle bus service. The assumed location for the Metro Station would be on the Potomac Yard site in Alexandria. The projected ridership of a Metro Station at the proposed location will not provide a significant improvement in the v/c. The overall v/c ratio for the critical PM peak hour will be 1.04 as shown in Table 2. The v/c ratio for the critical link will be 1.07 as shown on Figure 6. The annual cost for operating the new Metro Station is estimated to be \$4,040,000 per year, including annualized capital costs, as shown in Table 1. The initial capital cost estimate for a new Metro Station in Alexandria ranges from \$45 million to \$60 million¹. This study used \$60 million as the estimate for the initial capital cost for the Metro Station. With the addition of the shuttle buses needed to serve the Metro Station, the initial capital cost estimate for this option is \$61,250,000. A location in Arlington County was also considered. A station at that location would have a significantly higher capital cost of approximately \$81,500,000. It should be noted that the developer has proffered the dedication of land for the potential new station at the

¹ WMATA's January 26, 1999 study for the Potomac Yard heavy rail station estimated the cost at \$45,200,000. Commonwealth Atlantic Properties representatives indicated that the station is likely to cost \$50 million to \$60 million.

Alexandria location and the WMATA Board of Directors has adopted plans recommending a station at that location.

**Table 2
Total Cordon V/C Summary**

<u>Cordon</u>	<u>Volume/Capacity Ratio*</u>				
	<u>Baseline**</u>	<u>Shuttle Bus</u>	<u>VRE</u>	<u>Metro</u>	<u>Light Rail</u>
Inner Cordon					
AM Peak Hour	0.88	0.87	0.86	0.86	0.79
PM Peak Hour	0.95	0.93	0.92	0.91	0.82
Outer Cordon					
AM Peak Hour	1.01	0.99	0.99	0.98	0.90
PM Peak Hour	1.07	1.06	1.05	1.04	0.94

Notes: * Year 2010 traffic conditions

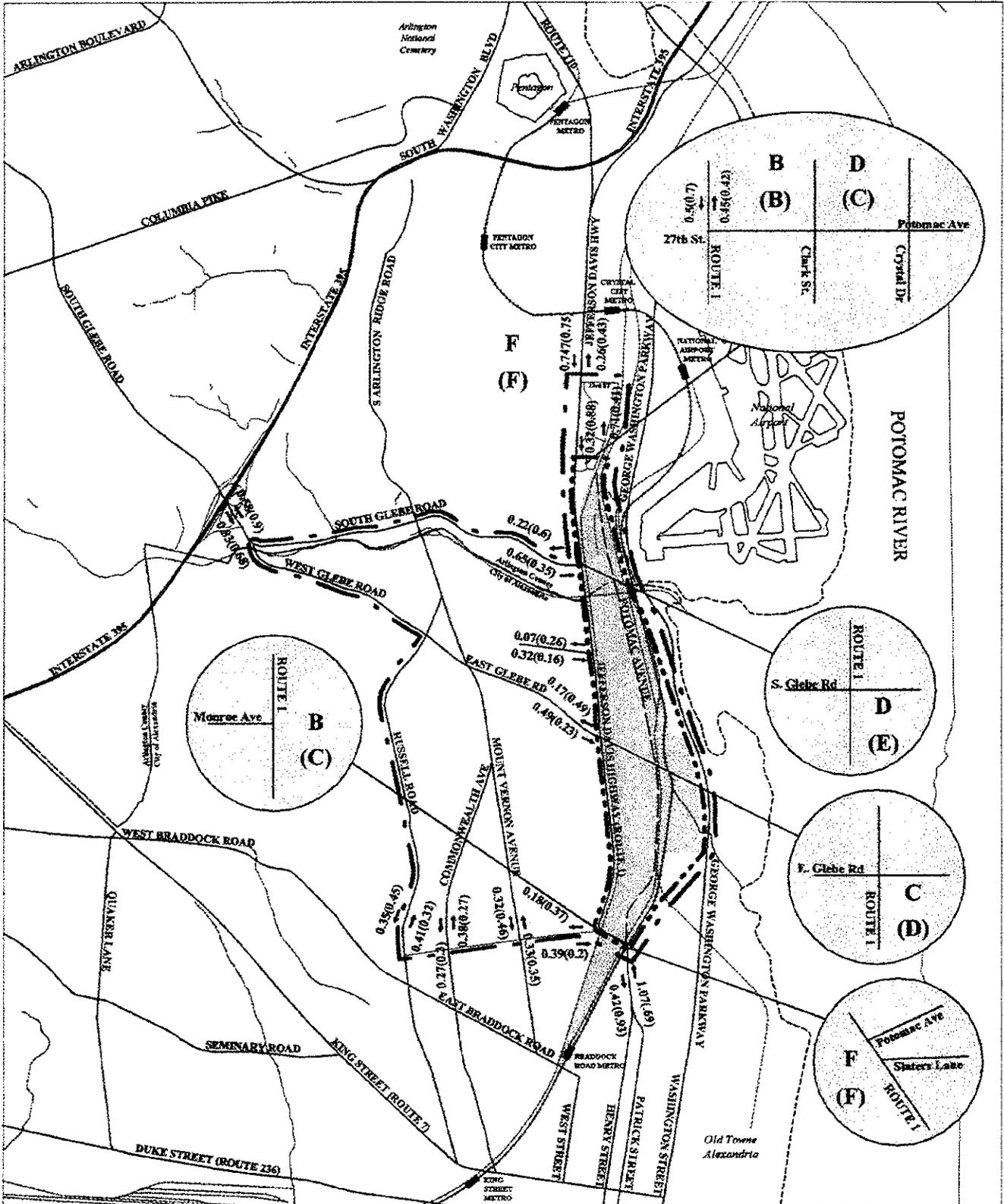
** Includes Potomac Avenue

Option 4 – Light Rail: The final option considered a transit system providing supplemental service between the Braddock Road Metro Station and the Pentagon Metro Station. For the purposes of this analysis, this transit option was assumed to be a light rail system including a portion of the rail alignment along Potomac Avenue within the Potomac Yard site. Variations of this type of transit system, such as Bus Rapid Transit instead of rail or a Route 1 alignment instead of Potomac Yard alignment, should be considered as long as the intended function is obtained. The light rail option would have a combined annualized capital and operating cost of approximately \$25,410,000 per year. The initial capital cost is estimated to be \$300,000,000². Although the cost estimate is higher than the Metro Station, it is the only option that lowers the traffic volumes in the study corridor to below the available capacity. The overall v/c ratio is projected to be 0.94 for the critical PM peak hour on the outer cordon by the year 2010, as shown in Table 2. The critical link (Route 1 south of Slaters Lane) will have a year 2010 v/c ratio of 0.97 as shown on Figure 7. The v/c will increase to approximately 0.97 by the year 2020 with the light rail transit system. The critical link will have a v/c ratio of 1.00 by the year 2020 with the light rail system as shown on Figure 8.

² A revised initial capital cost of \$326,000,000 was provided by WMATA after the completion of the technical analysis. The change in estimated cost is not expected to change the overall conclusions of the study.

FIGURE 6

Route 1 Corridor
 Year 2010 Metro Station Option
 Levels of Service & V/C Ratios



Legend

- | | | | |
|-------------------|-----------------------|--------------|--|
| Boundaries | Transportation | Other | |
| Potomac Yard | Major Roads | Rail Lines | C(C) Levels of Service (am, pm) |
| County Boundary | Proposed Roads | Metro Stops | X.XX(X.XX) V/C Ratio (am, pm) |
| | Streets | Outer Cordon | |
| | | Inner Cordon | |

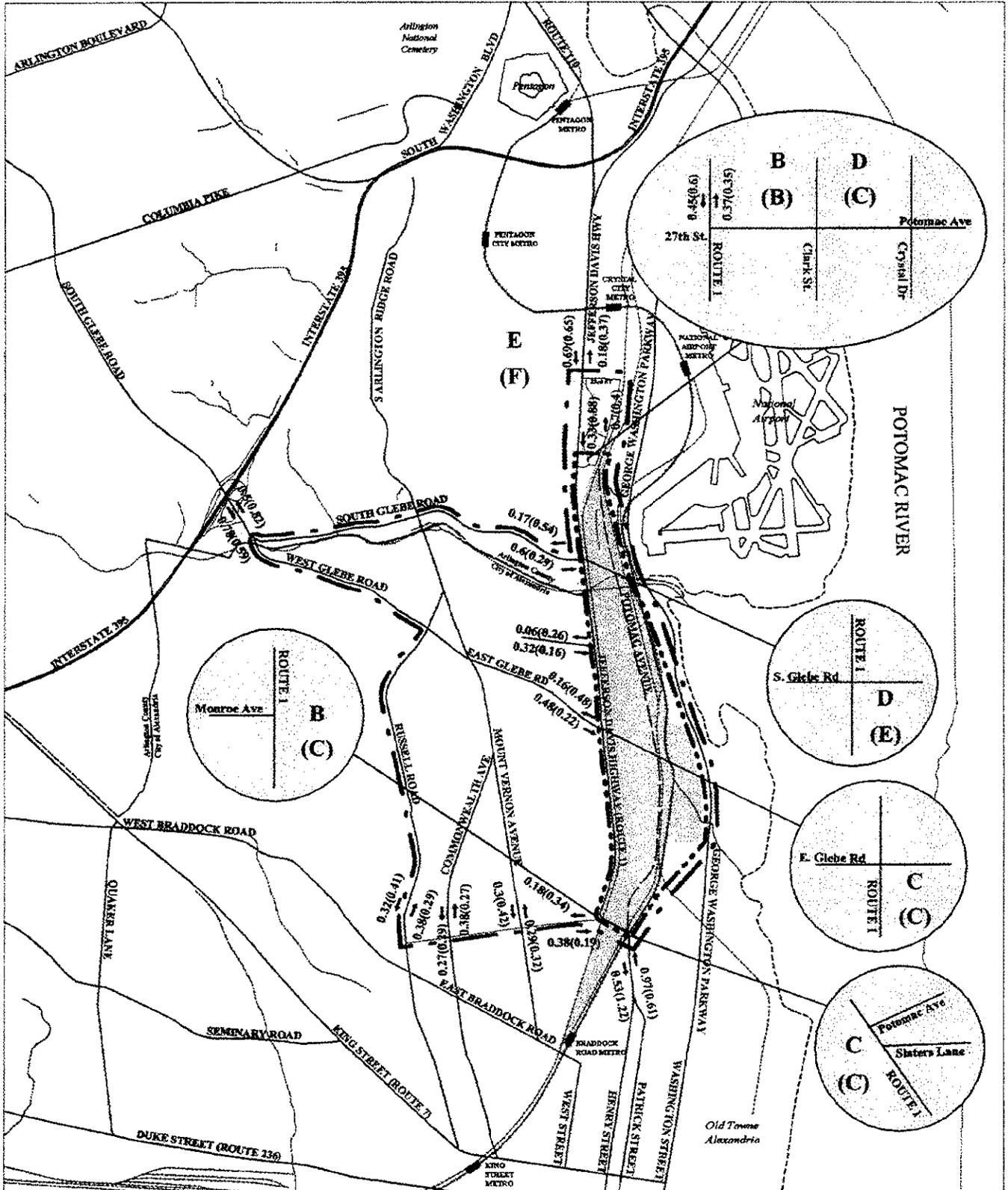
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Date	Project	File No.	Figure No.
11/99	08-02-02	10149-3-2	6

FIGURE 7

Route 1 Corridor
 Year 2010 Light Rail Option
 Levels of Service & V/C Ratios



Legend

Boundaries	Transportation	Other	
Potomac Yard	Major Roads	Rail Lines	C(C) Levels of Service (am, pm)
County Boundary	Proposed Roads	Metro Stops	X.XX(X.XX) V/C Ratio (am, pm)
	Streets	Outer Cordon	
		Inner Cordon	
		Streams	

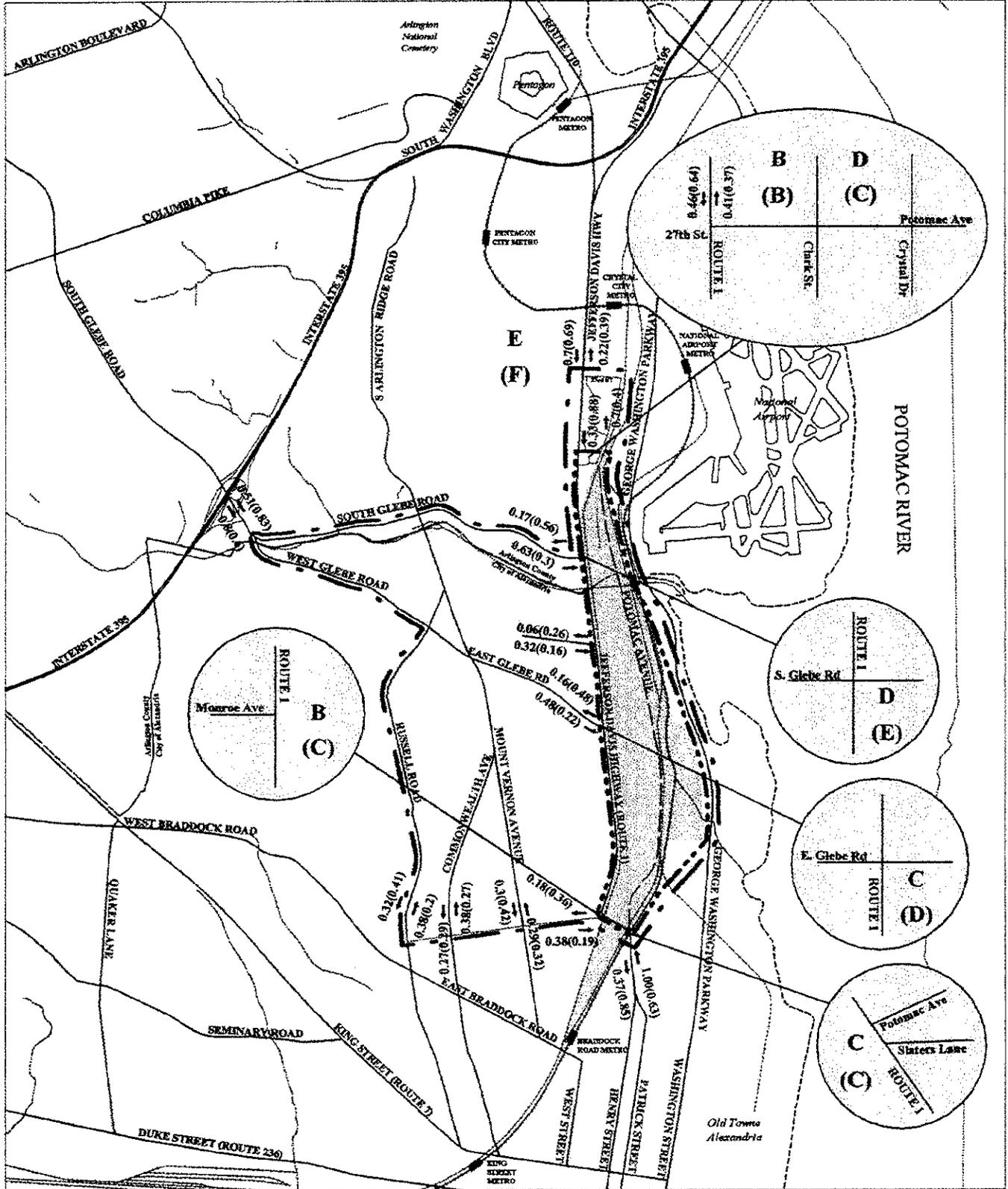
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Date	Project	File No.	Figure No.
11/99	00-02-02	10149-3-2	7

FIGURE 8

Route 1 Corridor
 Year 2020 Light Rail Option
 Levels of Service & V/C Ratios



Legend

- | | | | |
|-------------------|-----------------------|--------------|--------------|
| Boundaries | Transportation | Other | |
| Potomac Yard | Major Roads | Rail Lines | Streams |
| County Boundary | Proposed Roads | Metro Stops | Outer Cordon |
| | Streets | Inner Cordon | |

C(C) Levels of Service (am, pm)
L.XX(L.XX) V/C Ratio (am, pm)

Scale Bar:



Date	Project	File No.	Figure No.
11/99	99-82-82	10149-3-2	8

The v/c ratios were chosen to evaluate the effectiveness of each transit option to lower the traffic volumes to within the available roadway capacity. The benefit of improved v/c would be nine times higher than the shuttle bus option and four times greater than the Metro Station option. However, the cost per unit v/c improvement for the light rail is almost five times greater than that for the shuttle bus service and almost one and a half times greater than the Metro Station option, as shown in Table 3. The benefit, in terms of annual ridership, is three times higher for the light rail compared to the shuttle bus and approximately two times greater than the Metro option providing an alternative mode for over 10 million person trips per year. The cost per annual person trip for light rail would be 16 times higher than the shuttle bus service and three times higher than the Metro Station option, as shown in Table 3. The cost per unit benefit is significantly higher than the other options studied, however, only the light rail option will provide an alternative means of transportation to enough people to reduce traffic volumes to the available roadway capacity.

**Table 3
Cost Benefit Analysis**

Benefit Basis	Baseline Metrobus	Shuttle Bus	VRE	Metro	Light Rail
v/c Improvement					
** Benefit (v/c 100ths)	NA	1.52	*	3.49	13.26
Cost/Benefit (\$million/ v/c100ths)	NA	0.36	*	1.16	1.92
Annual Non-auto Ridership					
Benefit (Million Person Trips/Year)	NA	3.59	*	4.76	10.42
Cost/Benefit (\$/Person Trip/Year)	NA	0.15	*	0.85	2.44

Notes: * Operating costs for VRE service were not available.

** The benefit was calculated as the improvement in the volume to capacity ratio (v/c) comparing each of the alternatives to the baseline alternative.

Study Recommendation:

Although expanded shuttle bus service from the site to the existing Metro Stations is not anticipated to provide sufficient capacity when the site is fully developed, it is recommended until a higher level of transit is in place. The implementation of a light rail or equivalent service is recommended to prevent undesirable traffic conditions in the future. An additional study should be conducted to determine the appropriate system parameters such as the vehicle type, alignment, station locations and operating headways and should consider costs. The reservation for a Metro Station at Potomac Yard should be maintained, so as not to preclude future transit options for the vicinity. The ability to provide alternative site access via Metro or other rail systems should be preserved in the development plans to allow flexibility as transit technologies evolve.

Potential Funding Sources:

The developer as described in their development proffers would fund the shuttle bus. The Metro Station or Light Rail Options could seek funds from the following sources:

1. Commonwealth of Virginia
2. Federal Funds (TEA-21, FTA)
3. A special tax district could be established for the corridor to provide a portion of the needed funds.
4. Virginia Department of Rail and Public Transportation
5. Arlington County
6. City of Alexandria

3. COMMUNITY CONCERNS

During Committee discussions, concerns were raised regarding potential transportation issues in communities outside the analysis area of this study. Traffic congestion and circulation issues were raised regarding Crystal City north of 23rd Street. Also traffic congestion in Alexandria south of the study area including Old Town is a concern. Neighborhood cut-through traffic issues for neighborhoods such as Del-Ray were discussed as well.

3.a. Impacts of Development on Crystal City

Issue: The technical analyses conducted for this study evaluated the interaction of the Potomac Yard traffic in Crystal City where it interfaces with the existing roadway network including the proposed 27th Street/Potomac Avenue intersections with Clark Street and Crystal Drive. The future traffic conditions at locations farther north in Crystal City may also be a concern, particularly at the locations where Crystal Drive traffic accesses Route 1 such as 15th Street. In addition, other developments in North Crystal City could further impact the future traffic conditions depending upon the specific development plans and potential changes in the roadway network, such as the extension of Crystal Drive to Boundary Channel Drive.

Evaluation: Based on the analyses of this study, there will be sufficient capacity at the screenline locations north of the South Tract Parcel. As indicated by the capacity analyses of the Route 1/23rd Street intersection, operational deficiencies at specific intersections in Crystal City may continue to be a concern in the future. This intersection currently operates at a Level of Service (LOS) “F” during the PM peak hour. With the light rail transit option, intersection operations in the year 2010 will remain LOS “F”, however the delays are projected to be lower than the current delays.

Study Recommendation: Traffic studies should be required of new development in Crystal City to be reviewed by Arlington County. Studies should include the impacts of additional traffic as well as diversions resulting from modifications to the roadway network.

3.b. Impacts in Alexandria

Issue: The technical analyses conducted for this study evaluated the interaction of the Potomac Yard traffic in Alexandria where it interfaces with the existing roadway network including the Route 1/Slaters Lane intersection. New development in the study area could have traffic impacts on Old Town Alexandria as well as neighborhood streets to the east such as Powhatan Street, Slaters Lane and the George Washington Parkway.

Evaluation: The Old Town Alexandria area consists of a large roadway network grid system with two primary north/south routes. Route 1 is a one-way pair with three lanes in each direction and Washington Street is a four-lane roadway that becomes George Washington Parkway in the vicinity of Slaters Lane. These roadways generally operate near capacity under current traffic conditions. Providing additional capacity through roadway improvements is not considered feasible due to physical constraints and City opposition of additional through traffic. The areas to the east of the proposed development have been studied in conjunction with the land use applications submitted to the City of Alexandria. Slaters Lane at George Washington Parkway is projected to operate beyond the intersection capacity.

Study Recommendation: A study should be conducted to determine if the transit recommendations of this study will benefit the Alexandria roadway network and to determine if expansion of the service area is necessary to provide sufficient through capacity for the City. The potential for implementation of mass transit to improve access to the Northeast neighborhood and Old Town should be studied. Concerns regarding additional use of neighborhood roads such as Powhatan Street should be addressed by a neighborhood cut-through traffic study.

3.c. Neighborhood Cut-Through Traffic

Issue: Neighborhoods surrounding Potomac Yard, particularly to the west, are concerned about an increase in cut-through traffic as a result of the additional traffic generated by the potential development of Potomac Yard.

Evaluation: The conceptual design plan of the Potomac Yard site, as approved by the Alexandria City Council, illustrates roadway connections from the planned Potomac Avenue to Route 1

adjacent to Howell Avenue, East Glebe Road, and Swann Avenue. Since Howell Avenue and East Glebe Road continue to other north/south collector roads such as Mount Vernon Avenue, Commonwealth Avenue, and Russell Road, these roads are potential cut-through routes.

Study Recommendation: Since existing data does not address this issue, several aspects of cut-through traffic should be evaluated including the existing travel patterns and impacts of the proposed development. A study of affected neighborhoods such as Del-Ray, Oakville Triangle, Mt. Jefferson, Lynhaven, Arlandria, Oakcrest and Aurora Hills should be conducted as perceived cut-through traffic issues are raised to the City of Alexandria and Arlington County by these communities. These studies should consider existing VDOT policies and operational solutions to identify and address cut-through traffic.

4. SITE CONCERNS

Issues directly related to the Potomac Yard site that were raised by the Committee include internal site traffic circulation and the Transportation Management Plan that was submitted by the developer and approved by the City of Alexandria.

4.a. Internal Circulation:

Issue: The analysis conducted considers transportation requirements for the corridor adjacent to the Potomac Yard site. Since the roadway network could be subject to change as plans are refined throughout the approval and development procedures, the evaluation of transportation needs on the site was limited to the need for the proposed Potomac Avenue as it relates to the Route 1 corridor.

Study Recommendation: Circulation within the site needs to be evaluated by the City of Alexandria and Arlington County. The plans submitted by the developer should ensure safe and efficient circulation within the site.

4.b. Transportation Management Plan (TMP):

Issue: It should be noted that the Development Concept Plan approved by the City of Alexandria included a comprehensive TMP.

Evaluation: City of Alexandria Staff recommended approval of the development concept plan subject to compliance with the applicable codes and ordinances and conditions on the following issues:

1. Designation of a single TMP coordinator (TMPC)
2. The coordinator shall promote transit, carpooling and vanpooling, bicycling, telecommuting, the Guaranteed Ride Home Program and other components of the TMP.
3. The TMPC shall be responsible for maintaining an information center.
4. The TMPC shall administer a ride-share program.

5. The applicant shall implement a transportation fund at a rate of \$60 per year per occupied residential unit and \$0.10 per occupied net square foot of commercial/retail space for transportation program purposes.
6. Annual surveys shall be conducted to determine mode of transportation.
7. The applicant shall provide reports to the Alexandria Office of Transit Services and Programs (OTS&P).
8. Discounted bus and rail fares must be sold on-site.
9. The applicant will implement a parking management plan.
10. Bicycle racks shall be provided.
11. Shuttle Bus service shall be provided to the Braddock Road and Crystal City Metro stations.
12. The applicant will work with the OTS&P and transit companies to encourage ridership.
13. The applicant will provide space for a transit store.
14. The applicant will inform prospective tenants and buyers of the TMP conditions.
15. Modifications to the TMP shall only be permitted if approved by the Director of Transportation and Environmental Services (T&ES).
16. The Director of T&ES shall review the TMP in conjunction with the submission of the initial preliminary development plan.

Study Recommendation: The Arlington County review of the land use application should consider a Transportation Management Plan consistent with the plan approved by the City of Alexandria.

5. PEDESTRIAN AND BICYCLE ACTIVITIES

Issue: Citizens have expressed concern that the proposed development will not provide adequate pedestrian and bicycle access through the site in both the north/south and east/west directions.

In addition, modifications to the Monroe Avenue Bridge and the proposed intersection of Potomac Avenue with Route 1 and Slaters Lane could have a negative effect on east/west bicycle and pedestrian access.

Alexandria staff has reviewed the Potomac Yard Urban Design Guidelines submitted by Commonwealth Atlantic Properties. According to the design guidelines at the north end of the Potomac Yard Park, a connection to the existing Four Mile Run bike trail will be made over the easternmost railroad bridge. The Potomac Yard Park is a proposed dedication by the developer running along the entire length of the site.

Study Recommendation: Development plans for the Potomac Yard site should consider the Arlington and Alexandria trail plans. Contiguous bicycle and pedestrian access should be provided through the site in the north/south and east/west directions connecting the existing trail systems around the site.

Alexandria has approved development that includes a network of bicycle paths. Arlington should ensure that the plans submitted for their review provides the linkage over Four Mile Run.

CONCLUSION

Based on the technical analysis conducted, the build-out of Potomac Yard will require significant transit infrastructure improvements to maintain roadway capacity at acceptable levels of service. The provision for a light rail transit service from the Pentagon METRO station to the Braddock Road METRO station through the subject site is the most effective transit recommendation to provide alternative service for the future development. Furthermore, highway improvements and a continuation of the proffered Shuttle Bus service, evaluated in the context of future development and traffic growth in the Route 1 and Glebe Road corridors, will not support the increase in traffic. The site development does include a significant improvement for the northbound Route 1 corridor, through the construction of Potomac Avenue from Slaters Lane to Crystal Drive. The study also identified several issues which should be considered for further analysis, such as site phasing, cut-through traffic, Route 1 traffic signal progression, I-395 High Occupancy Vehicle (HOV) ramp, and the extension of Potomac Avenue/Crystal Drive.

APPENDIX A

SENATE JOINT RESOLUTION NO. 406

Requesting the Secretary of Transportation to study improvement of transportation affecting the Crystal City and Potomac Yard Areas of Arlington County and the City of Alexandria.

Agreed to by the Senate, February 4, 1999

Agreed to by the House of Delegates, February 15, 1999

WHEREAS, the Crystal City and Potomac Yard areas of Arlington and Alexandria are, and will continue to be, major regional centers of business and commercial activity for the Washington metropolitan area; and

WHEREAS, there is currently a need to move large volumes of people and products both within the immediate Crystal City and Potomac Yard areas and between this area and origins and destinations outside the area and throughout the region; and

WHEREAS, plans for long-term developments of a major scale in Potomac Yard are being proposed by Commonwealth Atlantic Properties for consideration by Arlington and Alexandria; and

WHEREAS, the portion of U.S. Route 1 that traverses Old Town Alexandria, Potomac Yard, and Crystal City, and which was not included as part of the recent U.S. Route 1 Study conducted by the Virginia Department of Transportation, will be the major road accessing this area; and

WHEREAS, Metrorail stations at Crystal City and Braddock Road and the Virginia Railway Express stations at Crystal City and King Street are too distant to provide sufficient access to public transportation in this area; and

WHEREAS, development of this scale will create traffic implications for the residential neighborhoods that form the western border of the Crystal City and Potomac Yard areas; and

WHEREAS, future plans for the Crystal City and Potomac Yard areas should accommodate the transportation planning vision of the Transportation Planning Board of the National Capital Area for hub and web travel patterns to enhance access to and from the region; and

WHEREAS, the development of transportation solutions in this area must, by nature of their interests and proximate locations, include a number of local, state and federal agencies, and private corporations, including the National Park Service, Metropolitan Washington Airports Authority, U.S. Department of Transportation, CSX Railway Corporation, Washington Metropolitan Area Transit Authority, Virginia Department of Transportation, Virginia Department of Rail and Public Transportation, and the two local governments; and

WHEREAS, Commonwealth Atlantic Properties has a unique interest, with regard to addressing transportation concerns in this area, due to the extent of their land holdings, standards and designs applied to their development, implementation of site plan, and control over the phasing and pace of the anticipated build-out; and

WHEREAS, there is a crucial need to identify highway and transit improvements that will accommodate current and future development and will improve circulation within the Crystal City and Potomac Yard areas; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Secretary of Transportation, with the assistance and cooperation of the Commonwealth Transportation Board, the Virginia Department of Transportation, the Virginia Department of Rail and Public

Transportation, the County of Arlington, the City of Alexandria, the Metropolitan Washington Airports Authority, the Northern Virginia Transportation Commission, and the Washington Metropolitan Area Transit Authority be requested to study and develop a plan that recommends short-term and long-term transportation improvements affecting this area; and, be it RESOLVED FURTHER, That the maximum opportunity for input and coordination in the development of this plan be afforded other local, regional, state and federal agencies, Commonwealth Atlantic Properties and other private corporations, and community-based organizations that may have an interest in this area; and, be it RESOLVED FURTHER, That this plan identify the costs associated with implementing the plan and funding options; and, be it RESOLVED FINALLY, That the Secretary complete the work in time to submit her findings and recommendations to the Governor and the 2000 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

HOUSE JOINT RESOLUTION NO. 567

Requesting the Secretary of Transportation, with the assistance of certain authorities, to study improvement of transportation affecting the Crystal City and Potomac Yard areas of Arlington County and the City of Alexandria.

Agreed to by the House of Delegates, February 5, 1999

Agreed to by the Senate, February 18, 1999

WHEREAS, the Crystal City and Potomac Yard areas of Arlington and Alexandria are, and will continue to be, major regional centers of business and commercial activity for the Washington metropolitan area; and

WHEREAS, there is currently a need to move large volumes of people and products both within the immediate Crystal City and Potomac Yard areas and between these areas and origins and destinations outside the areas and throughout the region; and

WHEREAS, plans for long-term developments of a major scale in Potomac Yard are being proposed by Commonwealth Atlantic Properties for consideration by Arlington and Alexandria; and

WHEREAS, the portion of U.S. Route 1 that traverses Old Town Alexandria, Potomac Yard, and Crystal City, and which was not included as part of the recent U.S. Route 1 Study conducted by the Department of Transportation, will be the major road accessing this area; and

WHEREAS, Metrorail stations at Crystal City and Braddock Road and the Virginia Railway Express stations at Crystal City and King Street are too distant to provide sufficient access to public transportation in this area; and

WHEREAS, development of this scale will create traffic implications for the residential neighborhoods that form the western border of the Crystal City and Potomac Yard areas; and

WHEREAS, future plans for the Crystal City and Potomac Yard areas should accommodate the transportation planning vision of the Transportation Planning Board of the National Capital Area for hub and web travel patterns to enhance access to and from the region; and

WHEREAS, the development of transportation solutions in this area must, by nature of their interests and proximate locations, include a number of local, state, and federal agencies, and

private corporations, including the National Park Service, Metropolitan Washington Airports Authority, U.S. Department of Transportation, CSX Railway Corporation, Washington Metropolitan Area Transit Authority, Department of Transportation, Department of Rail and Public Transportation, and the two local governments; and

WHEREAS, Commonwealth Atlantic Properties has a unique interest, with regard to addressing transportation concerns in this area, due to the extent of their land holdings, standards and designs applied to their development, implementation of site plan, and control over the phasing and pace of the anticipated build-out; and

WHEREAS, there is a crucial need to identify highway and transit improvements that will accommodate current and future development and will improve circulation within the Crystal City and Potomac Yard areas; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Secretary of Transportation, with the assistance and cooperation of the Commonwealth Transportation Board, the Department of Transportation, the Department of Rail and Public Transportation, the County of Arlington, the City of Alexandria, the Metropolitan Washington Airports Authority, the Northern Virginia Transportation Commission, and the Washington Metropolitan Area Transit Authority be requested to study and develop a plan that recommends short-term and long-term transportation improvements affecting this area.

The Secretary shall provide maximum opportunity for input and coordination in the development of the plan by local, regional, state, and federal agencies, Commonwealth Atlantic Properties and other private corporations, and community-based organizations that may have an interest in this area.

This plan should identify the costs of implementation and other funding options.

The Secretary shall complete her work in time to submit her findings and recommendations to the Governor and the 2000 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

Attachment 2

**Summary of Written Comments
From Technical Advisory Committee**

Comments from Jennifer Straub (NVTC)

Chris - as we discussed, my comments on the October, 1999 version of the Potomac Yard study are as follows.

1. Study Recommendation #8 (page 4) - at the last technical committee meeting, we discussed removing the mention of legal proceedings related to the Monroe Avenue bridge. This reference is also made in section 1.g - Monroe bridge straitening, in the discussion regarding evaluation.
2. Citizen Output section (page 11) - I would add the date of the meeting.
3. 1.d. - New I-395/South Glebe Road HOV Ramp (page 14) - if available from VDOT NoVA staff, add the number of new carpool trips.
4. Option 2, VRE (page 20) - I would change the last three sentences to read, "VRE would prefer to investigate the relocation of the Crystal City station farther south where it could serve Crystal City, Potomac Yard, and National Airport. Accordingly, the Potomac Yard VRE station was eliminated as an option in this study. The cost of providing service to a Potomac Yard VRE station was not available for this analysis."
5. Table 1 (page 20) - the 3rd footnote should read, "Operating costs for VRE service were not available." The second sentence in the footnotes is out of place, as all of the other footnotes refer to specific issues related to cost. I would suggest deleting it.
6. Option 4, Light Rail (page 23) - the third sentence should read, "...almost five times greater than for the..."
7. Table 3 (page 26) - the footnote should read, "Operating costs for VRE service were not available."

Good luck pulling everything together, please call me with any questions.

Comments from Ik Pyo Hong (WMATA)

The preliminary concept cost of the LRT was given to you at \$326 M. Corrections should be made to pages 4, and 23 and any other pages that reference the \$.

WMATA's Jan 26, 1999 study for the Potomac Yard heavy rail station estimated project cost at \$45.2M range, not \$61,250,000. The Arlington site was estimated at \$81.5M not \$85M. Please correct page 20.

Also, I noticed that my name was inadvertently left off the participants list as representing WMATA. Thank you for the opportunity to serve on the committee, and I look forward to the Virginia legislature's endorsement of the report.

Comments from Bahram Jamei (VDOT)

I have the following comments on October 1999 Draft report.

Page 1 - Preface (first paragraph). It should be (HJR 567) not (SJR 567).

Page 2 - Executive Summary (next to the last paragraph). The termini for the proposed Potomac Avenue where it connects to the existing roadway is not mentioned. I think it is Slaters Lane and Crystal Drive, as mentioned on page 4 (last paragraph).

Page 3 - last paragraph. SCOOT needs to be defined. The definition is given on page 15 (Split Cycle Offset Optimization Technique).

Page 16 - Item 2, second paragraph. The last sentence should be changed to read. This indicates that the traffic volumes will be seven percent higher than the available roadway capacity. this corresponds to 1.07 v/c ratio, mentioned in previous sentence.

Page 16 - Item 2, second paragraph. It is not clear whether the baseline transit scenario includes Potomac Avenue or not. My guess is that it does. If this is the case, it should be mentioned in this paragraph and on Figure 3 as well.

Page 23 - last paragraph. It is not clear to me where the v/c improvement numbers (Benefit - v/c 100ths) in Table 3 (1.52, 3.49, and 13.26) are derived from. A general statement explaining the technique for obtaining these numbers should suffice.

Please give me a call for any questions regarding these comments.

Bahram Jamei, Ph.D., P.E.
Senior Transportation Engineer
Phone (703) 383-2214
Fax (703) 383-2230

Comments From John Wright

MEMORANDUM

To: Chris Detmer

Project No.: 2300073

From John Wright

Date: November 18, 1999

Re: Draft Report – Crystal City/Potomac Yard

I have reviewed the draft report “Crystal City/Potomac Yard Area Transportation Study” dated October 1999. The following are my comments on the draft:

1. On page 2, I feel the fourth bullet indicating the cordon capacity will be insufficient to accommodate projected traffic should be the first bullet. This is the primary finding of the study.
2. On page 13 under the South Glebe Road Widening issue, South Glebe Road may not be “the critical approach” but is certainly an important one. I would suggest some rework of this statement. Also, I would estimate that South Glebe Road is the corridor with the potential for further traffic growth given that it has excess capacity.
3. On page 21, Table 2, a design year should be included for the table.
4. The last paragraph on page 4 is actually the conclusion of the study and I would recommend labeling it as such.
5. The conclusion on page 30 should be modified to better match the last paragraph on page 4. The conclusion on page 30 requires a leap of faith to assume “...adequate transportation will be provided...” when so many things are left for further study.
6. On page 4, the last paragraph states “The provision of a light rail transit service...is the most feasible transit recommendation to provide alternative service for the future development.” This may be true. However, at this time, we are without the results of the recommended study ... “to determine the appropriate system parameters, such as vehicle type, alignment, station locations, and operating headways and should consider costs.” Also, in light of the \$300 million price tag for this service, is such cost justified when compared to the cost per unit benefit achieved?

This study is essentially an analysis of peak hour conditions. On page 23, it is indicated that the light rail would accommodate over 10 million person trips per year. How many of these are in the peak periods that are the basis of study?

Comments from John G. Milliken

MEMORANDUM

TO: Chris Detmer
FROM: John G. Milliken
DATE: November 18, 1999
RE: Draft Route 1 Corridor Study

I have reviewed the Draft of the study and have a few comments.

1. The language that was added on p. 4 as the final paragraph of the Executive Summary was a good addition. Without it, the Executive Summary did not come to a conclusion. I suggest that this final paragraph be labeled Conclusion; so that it is separated from the Cost Estimates paragraph above.

2. I do not believe that the language in the Conclusion on p. 30 in the current draft can be supported. You are saying that based on "recommended future analyses, adequate transportation will be provided" Since there is no way to know what further analyses may conclude, I do not think you can make the statement you suggest.

I recommend instead that you combine the first sentence from the fourth bullet on p. 11 with the conclusion you are already using in the Executive Summary on p. 4. The result would read

CONCLUSION

The overall cordon capacity will be insufficient to completely accommodate projected traffic with the Potomac Yard development. Based on the technical analysis conducted, the build-out of Potomac Yard will require significant transit Furthermore, highway improvements and a continuation.... The site development does not include...I-395 High Occupancy Vehicle (HOV) ramp, and the extension of Potomac Avenue/Crystal Drive.

3. The *Study Findings* are set out on p. 2-3 in the Executive Summary and again on p.11. I suggest that the final bullet about the overall cordon capacity be made the first bullet in each place since everything else flows from the initial conclusion that the cordon capacity is insufficient.



City of Alexandria, Virginia

**Department of
Transportation and Environmental Services**

P.O. Box 178 - City Hall
Alexandria, Virginia 22313

14
11-23-99



January 6, 2000

Mr. Chris Detmer, Project Manager
Transportation Planning Division
Virginia Department of Transportation
1401 East Broad Street
Richmond, VA 23219

Dear Mr. Detmer:

**RE: COMMENTS ON THE DRAFT POTOMAC YARD/CRYSTAL CITY AREA
TRANSPORTATION STUDY**

At its November 23 legislative meeting, the Alexandria City Council requested that the City's comments on the Potomac Yard/Crystal City Arlington transportation study be forwarded to the Virginia Department of Transportation (VDOT).

The City believes that the study confirmed the City of Alexandria's traffic projections, and the legislative study reaffirmed the need for significant investment in the transportation infrastructure required to support the Potomac Yard development. We were pleased to find that the legislative study recommended both the construction of the spine road (Potomac Avenue) and the straightening of the Monroe Street Bridge, which are consistent with the development conditions set forth in September by the City Council for the Alexandria portion of Potomac Yard. We believe that both the bridge straightening and the spine road will have a greater positive impact on the Route 1 traffic congestion than the draft study identified. These two projects also will have a major economic development impact on the City and the State. The City and the State will need to jointly pursue funding opportunities to ensure the timely construction of both of these recommended improvements. The City also concurs with the finding indicating that shuttle bus service between Metrorail station will be needed until some higher level of transit available to the site.

In approving the Potomac Yard Coordinated Development District plan in Alexandria, the City recognized that the Potomac Yard Development needs to be transit oriented. The legislative study provides a preliminary cost benefit analysis of three transit options for the site: Metrorail, light rail,

Mr. Chris Detmer
Page 2
January 6, 2000

and bus/shuttle options. Although the analysis of these options suggested that light rail or its equivalent would provide the most significant transit improvement, it also indicated that light rail would likely have the highest per passenger cost. The study recommends that a more comprehensive study be prepared analyzing each of the transit options, and that the future study should specifically address the issues of headways, alignments, types of vehicles, projected ridership and impact on the surrounding neighborhoods. The City concurs with this recommendation and has indicated that additional studies will be essential in order to support the level of investment that would be required for the proposed transit improvements.

If you have any questions about our comments, please call me at (703) 838-4966.

Sincerely,



Dave Ruller
Acting Director of Transportation and
Environmental Services

cc: ~~The Honorable Mayor and Members of City Council~~
Vola Lawson, City Manager
Michele Evans, Assistant City Manager
Kenneth Klinge, Chairman, Transportation Coordinating Council of Northern Virginia
Betsy Massie, Division Chief, OTS&P
Tanya Husick, Transportation Planner, OTS&P
Bernie Caton, Legislative Director
Mark Jinks, Director, Financial and Information Technology Services