Market Analysis for Commuter Ferry Service on the Occoquan, Potomac, & Anacostia Rivers

Final Report

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EXECUTIVE SUMMARY

BACKGROUND AND STUDY PURPOSE

This is the third study published in the past fifteen years that considers the possibilities of establishing commuter ferry service on the Potomac River System (including the Potomac, Anacostia and Occoquan Rivers) that both connects and divides the greater Washington, DC metro region. The first was a study published in 2000 by the Virginia Department of Transportation, The Passenger Ferry Boat Feasibility Study. The scope of this study was to consider the possibility of long distance high-speed passenger ferries as a adjunct to the I-95 and US- 1 corridors. The second was published in 2009 by Prince William County Department of Transportation, Potomac River Commuter Ferry Service Study and Route Proving Exercise. That scope of the study was to use document and observe the operation of a high speed passenger vessel to assess the navigational potential for particular terminal sites as well as determine vessel travel times between various terminal sites. This study uses components of these former efforts as foundational and does not revisit the conclusions of the earlier work. Rather the scope of this study is to assess the broader market potential for technically and navigationally feasible ferry services as established in the previously published works.

The purpose is to determine if there is a sustainable market for fast commuter ferry service on the Potomac River System. While the study reaches conclusions about the market for such a service, many questions remain with regard to feasibility. The study begins to identify steps necessary to actually implement ferry services that have market potential and are technically feasible. The study also captures many issues, although not comprehensively, and points out direction for further study, but it is not intended to be a comprehensive feasibility assessment or implementation plan.

STUDY OBJECTIVES

The objectives of the study are to identify and quantify to the extent possible:

- Corridors, routes, or terminals that could host a financially sustainable market for commuter ferries along the Potomac River System.
- Markets for commuters, people who currently travel by land between locations in relative proximity to the river system, or casual travelers, who could, or would, take advantage of a ferry system, or route that is designed primarily to meet their specific needs.
- Potential to improve access to military installations along the waterways if waterborne linkages were available, particularly as functions are realigned and relocated as a result of BRAC.
- Potential to expand the visitor/tourist market beyond the more traditional boundaries of Washington, DC.

STUDY STAKEHOLDERS

Early in the study stakeholder interviews revealed that many people felt a ferry system needed to be part of the total transportation system, that more alternatives are needed to grow the region's jobs and housing market. The interviews revealed that there are many opportunities, constraints, and policy issues that need to be addressed. Several waterfront developments (Capitol Riverfront, The Yards, The Wharf, Old Seaport, Potomac Shores, Potomac Yards and many others) are underway. No new river crossings or additional capacity are being planned between the Key Bridge and Nice Bridges (US-301), a stretch of nearly 45 miles of riverfront. As the several Potomac River Bridges age and reach capacity, alternatives are needed to ensure the region continues to enjoy cross-river mobility.

The constraints are many. Perhaps the least obvious is that there has not been commuter ferry service on this part of the river for over 100 years and is, therefore, no longer in the public vernacular. New waterfront property and access points have not been developed for commuter ferries. Much of the waterfront is controlled by various branches of the military or the National Park Service. Finally, despite new development on the waterfront, the region continues to grow in an increasingly decentralized manner, further scattering commuter destinations and forcing transportation investment decisions to be spread over a large number of priority projects. Not to be forgotten, many of the priority projects are designed to maintain and modernize currently available transportation infrastructure and services.

Regarding policy issues – funding remains "THE" key issue. Many stakeholders observed that adding another mode to the mix of decisions on existing highway and transit infrastructure maintenance needs as well as already planned and underway transportation infrastructure expansions may cause even more "fog" in the funding equation. For example, the present Financially Constrained Long Range Transportation Plan of the National Capital Region's Transportation Policy Board has no projects presently identified that relate to implementing ferry service. Further there is no existing governance structure that addresses water transportation. It should be noted that these statements represent the perspectives of stakeholders, but the fact remains that funding and governance for ferries in the National Capital Region is a relatively unexplored topic.

ASSESSMENT PROCESS AND CORRIDOR SELECTION

The technical analysis started with 26 terminals and 260 different terminal combinations. The initial terminal sites were all derived from the Prince William County Route Proving Report, September 15, 2009. After an initial assessment of terminal locations, 13 of the 26 terminals were eliminated based on feasibility. Several of the corridors were eliminated based on practicality and feasibility, thus reducing the study focus to 67 corridors. Fort Belvoir and Marine Base Quantico were excluded from further study at this point based on direct requests from the commands of those installations. While both may well viable markets for ferry service, they will need to be assessed through further study. The remaining corridors were further evaluated based on market size and travel time savings then grouped into six market areas, which were:

- SE and SW Washington, DC
- City of Alexandria
- Eastern Prince William County
- National Airport/Crystal City
- Southern Maryland

- National Harbor

HOUSEHOLD SURVEY FINDINGS

A household random dial telephone survey was conducted of 1,200 households in the six market areas. Highlights from the household survey:

- 53% of the market areas travelers who currently travel parallel to a potential ferry route do so to get to work.
- Of those travelers who make their way parallel to a ferry route 60% are driving alone.
- The major concern of these drivers – traffic, followed by total travel time and parking costs.
- 30% of the people surveyed are likely to try a ferry, but lack of familiarity with ferries as a commute mode is an issue for many.
- People making their current trip by car are more likely to try a ferry than those who commute by an existing alternative mode.
- Potential ferry terminals mentioned frequently are equivalent in relative volume when compared to modeling analysis conducted as part of the analysis.

MARKET ASSESSMENT FINDINGS

The household survey data was joined with results from the MWCOG Travel Demand Model using pivot point techniques and an econometric ferry operation model to assess potential for sustainable ferry market demand. The six corridors tested and the model results indicating sustainability are described below.

- Four corridors were found to have financially sustainable market demand:

  Old Town Alexandria to and from Southwest, DC and Southeast, DC

  National Airport to and from Southwest, DC and Southeast, DC

  Service features include:
  - Smaller ferries, around 50 passengers with frequent service – departures every 15 minutes.
  - Service operating approximately 5 am to 9 pm, seven days per week.
  - Fares vary based on how service is provided, but in the range of $8 to $10 per trip.
  - Ridership in the range of 1,100 to 2,000 per day on each of the four corridors

- One corridor was found to be a viable market for access to a military installation:

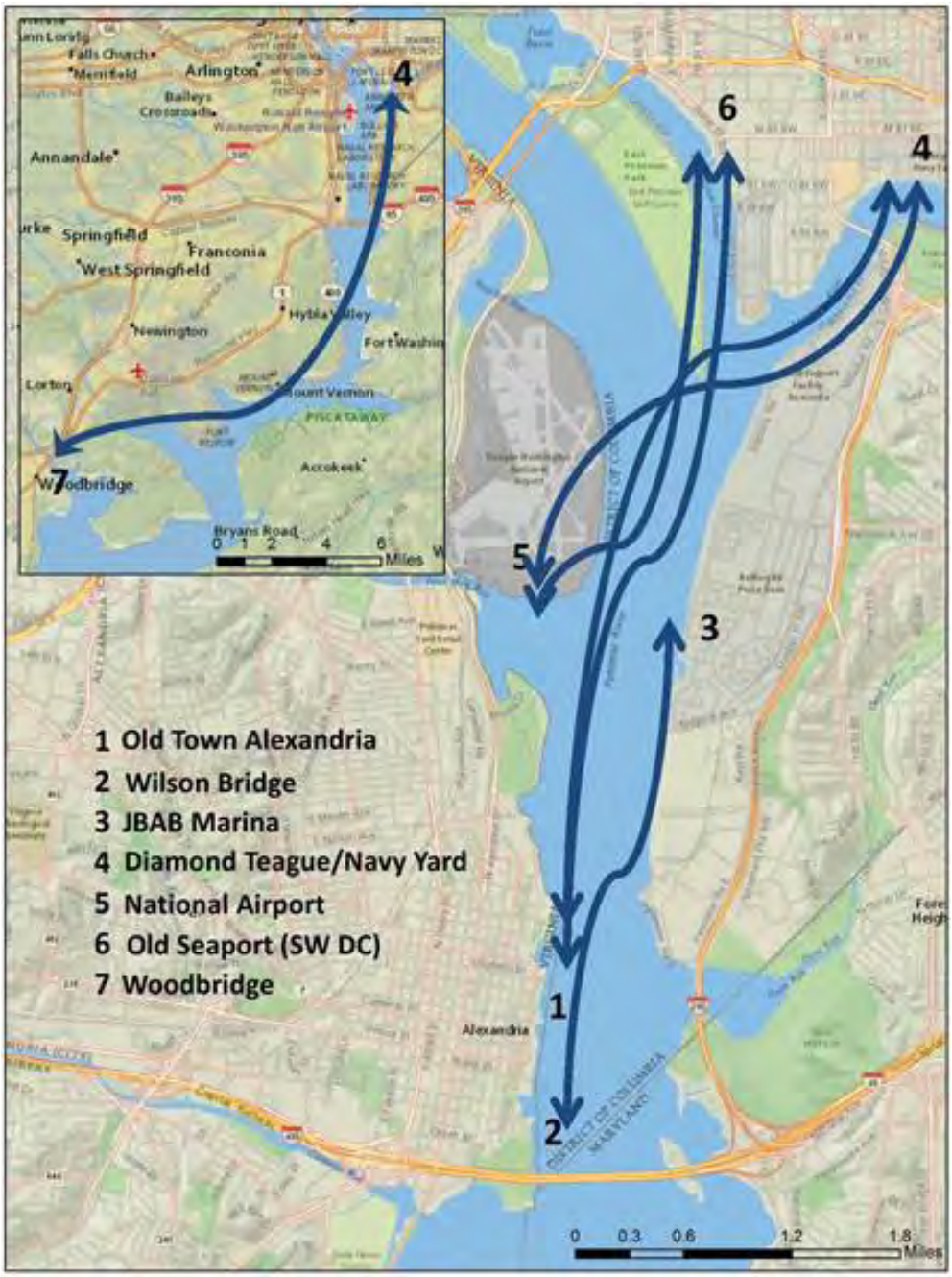
  Alexandria to Joint Base Anacostia Bolling (JBAB) and Department of Homeland Security Headquarters (St. Elizabeth's Hospital site)

  Service features include:
  - Service for work trips - peak weekday
  - Smaller ferries, around 50 passengers with frequent service , trips every 15 to 20 minutes in peak
  - Fare based on a number of a factors including degree of participation from sponsoring agencies, US Navy, US Air Force, DIA, DHS, USCG
  - Ridership in range of 300 to 500 trips per day

- One corridor was found to have potential, but not sustainable under today's conditions:

  Woodbridge/Potomac Shores to Southeast/Southwest DC
  Service features include:
  - Service would be peak weekday only
  - Trips every 20 minutes in peak
  - Ferries, around 50 to 75 passengers
  - Fares $10 to $15 per trip
  - Ridership in range of 100 to 200 trips per day today which is insufficient ridership to sustain the operation
  - To become sustainable this corridor needs additional influence to further develop ridership potential. Those influences would be the result of external travel constraints and opportunities, for example:
    - Construction and maintenance activity on parallel paths such as , Highway 1, I-95, Virginia Railway Express
    - Influence of I-95 Hot Lanes on travel patterns
    - National Harbor Casino build-out (forms a secondary midday market)
    - Fort Belvoir elects to open new access points from the water side
    - Some significant event occurs that limits current carrying capacity over the Potomac, such as a bridge closure for replacement and/or repair.

The map below illustrates the six corridors with potential



ABOUT THE WILSON BRIDGE TERMINAL SITE

In the course of the study an underutilized location adjacent to Jones Point Park under the Wilson Bridge on the Virginia side was identified as a terminal location that would allow for rapid deployment of a service between Alexandria and JBAB as a starter commuter ferry service. As the study was winding down, it became obvious that this location, while ideal in many physical ways, hosted a convergence of other issues that rendered it difficult, if not impossible, to use as a terminal

site. Chief among these factors were city and neighborhood concerns, potential conflict with park use and operation (Jones Point Park is a National Park and part of the riverfront park stretching from north of the Key Bridge to the Wilson bridge), concerns about the security of the Wilson Bridge as well as concerns about the historical context of the location. The Northern Virginia terminal site for potential service to JBAB was thus transitioned to a more generic identification of "Alexandria." From a market strength assessment perspective, the Jones Point Park site is better suited for people travelling to JBAB from points outside Alexandria, due to better freeway access and availability of park and ride space. Other locations such as the Old Town area are stronger for trip origins within Alexandria due to the adjacency of high density residential population and frequent transit service. This study did not attempt to reconcile these issues as they are more about implementation than assessing the potential demand between points. Either of the two terminal points on the west bank of the Potomac would function to meet the demand to JBAB and both would produce about the same level of ridership; however, the final selection of a terminal site is left to further study and community consideration.

What is instructive about this evolution is to point out that the market assessment was designed only to identify market potential between points, not to establish a full reconciliation of feasibility to implement ferry service. That will require on-going efforts between various stakeholders and communities and will form the essential focus of any on-going effort to bring commuter ferries to the Potomac. The demand exists to support commuter ferries in several locations across the river. Creating a forum for decisions on planning, policy, governance, funding, and environmental considerations were not within the scope of this study.

WATER TAXI SERVICE

The study found that there is very high travel demand for short local trips between various locations along the Washington DC waterfront. Terminal sites at Georgetown, National Mall, Old Seaport (along the Southwest Waterfront), Buzzard's Point (adjacent to the new soccer stadium), Navy Yard (along the Southeast Waterfront and adjacent to Nationals Park) and Poplar Point, (along the Anacostia), were all identified as potential stops for a water taxi operation. The level of analysis scoped for this study was more focused on commuter trips as the baseline trip to determine demand, while travel between these points is more discretionary and in competition with walk, bicycle, and transit trips as the primary market from which they would draw customers. These locations are better suited to the type of analysis used to determine locations for bike share stations rather than analysis that looks at commuter trips being drawn from longer distance corridors and at a larger scale. Therefore, the study did not further develop the potential of these sites as water taxi terminals. Many of these points are already served by water taxi type operations and have evolved over the years to the current level of operation. These services, unless there is a substantial pool of public resource available to act as a catalyst to accelerate development, are likely best left to the current private sector operators to continue the market development of water taxi service as a way to interconnect these points along the DC Waterfront. However, the current private operation does provide a significant starting point for public-private ventures should development of short haul ferries become a priority as a way to improve the multi-modal mobility choices within the National Capital Region and funding is available to further develop these services.

SUMMARY

In summary, the shorter connections between Alexandria and Washington, DC including Joint Base Anacostia-Bolling and Reagan National Airport and Washington, DC have the market potential that they could be pursued and are likely, in the long-term, to be commercially viable, that is operate without subsidy. Some amount of public subsidy would be needed to establish adequate shore-side facilities and assist in service startup but these are strong long-term, viable markets that could add depth to the greater metropolitan Washington, DC multi-modal transportation options. These services could be expanded further to offer circulation to National Harbor as well as along the DC waterfront, most particularly to Georgetown.

Long distance services that parallel Virginia Railway Express service and I-95 might make sense, long-term, as a capacity supplement to parallel routes or as construction mitigation. This long distance commuter services would have to be paired with other markets, for example, midday trips to National Harbor or commuter service to Fort Belvoir, to make operations financially viable. The household market research strongly suggests that a pre-requisite for the longer distance corridors is commuter ferries operating in metro area as proof of concept to address the perceptions of potential users. The Woodbridge to DC corridor would have a much better probability of success if built from a solid base of successful shorter distance commuter operations.

KEY RECOMMENDATIONS FOR NEXT STEPS

The key issues for the next implementation steps include governance, environmental review, finance and operations planning. Consistent with those key issues the next steps for implementation could include the following:

- Assemble local government, Federal, regional and local agencies and private sector to
    - Explore, define, and establish a governance plan
    - Form public-public and/or public-private partnership(s) to move service into implementation
- Identification of a lead agency to conduct environmental studies consistent with NEPA (assumes the project is using Federal funds and involves Federal agencies).
- Develop a funding stream – A $3.3 million grant ($4.8 million including local match) from FTA has already been secured, specific funding needs include (some of these are partially or fully covered by the grant):
    - NEPA evaluation
    - Vessel acquisition
    - Design and construction for terminal facilities and filling connectivity gaps at potential terminal sites.
    - Start-up funds for service. The sustainable corridors identified are commercially viable, however, this is a new concept and needs financial support to get started.
    - Completion of an operating and implementation plan.

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1 INTRODUCTION AND STUDY PURPOSE

Transportation in the Washington region is at a crossroads and in need of new ideas to maintain the mobility and reliability essential to the region's economic strength. Many of our land corridors are overtaxed. A trip that used to take thirty minutes can easily take two or three times that during rush hour. The region's congestion—now first in the nation—is making travel times increasingly unpredictable and nearly universally frustrating.[1] Other waterfront communities in the United States that have viable waterway alternatives are rebuilding what once existed as the backbone of the transportation system: waterborne transportation. Perhaps the most striking are the development of waterborne transportation systems in Boston and New York. Waterfront termini that had been abandoned in the early part of the 20th century have, once again, become busy passenger portals with sizable passenger fleets.

The Washington Region has a rich and mature mix of commuter and visitor transportation options. The WMATA Metro system is foundational to the region. The region has deployed HOV and HOT lanes, carpool, and vanpool networks, and is pursuing rapid bus and streetcar lines—yet passenger demand continues to rise. Meeting this demand and exploring new alternatives is vital to the region's economic competitiveness.

It is in the context of this mix of transportation alternatives and waterfront reclamation that the concept of adding regular passenger ferry operations to the Anacostia, Occoquan, and Potomac River system has come to exist. Leaders in Northern Virginia, Southern Maryland, and Washington, DC are asking the question: Could a return to our waterborne heritage benefit our communities and economy? Some questions have already been partially answered, such as, is it physically feasible to operate modern ferry type vessels between ports on the Anacostia, Occoquan, and Potomac Rivers? Certainly in the vicinity of Washington, DC entrepreneurs have found that visitors and recreationists enjoy getting in touch with the river system.

But questions remain. Are there other markets for commuters, people who currently travel by land between locations in relative proximity to the river system, or casual travelers who could, or would, take advantage of a ferry system, or route, that is designed primarily to meet their specific needs? Could the various military installations along the waterways, particularly as functions are realigned and relocated as a result of BRAC, operate more efficiently if waterborne linkages were available to meet those needs? Could the visitor/tourist market be expanded beyond the more traditional boundaries of Washington, DC? Are there corridors, routes, or terminals that could host a sustainable market for commuter ferries? Certainly such efforts have been successful in other parts of the country and the world. Are the necessary ingredients present to make such a system successful in the Anacostia, Occoquan, and Potomac River system? The answer to that question forms the essential purpose and framework for this study. It must be emphasized that

[1] Texas Transportation Institute. "Annual Urban Mobility Report." 2011. Accessed from http://mobility.tamu.edu/ums/.

the study did not focus on other issues which may affect feasibility of the concept of commuter ferries on the Potomac River system. While many of these issues surfaced in the conduct of the study and are recorded in the study documents, the core focus of this study was on an assessment of the market potential for such a ferry system. Other questions regarding feasibility remain to be answered.

STUDY OBJECTIVES

The objectives of the study are to identify and quantify to the extent possible:

- Corridors, routes, or terminals that could host a financially sustainable market for commuter ferries along the Potomac River System.
- Markets for commuters, people who currently travel by land between locations in relative proximity to the river system, or casual travelers, who could, or would, take advantage of a ferry system, or route that is designed primarily to meet their specific needs.
- Potential to improve access to military installations along the waterways if waterborne linkages were available, particularly as functions are realigned and relocated as a result of BRAC.
- Potential to expand the visitor/tourist market beyond the more traditional boundaries of Washington, DC.

2 STAKEHOLDER INTERESTS AND PREVIOUS STUDIES

NVRC contracted with a consulting team headed by Nelson\Nygaard Consulting Associates to conduct this study. In the early stages of the project in September and October 2012, a key task was accomplished to interview as many interested parties of "stakeholders" as possible to ensure that the boundaries of the study were well understood and that the interests of jurisdictions directly involved and those with more peripheral interests were well understood.

The effort began with a stakeholder interview guide that is documented in Appendix A along with the details of all the interviews. This guide served to ensure that there was a consistent conversation from one meeting to the next and to ensure that all topic areas were covered. Each meeting took its own unique course based on the interests and knowledge level of those participating in the meeting. Twenty different interview sessions were conducted with over 80 different individuals participating in the meetings.

SUMMARY OF STAKEHOLDER INTERVIEWS

The following is a very high level summary of information collected from the interviews. The details of the information collected are contained in Appendix A.

Market for Service

In general there was a very mixed viewpoint on the market potential for commuter ferry service. One of the most common general resposnses was, "this topic has been studied before." It would be very accurate to say that among the interviewees there was a nearly polar persepctive of sketicism versus outright optimism about the market potential. It would also be accurate to observe that there was no universal recognition of any particlar market of ferry crossing that seemed to hold significant promise. At the same time, however, there was a diversity of opinions about opportunties that may exisit for commuter ferries to meet various comunity objectives. These objectives, expressed in differnt ways, seemed to address two essetntial goals, improved mobility and ecnomic development. A distant third goal, and certianly not universally embraced was the potential to use the development of commuter ferries as an emergency preparedness resource. ***It must be emphasized that the following text is a summary of comments and persepctives about ferries. These summary statements and obsevations are not intended to be presented as "facts" about the market potential, but are a summary of the opinions and ovservations of people contacted regarding the study.***

The follwing offers more specifics as to what particpants saw as market opportunities for commuter ferries.

- There is a perspective that ferries could provide new job access opportunities. That the existence of a ferry may attract employers to particular locations and/or provide new opportunities to provide employees better access to their worksites or provide new opportunities for people to access jobs. This was particularly noticeable in areas under heavy development pressure or increasing access challenges and areas struggling with lack of development pressure.

- Providing new options in the multimodal network was seen as a potential opportunity presented by development of commuter ferries. Far from universal, some jurisdictions see ferries as a way to add more options for access and mobility as opposed to continued reliance on what exists today
- Economy – Transportation is the basic necessity needed to grow the region's jobs and housing markets. Some interviewees regard the potential for ferry service as a basic necessity to strengthen the local economy, either through development or creation of jobs in the area.
- While ferries are not seen as a key ingredient to numerous waterfront developments (Yards Park, The Wharf, Old Seaport, Capitol Riverfront, Potomac Yards, National Harbor, etc.), there is recognition that they could be a complementary access mode that increases the potential of these developments.
- There are community plans to develop new areas where ferries could make the difference between a successful development and one that never blossoms. This opportunity is most significant in areas like Indian Head, and shoreline developments in Prince William County, Virginia.
- There is a very commonly held perception that many of the current corridors available to support mobility in the study region are at capacity.

  These included:

  – Northern Virginia: Route 1, I-95, I-495, I-295, the Wilson Bridge, and VRE,
  – Southern Maryland, MD-210 and I-295/495.
  – Regionally, the Metrorail Orange and Green Lines were cited as problematic in terms of capacity versus demand.
- Known areas of interest in terms of increasing residents and jobs that are presently under development of particular note:
  – The former St. Elizabeth's Hospital site as host to the new headquarters for the Department of Homeland Security, first tenants to be the United States Coast Guard in August 2013. This is combined with interest from the Navy in developing alternative access to Joint Base Anacostia-Bolling.
  – Base Realignment and Closure (BRAC) sites, particularly Fort Belvoir
  – Washington, D.C. waterfront area with 100,000 new jobs and in excess of 30,000 dwelling units. Some of which are under development currently and some of which will be under construction beginning in 2013.

- National Harbor has increasing commuter market and access challenges as well as increased development pressure with the development of the casino.
- Ferries are seen as providing additional resources that may be deployed as an option for emergency evacuations, although the terminal sites are likely to be as important to this planning as the vessels themselves as a resource.
- A new crossing of the Potomac River as there are no bridges, existing or planned, between the Woodrow Wilson bridge and Nice bridge, a distance of about 45 miles.
- Development of additional tourist markets such as Fort Washington as well as the long term potential to also provide access to current Washington, DC heritage sites such as the National Mall and Kennedy Center.

While there are many recognized opportunities there are also many recognized constraints to the development of commuter ferries.

- The singular most mentioned constraint was about the potential for financing a new mode in the region. Throughout the area there is universal recognition that there are insufficient resources to operate and maintain even the present transportation options. If ferries were established would money be available to operate and maintain them and would investing in a new mode simply detract from making progress on supporting existing services and transportation needs?
- Close behind concerns about funding are organizational and governance issues. If ferries were operating with any form of public money, how would they be controlled and who would make policy about the investment policies?
- Washington, DC, Northern Virginia, and Southern Maryland have developed over the past 75 or more years with little attention, or focus, on the waterways. Therefore, public perceptions and beliefs that ferries are not really a viable commuter mode may be difficult to overcome.
- Attracting year-round, regular users to a currently unknown mode could be a significant challenge. Reliability for year around commuters may be an issue that is related to natural conditions that will limit ferry operations such as river freezing or excessive floating debris following a significant storm and flooding event.
- Some of the potential markets and corridors may involve service to secure military installations. In these cases accommodating both civilian and military markets on a singular vessel could present significant security challenges.
- Much of the riverfront within the study area is in the hands of private property owners, the National Park service, or the US military. This means that public access to the riverfront is very limited which, in turn severely limits development of intermodal connections. While this is a significant issue within Washington, DC, the constraint is even more prominent outside the boundaries of Washington, DC.
- On-going development patterns, particularly in Northern Virginia, appear to be moving to more decentralization and away from areas immediately adjacent to the waterfront such as Tyson's Corner, Arlington, Alexandria, the Dulles corridor.
- A concern that was expressed several different ways was about potential passenger fares. The concerns ranged from how to balance an attractive fare with minimizing subsidy to ensuring that commuter ferries are also a viable option for people with lower household incomes and not just people who can afford them.
- A recognized financial and service constraint will be offering service that is frequent enough to accommodate the intended markets, particularly commuters.

Operational Issues

This section throws a broad net over what are being called "operational" issues. This really represents more of a catch-all for a wide variety of opportunities and constraints that are more direclty related to the physical feasiblity of ferry operations on the Potomac.

The following are intended to list opportunities that participants discussed in the interviews.

- As it already exists to a certain degree east-west "water taxi" style service may be feasible by simply adding to what is already in operation.
- By combining corridors, service could potentially accommodate both long distance and short distance commuters. Example, ferry from Indian Head to Occoquan and then from Occoquan to Diamond Teague Park (Washington, DC Southeast Waterfront).
- There are several locations that currently have buses and Metro available to facilitate landside connections.
- Being able to provide on-board amenities (e.g. Wi-Fi, newspapers, adult beverages, etc.) adds quality to commute that is often not available in other modes.

At the same time there are significant operational constraints to the potential for ferries. Some of these are also directly related the market feasibility.

- Ferry travel times must be competitive to driving, VRE, bus, Metrorail. With Washington DC (including the Alexandria waterfront) marine speeds set to 10 MPH to control vessel wash, achieving significant travel time saving could be very challenging. Furthermore, potential north-south ferry routes may have comparatively longer travel times that will not compare favorably with VRE travel times.
- Ferry service must be reliable and easily accessible.
- Weather conditions are a significant constraint. Perhaps most often discussed is the winter time formation of ice north of Woodrow Wilson Bridge and in National Harbor. Also mentioned were wave conditions in the southern reaches of the river around Indian Head, Quantico, and in the main channel outside of Occoquan Bay and Gunston Cove at Fort Belvoir. Finally some were concerned that summertime drought conditions might lower river water levels to the point that ferry operations were no longer practical.
- Many potential landing sites are too shallow for larger vessels; some sites will not allow terminals to be built without significant dredging. Aside from terminal facilities, the relative depth of some channels also limits the ability of vessels with a draught of four feet, or more, to achieve higher speeds until they reach deeper water.
- Environmentally speaking there is very little commercial traffic on the river system at present. There may be significant environmental challenges to establishing ferry service that operates along some areas that are considered "environmentally sensitive," or that seem to conflict with recreational uses of the river. Further, there may also be concerns about vessel noise as many waterfront areas are perceived to be quiet areas.

HIGHLIGHTS OF PREVIOUS STUDIES

There are a large assortment of studies and results from assessing market conditions for passenger only ferries from jurisdictions throughout the US. However, the Washington, DC area is fairly unique in its development as a community which turned its back to the waterfront many years ago. This renders limited value to the findings of studies from other locations. However, two studies have been conducted in the past 15 years that have direct bearing on this effort.

Passenger Ferry Boat Feasibility Analysis -- Virginia Department of Transportation (2000)

This study was not the first study of ferry potential for service on the Potomac, but represents the earliest study in the past twenty years on the topic. The study focuses heavily on the potential to establish service in the longer distance markets from Prince William County into Washington, DC as a way to supplement options for I-95, Highway 1, VRE , and express bus services. Importantly, this study was accomplished prior to the implementation of the BRAC process and the influences it has had on travel in the region. The essential conclusion of the study was that passenger ferry service would be feasible, but would require significant subsidy to achieve a financially sustainable operation.

Potomac River Commuter Ferry Study and Route Proving Exercise – Prince William County Department of Transportation (2009)

This study contains a significant amount of background and foundational information that was crucial to the conduct of this study. Among the most important information was the identification of potential ferry terminal sites and an initial assessment of the physical feasibility of utilizing the site as a ferry terminal. This information was used extensively within this study to narrow the potential corridors under consideration. As such, it is a recommended reading companion for this study as many of the findings and conclusions of that study are directly transferred to this study. For example, a reader might ask, how were the initial terminal sites chosen for the Market Analysis Study? The answer is that there was a concerted effort to utilize the results of the Route Proving Exercise and not to re-create that investigation and documentation in this study.

The report also tested and documented operating times between each of the terminal sites and identified important navigational and vessel design characteristics. The stated primary goal of the project was to determine likely ferry service travel times between potential docking locations, assess potential environmental impacts resulting from a ferry service, prepare preliminary capital and operational costs of a ferry service and define the operational parameters necessary to provide optimal ferry service between points in Virginia, Maryland and Washington, DC. Another project goal was to determine a preliminary estimate of ferry service travel demand and operational revenue as well as assess the need to further analyze travel demands through market studies and updated trip generation models.

The following are the conclusions and recommendations from the report. The more specific data generated by the study is sited throughout this document and not repeated here.

1) The commuter ferry service described in this report will require public financial support.

2) Based on the data and analysis contained herein, a Potomac River ferry operation has the potential to offer a commuting option to the public that in terms of travel time and service between the area of Occoquan, Virginia and SE Washington DC would be competitive with those commuter services offered by PRTC and VRE. Public commuter ferry service between points in

Maryland and Virginia appears to be especially promising given the significant amount of travel time saved as a result of ferry usage.

3) The estimated travel demand derived from the application of current-day existing conditions to the demand model contained in the VDOT 2000 feasibility report suggests that additional analysis of travel demands through market studies and a new trip generation model is warranted. As noted in this report, sole reliance on the travel demand results in this report is not advisable as the model used to predict the travel demand cannot account for some current conditions that were absent at the time of model development.

4) No significant noise or wave impacts associated with ferry service are anticipated given the operating parameters specified herein.

5) Should this opportunity be pursued further, the project team makes the following recommendations:

• Coordination with the proper authorities to obtain speed restriction waivers along the Potomac

River should be initiated.

• A more rigorous market analysis should be undertaken to analyze prospective demand by market in order to account for all the significant variables bearing on usage and estimated ridership diversions by mode.

• Continued coordination with local governments and military installations that front the Potomac River should be pursued. While commuter ferry service from Prince William County to Washington D.C. appears viable, there is great potential for a ferry operation to serve cross-river commuters between Southern Maryland and Virginia

• Initial investigations into an authority to oversee ferry operations should also be discussed with those counties and cities that might have an interest in commuter ferry service.

3 STUDY APPROACH

The study approach was greatly aided by data from the 2009 Route Proving Exercise Report. The steps utilized to reach the corridors with the highest potential are shown below. It is important to note the market assessment study focused on the corridors with the highest potential. There may be corridors with lower potential that, when joined with high potential corridors, are also viable. For example, a Georgetown to National Airport corridor when attached to other routes operating from National Airport, or a route from Indian Head to Fort Belvoir if operated in conjunction with a Washington, DC to Fort Belvoir corridor. The opportunity may exist for development of these lower potential corridors. However, they were not identified as corridors that could be developed in a sustainable manner within the scope of this study. That circumstance should not foreclose future opportunities to consider those lower potential terminals and corridor combinations that could also be sustainable under conditions that could not be forecasted when this study was undertaken.

Step 1 – The route proving exercise identified 26 locations for potential terminal sites. In this study this first step identified locations that did not meet selection criteria and were subsequently dropped. This resulted in the identification of 13 potential terminal locations

Step 2 – Pair up the terminal locations to form corridors, which results in 84 corridors. 17 of those corridors were set aside as limited value, e.g. Occoquan Marina to Fort Belvoir, leaving 67 corridors.

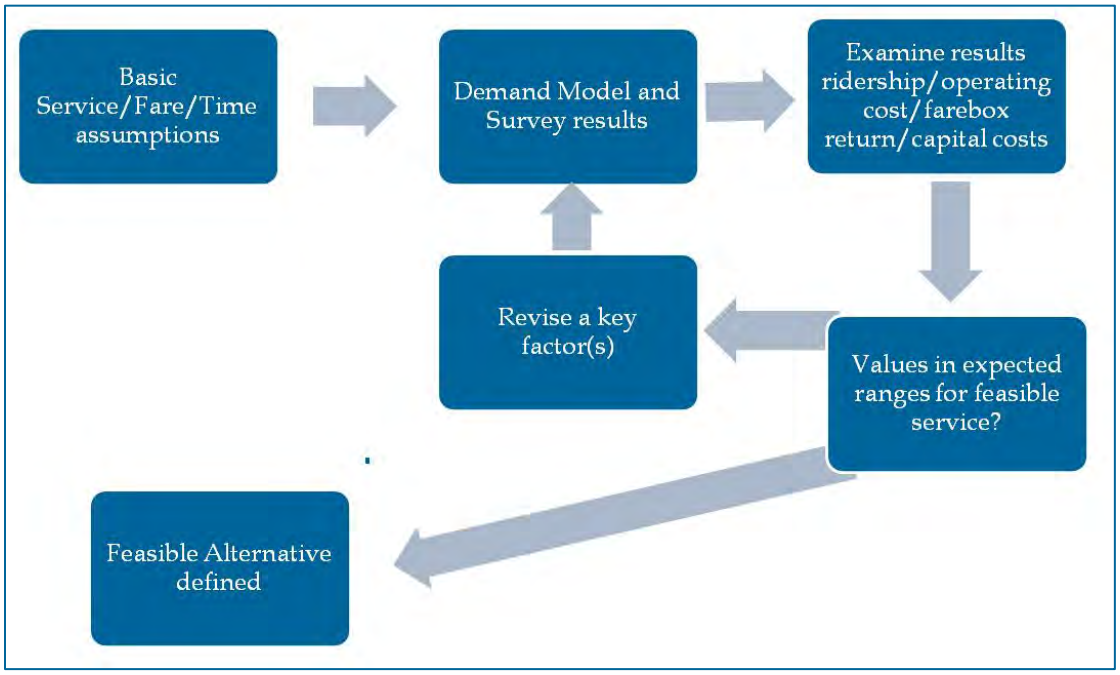
Step 3 – The 60 remaining corridors were evaluated on a set of criteria (documented later in this report) to establish which had the highest potential. Twenty-five corridors with the highest potential were selected from a ranked list, based on application of the criteria.

Step 4 – Each corridor and terminal end was associated with a potential travel shed, which resulted in a total of six travel sheds.

Step 5 – A household survey was conducted in each of the six travel shed areas, each with a pre-determined sample size, resulting in an overall 1200 completed response survey that is statistically representative of each of the travel shed areas. The survey was conducted with random digit dial technique with each travel shed area supplemented with cell phone listings due to the very high incidence of cell phone only households, for example Prince William County exceeds 60% of households that are cell phone only.

Step 6 – An econometric model was developed that utilizes several independent variables to predict the needed level of ridership on a corridor to reach a given level of farebox return. The independent variables included model vessel types (size, speed, crew size, operating cost, capital cost), route lengths and travel time (taken directly from the route proving exercise when available), service levels (frequency of service in various time periods, span of service, days of available service), and various fare levels. This model, without predicting actual demand, indicates the level of demand required to meet varying levels of farebox recovery.

Step 7 – Utilizing the results of the econometric model, the household travel shed survey, and the MWCOG Travel Demand Model six corridors with the highest potential were identified and additional analysis conducted to determine if the identified market is sustainable, i.e. that the demand is high enough to return a significant portion of operating and capital costs directly from corridor users. This was accomplished using a “pivot point” modeling techniques as well as optimization of fare versus demand as depicted in the graphic below:


Basic Service/Fare/Time assumptions
Demand Model and Survey results
Examine results ridership/operating cost/farebox return/capital costs
Revise a key factor(s)
Values in expected ranges for feasible service?
Feasible Alternative defined

4 TERMINAL IDENTIFICATION AND SELECTION

This section documents the research and analysis that was conducted to identify both terminal sites and terminal pairs (corridors). It also details the process by which the universe of potential corridors was evaluated and screened to produce a reduced set of potential corridors for further analysis and subsequent market analysis.

INITIAL IDENTIFICATION OF TERMINAL SITES

The list of potential ferry terminal sites was created based on several different sources comprised of the following:

- Feedback from 2012 outreach meetings including 20 interviews with over 80 participants
- Locations identified in the Ferry Route Proving Exercise, 2009
- Locations identified in the VDOT Ferry Feasibility Study, 2000

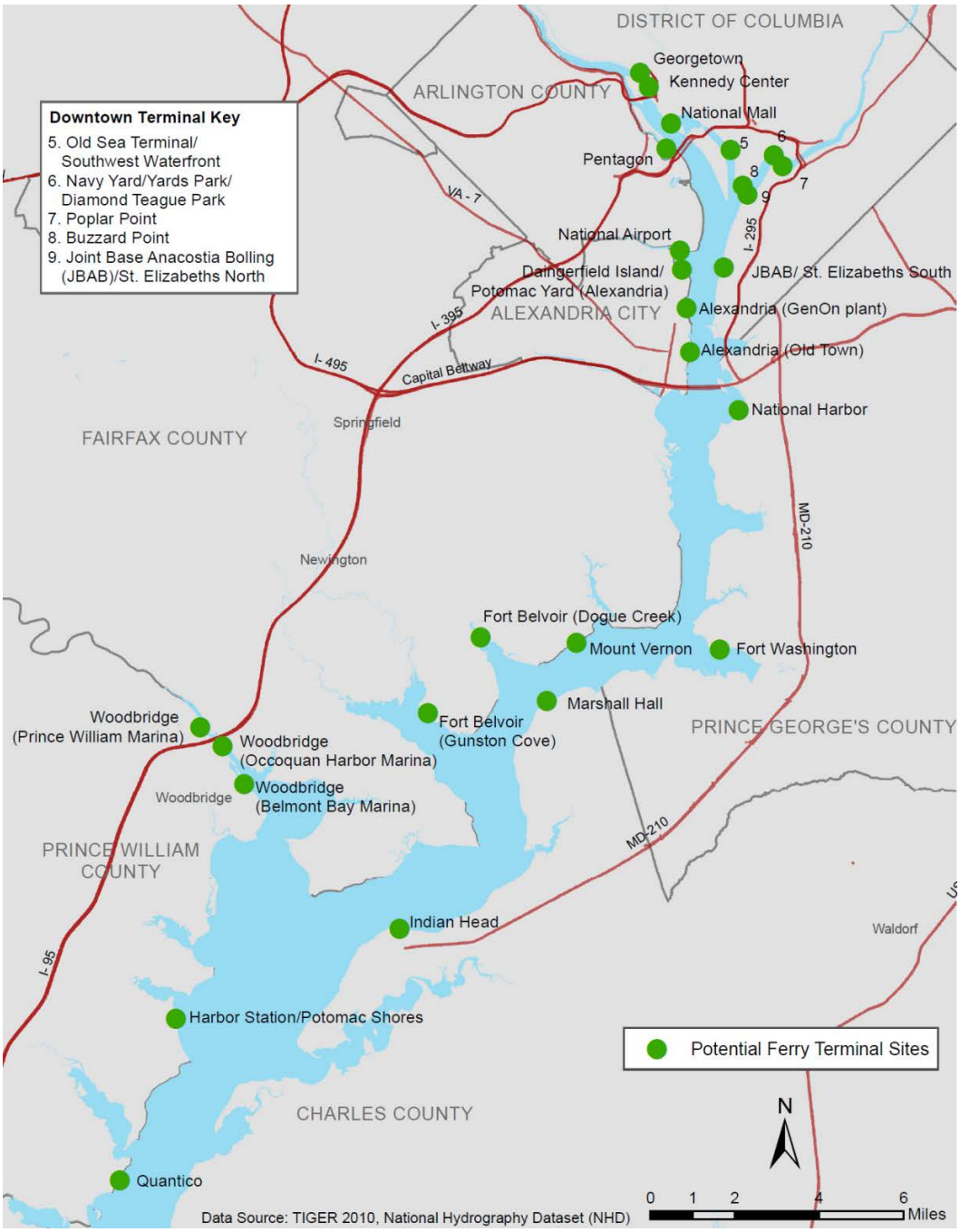
As a result of this effort a total of 26 ferry sites were identified. These sites are listed in Figure 4-1 below by jurisdiction. [2] The 26 terminals identified vary widely not only in geography but also in their potential use. While some locations would clearly have a primary use of serving commuters, others would likely serve a combination of commuters, tourists, and local non-work trips. For some locations the only use would be for tourism. In addition, eight military related terminals (at or near military facilities) have been identified to serve both historical commuting patterns and new patterns that have occurred as a result of BRAC. Figure 4-2 illustrates these 26 locations in map format.

[2] Jones Point Park, referenced in this study was not originally identified as a potential terminal site as it was not referenced in any of the previous studies, nor in the stakeholder interviews. The site was identified later in the study as a potential opportunity.

Figure 4-1 Initial Ferry Terminal Locations

District of Columbia	Virginia	Maryland
• Buzzard Point • Georgetown • Joint Base Anacostia Bolling / Saint Elizabeths North • Joint Base Anacostia Bolling / Saint Elizabeths South • Kennedy Center • National Mall • Navy Yard/Yards Park/Diamond Teague Park • Old Sea Terminal / Southwest Waterfront • Poplar Point	• Alexandria (GenOn Plant) • Alexandria (Old Town) • Daingerfield Island / Potomac Yard (Alexandria) • Fort Belvoir (Dogue Creek) • Fort Belvoir (Gunston Cove) • Harbor Station / Potomac Shores • Mount Vernon • National Airport • Pentagon • Woodbridge (Occoquan Harbor Marina) • Woodbridge (Belmont Bay Marina) • Woodbridge (Prince William Marina) • Quantico	• Fort Washington • Indian Head • Marshall Hall • National Harbor

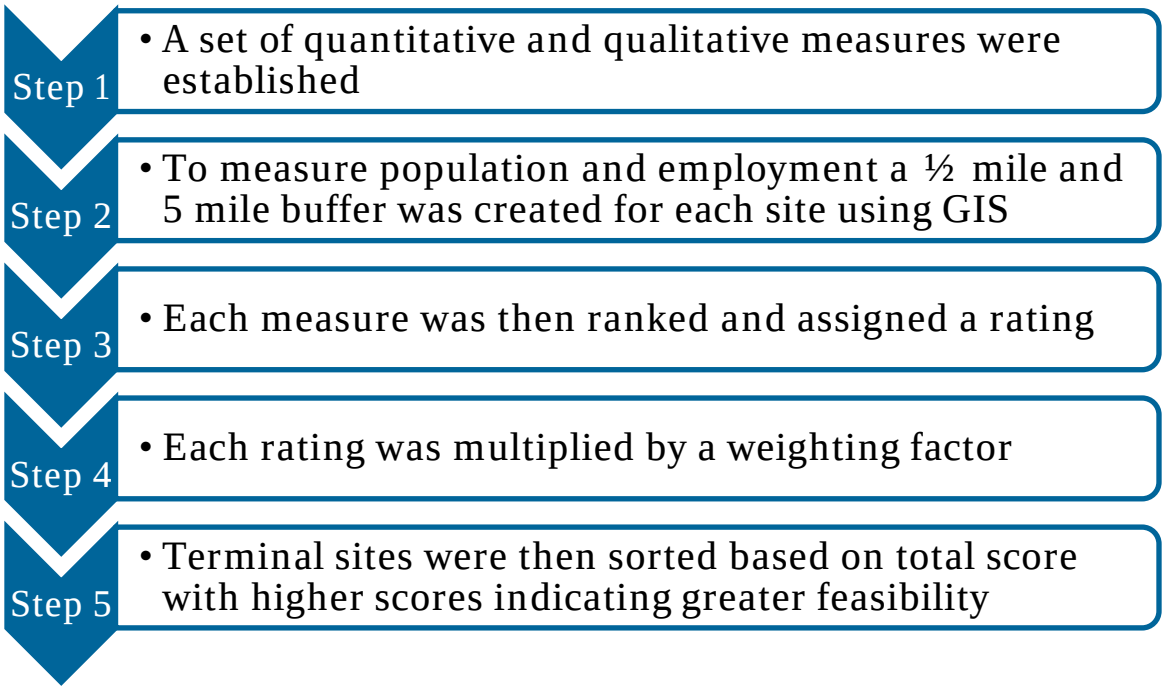
Figure 4-2 Map of Initial Ferry Terminal Locations



SELECTION CRITERIA

Following the identification of potential terminal sites an extensive array of evaluation measures was developed to eliminate terminals from consideration that have a low probability of success and/or utility for the purpose of this study. Elimination did not mean that a terminal location is infeasible in itself, but rather that it would not be considered as a potential terminal site during remainder of this study.

The following points summarize the evaluation process:



The evaluation measures that were developed are described in Figure 4-3 below. These measures evaluate the market for the ferry service in proximity to the terminal, both on the origin and destination side, future development, intermodal transfer opportunities, and site feasibility (based on seven distinct factors).

Figure 4-3 Terminal Evaluation Measures

Criteria	Description	Score
Size of Origin Market	The concentration of residents within 0.5 miles and 5 miles of each potential service location in 2010	1-4 assigned based on quartile ranges per each buffer size (75th percentile or higher = 4)
Size of Destination Market	The concentration of jobs within 0.5 miles and 5 miles of each potential service location in 2010	1-4 assigned based on quartile ranges per each buffer size (75th percentile or higher = 4)
Planned development surrounding terminal sites	The concentration of residents and jobs within 0.5 miles and 5 miles of each potential service location in 2020 and 2030	1-4 assigned based on quartile ranges per each buffer size (75th percentile or higher = 4)

Intermodal transfer opportunities at destinations/ connectivity	Distance from potential destination sites to nearest Metrorail stations	No metro = 0, 0-.49 miles = 3, 0.5-.99 miles = 2, 1.0 miles or more = 1
Site Feasibility (Qualitative Criteria)	• Environmental Feasibility • Bus Transfer Opportunities • Major Tourism Attractiveness • General Tourism Attractiveness • Organizational/ Government Attractiveness • Financial Feasibility • Physical Feasibility	Qualitative measures were assigned values based on the following scale: 1 = low, 2= medium, 3 = high, 0 = N/A

Figure 4-4 lists the weighting that was applied to the scores given to each terminal based on the evaluation measures listed in Table 3-1.

Figure 4-4 Terminal Evaluation Weighting

Evaluation Measures	Half Mile Weight	Five Mile Weight
Population	5	4
Employment	6	1
Distance to Metro	2	2
Environmental Feasibility Rank	2	
Bus Transfer Opportunities	1	
Major Tourism Attractiveness	2	
General Tourism Attractiveness	1	
Organizational/ Government Feasibility	3	
Financial Feasibility	4	
Physical Feasibility	5	

The greatest weight is given to population and employment within a 1/2 mile of potential terminals (both existing and future), as these measures capture the users with the highest

potential to use ferry service. Population within five miles is weighted four to reflect users within the potential capture shed for Park and Ride and Kiss and Ride users. Employment within five miles is only weighted 1 to reflect the resistance factor of potential ferry users who are unlikely to use a ferry if the terminal is far from their place of employment. Physical feasibility is weighted 5 and financial feasibility weighted 4 to reflect the challenges inherent with developing new ferry infrastructure. Other measures are weighted primarily based on feedback from stakeholders.

After reviewing the results of the terminal evaluation, however, it was apparent that counting population and employment in the vicinity of each terminal site was equal to the travel connection strength in a corridor or between two terminal sites. The affect produced a noticeable double weighting of population and employment that essentially outweighed all other factors. Thus the results were limited to only corridors with high population and employment in the immediate vicinity of each terminal. While population and employment are of central importance in determining market potential, this double application of those criteria seemed to unnecessarily limit the reach of the study and foreclose further evaluation of the market potential of some corridors at too early a stage in the analysis.

After presenting the methodology and the affects of the strict application to the stakeholders the population and employment metrics for each terminal site were eliminated from the terminal evaluation. In lieu of this it was decided that the analysis would blend the terminal selection process with the corridor evaluation analysis. This method combined the following elements:

- Terminal Feasibility
- Market Demand
- Travel Characteristics

INITIAL SCREENING RESULTS

The first step in forming corridors was to eliminate pairs that are immediately adjacent which left approximately 260 terminal pairs to be evaluated. Based on the terminal scoring and stakeholder feedback 13 of 26 terminal sites were set aside as unlikely for commuter service. The 13 terminals that were eliminated from further analysis as commuter terminals include:

- National historic sites or parks:
  - Mount Vernon
  - National Mall
  - Kennedy Center
  - Fort Washington
  - Marshall Hall
- Very shallow water depth unlikely to be resolved by dredging due to the volume and availability of alternate sites that are less restrictive.
  - Fort Belvoir, Dogue Creek
  - Dangerfield Island/Potomac Yards
  - Woodbridge - Prince William Marina
- Terminal constructability issues:
  - Pentagon
  - GenOn Plant – Alexandria

  - Poplar Point
- Military preference:[3]
  - Joint Base Anacostia-Bolling North Marina
  - Quantico

After this process, the 13 remaining terminals listed in the table below were paired together into corridors.

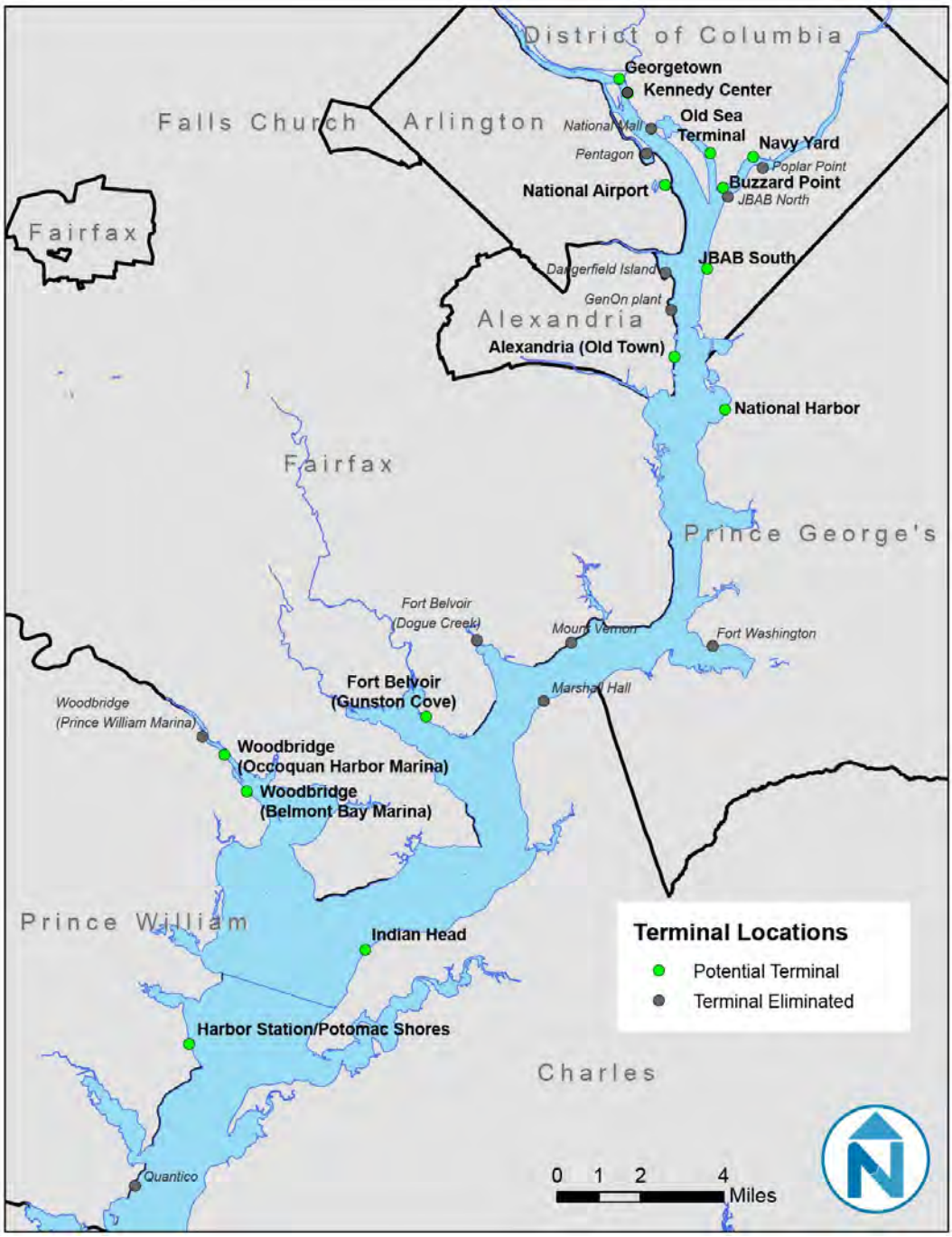
Figure 4-5 Terminal Sites Retained for Corridor Pairing

Old Town Alexandria
Ft. Belvoir/Gunston Cove
Harbor Station (Potomac Shores)
JBAB South Anacostia / St. Elizabeths
National Airport
Navy Yard/Yard's Park/Diamond Teague Park
Old Sea Terminal /Southwest Waterfront
Georgetown
Buzzard Point
National Harbor
Woodbridge (Belmont Bay)
Woodbridge (Occoquan Harbor)
Indian Head

Figure 4-6 below depicts both the terminals that were eliminated and those retained for corridor pairing.

[3] Indicating that feedback from military leaders at a given location was not supportive of a ferry terminal

Figure 4-6 Terminals Retained and Eliminated From Consideration



The remaining feasible terminal sites were then paired into corridors. This produced a total of 60 potential corridors for further evaluation.

Corridors Eliminated

The first step in the corridor analysis was to identify route pairings that do not make operational sense for commuter service. The following steps were taken to reduce the corridors identified for further evaluation:

- Eliminated pairing of a terminal to itself
- Eliminated destinations that are too close together, for example
  - Navy Yard to Old Sea Terminal
  - Woodbridge Occoquan to Woodbridge Belmont Bay
- Eliminated destinations on the same side of the river
  - Old Sea Terminal to Navy Yard to Buzzard Point
  - Harbor Station to Woodbridge Occoquan to Woodbridge Belmont Bay to Fort Belvoir Gunston Cover
  - Indian Head to National Harbor
  - Fort Belvoir Gunston Cover to Mount Vernon

Figure 4-7 displays the total universe of potential terminal combinations and which corridors have been eliminated. This results in 60 potential corridors for further evaluation.

Figure 4-7 Potential corridors in White Squares

	Terminal ID #	2	3	6	8	9	10	12	16	17	19	20	24	25
Terminal ID #	Terminal Name	Old Town	Buzzard Point	Ft. Belvois-Gunston Cove	Georgetown	Harbor Station	Indian Head	Anacostia/St. Elizabeth's South	National Airport	National Harbor	Navy Yard/Yards Park/Diamond T	Old Sea Terminal/SW Waterfront	Woodbridge (Belmont Bay)	Woodbridge (Occoquan Harbor)
2	Old Town	■		1					1				1	1
3	Buzzard Point	1	■					1		1	1	1		
6	Ft. Belvois-Gunston Cove	1	1	■		1			1				1	1
8	Georgetown	1	1	1	■		1							
9	Harbor Station	1	1	1	1	■							1	1
10	Indian Head	1	1	1	1	1	■			1				
12	Anacostia/St. Elizabeth's South	1	1	1	1	1	1	■						
16	National Airport	1	1	1	1	1	1	1	■					
17	National Harbor	1	1	1	1	1	1	1	1	■				
19	Navy Yard/Yards Park/Diamond Teague Park	1	1	1	1	1	1	1	1	1	■	1		
20	Old Sea Terminal/SW Waterfront	1	1	1	1	1	1	1	1	1	1	■		
24	Woodbridge (Belmont Bay)	1	1	1	1	1	1	1	1	1	1	1	■	1
25	Woodbridge (Occoquan Harbor)	1	1	1	1	1	1	1	1	1	1	1	1	■

Diagonal
Type 1 = Pairing removed

SECONDARY TERMINAL PAIRING AND SELECTION

The purpose of the corridor evaluation is to understand which corridors have the highest potential to provide travel time savings for different uses including:

- Commute market
- Off-peak travel market
- Tourist market

SELECTION CRITERIA

In order to assess which of the 60 corridors has the highest potential for commuter service, layers of evaluation criteria were applied and each corridor scored. To fairly assess how each corridor fared against the entire pool, quartile ranges were calculated and a score of 8, 4, 2, or 0 was assigned to the 100th-75th, 75th-50th, 50th-25th, and 25th-0 percentiles, respectively. This score was then multiplied by a weighting of 1, 2, or 3 from low to high priority, to help differentiate the many corridor options from each other. The weighting allows the very good corridors to rise higher to the top, and those with less chance of success to rank lower.

Market Size

The key indicator for service feasibility lies in understanding the market demand for a ferry route as this drives future ridership. Current travel patterns between Transportation Analysis Zones (TAZ's) within a 1/2 and 5-mile buffer of the terminal sites shows the potential market size that could be captured for ferry travel.

The MWCOG travel demand model for year 2020 was used to extract the number of trips between TAZ's for the following categories:

- Peak Work-based daily person trips (Home-Based Work) - As this is a commuter study, work trips are the most crucial component for service.
- Off-peak daily person trips (Home-Base Other, Non Home Based Work-Related, Non Home Based Other) - High levels of off-peak travel can support all-day service and serve more than just work trips.
- Tourist daily vehicle trips - Tourism trips are another layer of market that can support future commuter service.

Work Trips - As a first layer of analysis, work trips between the 5-mile buffers was calculated. This is especially useful in understanding the magnitude of travel from the more suburban sites where it might be expected that people will drive to terminals. The half-mile analysis layer focuses more tightly into the area within walking distance from the terminal.

Off-Peak Trips - Ferry has potential to attract off-peak ridership that supports service and broadens the market base.

Tourist Trips - The Washington, D. region contains numerous tourist sites. Transporting tourist trips during off-peak hours keeps vessels in use and also expands the ferry's constituent base. However, the tourism travel element of the MWCOG model is broadly recognized as an overall predictor of region-wide travel, but very quickly loses accuracy at lower scales of

evaluation as applied in this study. As a result, tourism trips were scored more qualitatively than the first two types of trip.

Taken together, the 5-mile and half-mile work, off-peak, and tourist trips represent the general magnitude of the service market. After weighting, scores ranged from 0 to 128.

Travel Time

Commuters place a high value upon their travel time. The analysis compared existing drive or transit times from terminal to terminal with the anticipated travel times observed in the *Potomac River Commuter Ferry Service Study & Route Proving Exercise* effort sponsored by Prince William County. That report stipulates that successful ferry service on the Potomac River will require a waiver of the 10 MPH speed limit in Washington, DC harbor front areas. Figure 4-8 lists the actual and anticipated travel times for corridors evaluated in the 2009 study.

Figure 4-8 Actual and anticipated travel times (assuming waiver of 10 MPH speed limit)

Time and Distance from potential docking locations	Quantico	Harbor Station	Prince William Marina	Occoquan Harbour Marina	Belmont Bay	Indian Head	Fort Belvoir (Gunston Cove)	Marshall Hall	National Harbor	Old Town Alexandria	Reagan National Airport	Washington D.C. (Southwest Waterfront)	Washington D.C. (Anacostia Waterfront)
Quantico		13.3	30.9	27.8	21.1	14.6	28.1	32.2	52.3	48.9	61.9	57.4	57.8
Harbor Station	7.41		25.6	22.5	15.8	9.3	22.8	26.9	47.0	43.6	56.6	52.1	52.5
Prince William Marina	13.47	10.50		3.1	9.8	18.9	31.9	36.0	56.1	52.7	65.7	61.2	61.6
Occoquan Harbour Marina	12.96	9.99	0.51		6.7	15.8	28.8	32.9	53.0	49.6	62.6	58.1	58.5
Belmont Bay	11.84	8.87	1.63	1.12		9.1	22.1	26.2	46.3	42.9	59.5	51.4	51.8
Indian Head	8.11	5.14	6.73	6.22	5.10		14.0	18.1	38.2	34.8	47.8	43.3	43.7
Fort Belvoir (Gunston Cove)	15.68	12.71	14.04	13.53	12.41	7.70		6.9	27.0	23.6	36.6	32.1	32.5
Marshall Hall	17.36	14.39	15.72	15.21	14.09	9.38	3.04		24.1	20.7	33.7	29.2	29.6
National Harbor	26.60	23.63	24.96	24.45	23.33	18.62	12.28	10.02		11.0	24.0	19.5	19.9
Old Town Alexandria	27.49	24.52	25.85	25.34	24.22	19.51	13.17	10.91	3.29		13.4	8.9	9.3
Reagan National Airport	30.10	27.13	28.46	27.95	26.83	22.12	15.78	13.52	5.90	2.71		19.7	20.1
Washington D.C. (SW Waterfront)	32.31	29.34	30.67	30.16	29.04	24.33	17.99	15.73	8.11	4.92	6.25		5.2
Washington D.C. (Anacostia Waterfront)	32.85	29.88	31.21	30.70	29.58	24.87	18.53	16.27	8.65	5.46	6.79	3.14	

Distance (Miles)

Time (Minutes)

Source: Potomac River Commuter Ferry Service Study & Route Proving Exercise, 2009

Potential ferry travel time estimates were not included in the route proving exercise report for the following terminals:

- Buzzard Point
- Georgetown
- JBAB/Anacostia/St. Elizabeth's South

To overcome this, the following assumptions were made:

Buzzard Point terminal travel time was determined to be the same as times for the Washington D.C. Anacostia Waterfront site.

Georgetown terminal is roughly 5 miles from the closest terminal with timing information, Southwest Waterfront. The 4.92 mile link between Old Town and Washington, D.C. Southwest Waterfront takes 8.9 minutes. For corridor pairs including Georgetown the travel times from the origin site to Southwest Waterfront (Old Sea Terminal) was found, then an additional 8.9 minutes was added to factor in getting from Southwest Waterfront (Old Sea Terminal) to Georgetown.

JBAB Anacostia/St. Elizabeth's South lies approximately 3 miles north of Old Town Alexandria and 3 miles south of Buzzard Point/Anacostia. A similar distance between the Anacostia Waterfront and Southwest Waterfront (Old Sea Terminal) takes 5.2 minutes. Thus any corridors including St. Elizabeth's South were mapped to either Old Town or Anacostia, depending on the direction of travel (north or south) and 5.2 minutes was added.

Auto travel times were calculated during a weekday evening peak (4-6 PM) leaving the District area. Transit travel times were calculated using Google Maps. For the two Woodbridge sites and Old Town Alexandria, which are served by VRE, the VRE travel times were used. A combination of the approximate drive (in the case of Woodbridge) or walk/bus (in the case of Alexandria) times were calculated, and the access time via transit from, for instance, the l'Enfant Plaza Metro station to the Navy Yard were added to the VRE train time tables. Harbor Station is currently not accessible via transit. To still include this site in the transit time savings metric, as the ferry could become the transit link to that site, the drive time was multiplied by 100, resulting in a transit time "savings" of 99%. At other sites, such as Indian Head and Woodbridge, the current transit travel times often exceed 4 hours, thus ferry has the power to make infeasible transit travel times feasible.

Once time savings was calculated, quartiles for driving and transit percent savings values was calculated and scored and weighted.

Application

To apply the evaluation criteria, a master matrix of all round trip terminal-to-terminal combinations was created and populated with data from the MWCOG model, the terminal score, and Google Maps analysis. Figure4-9 below shows the ranges resulting from the quartile analysis.

Figure 4-9 Evaluation Criteria and Scoring Matrix

Evaluation Criteria	Score				Priority (Low=1, Med =2, High=3) for score weighting
	0	2	4	8	
	0-25th Percentile	*25th-50th Percentile*	*Between 50th and 75th Percentiles*	*Above 75th percentile*	
Market inside 5 mile radius	0-10,007	10,007 - 19,377	19,317 - 174,864	174,864 - 355,251	3
	0-9,789	9,789 - 24,371	24,371 - 506,944	506,944 - 903,051	2
	0- 275	275 - 1,269	1,269 - 12,031	12,031 - 22,482	1
Market inside 0.5 mile radius	0-11	27,699	75 - 176	176 - 224	3
	0-6	41,080	20 - 107	107 – 4,999	2
	0-2	2 - 11	12 - 20	20 - 24	1
Terminal Feasibility	0-62	62 - 65	65 - 67	67 - 73	3
Drive Travel Time Savings	-130 to - 16%	-15 to 12%	13% - 31%	32% - 89%	3
Transit Travel Time Savings	-13% to 53%	54% - 69%	70% - 84%	85% - 99%	

After scoring all corridors, the analysis showed high market scoring for short trips such as between Georgetown and the Navy Yard and high travel time savings along both District-area trips without road connections (e.g. Old Town to Navy Yard) as well as longer corridors that currently suffer from congestion (Harbor Station to the Navy Yard) or are across the river from each other (Indian Head to Woodbridge). The market for shorter, water taxi trips around the District waterfront and Alexandria is quite clear both from the market numbers and the existing services running today. Yet the operations and market shed of a water taxi are different from commuter service, and should be distinguished.

As such, the corridors were divided into two, with water taxi potential routes including the following potential corridors:

- Georgetown-Navy Yard
- Georgetown-Old Sea Terminal
- JBAB Anacostia/St. Elizabeth's South-Old Sea Terminal
- Buzzard Point-Georgetown
- Georgetown-JBAB Anacostia/St. Elizabeth's South
- JBAB Anacostia/St. Elizabeth's south-Navy Yard
- Buzzard Point-JBAB Anacostia/St. Elizabeth's South

Water Taxi Evaluation

Of the 7 potential water taxi routes, the top scores in half-mile market, drive time savings, and transit time savings were collected. Water taxis generally rely upon walk-up trips, thus the 5-mile market scores are not relevant. Most of the water taxi sites scored very high in terms of terminal feasibility and as a result that was also not a factor in selecting the top potential corridors. Figure 4-10 summarizes the analysis and scores for the top performing water taxi markets.

Figure 4-10 Water Taxi Market High Scores

Site 1	Site 2	Half-Mile Commute Trips	Half-Mile Commute Trips Score	Half-Mile Tourist Trips	Half-Mile Tourist Trips Score	Half-Mile Off-Peak Trips	Half-Mile Off-Peak Trips Score	TOTAL: Half-Mile Market
JBABAnacostia/St. Elizabeth's South	Navy Yard/Yards Park/Diamond Teague Park	56	6	0	0	500	16	**22**
Buzzard Point	JBABAnacostia/St. Elizabeth's South	7	0	0	0	74	8	**8**
Buzzard Point	Georgetown	17	6	0	0	89	8	**14**
Georgetown	JBABAnacostia/St. Elizabeth's South	28	6	0	0	92	8	**14**
Georgetown	Old Sea Terminal/SW Waterfront	181	24	20	12	499	16	**52**

Site 1	Site 2	Drive Difference (+ means ferry is faster)	Drive Time Weighted Score	Transit Difference (+ means ferry is faster)	Transit Time Weighted Score	Corridor Scored Best in …
JBABAnacostia/St. Elizabeth's South	Navy Yard/Yards Park/Diamond Teague Park	67.5%	24	88.7%	16	Transit Time Savings
Buzzard Point	JBABAnacostia/St. Elizabeth's South	65.3%	24	89.8%	16	Transit Time Savings
Buzzard Point	Georgetown	50.6%	24	84.4%	8	Drive Time Savings
Georgetown	JBABAnacostia/St. Elizabeth's South	59.7%	24	78.6%	8	Drive Time Savings
Georgetown	Old Sea Terminal/SW Waterfront	31.5%	12	79.3%	8	Half-Mile Market - 2nd Highest

Commuter Evaluation

To understand the commuter potential, the market size and travel time savings were calculated for the commuter corridors. Both market and travel time are indicators of future success, but a corridor with high travel time savings might not currently have a large travel market, or vice versa. To ensure including corridors that show promise on both fronts, the top 25% of corridors in each metric separately were selected for further evaluation. Corridors that score high on both metrics show the most promise. For market evaluation, in order to include potential customers who would drive to terminals at outlying sites, the 5-mile market was analyzed. The 13 sites shown in Figure 4-11 scored high in one or multiple market subsets (commute, tourist, or off-peak trips).

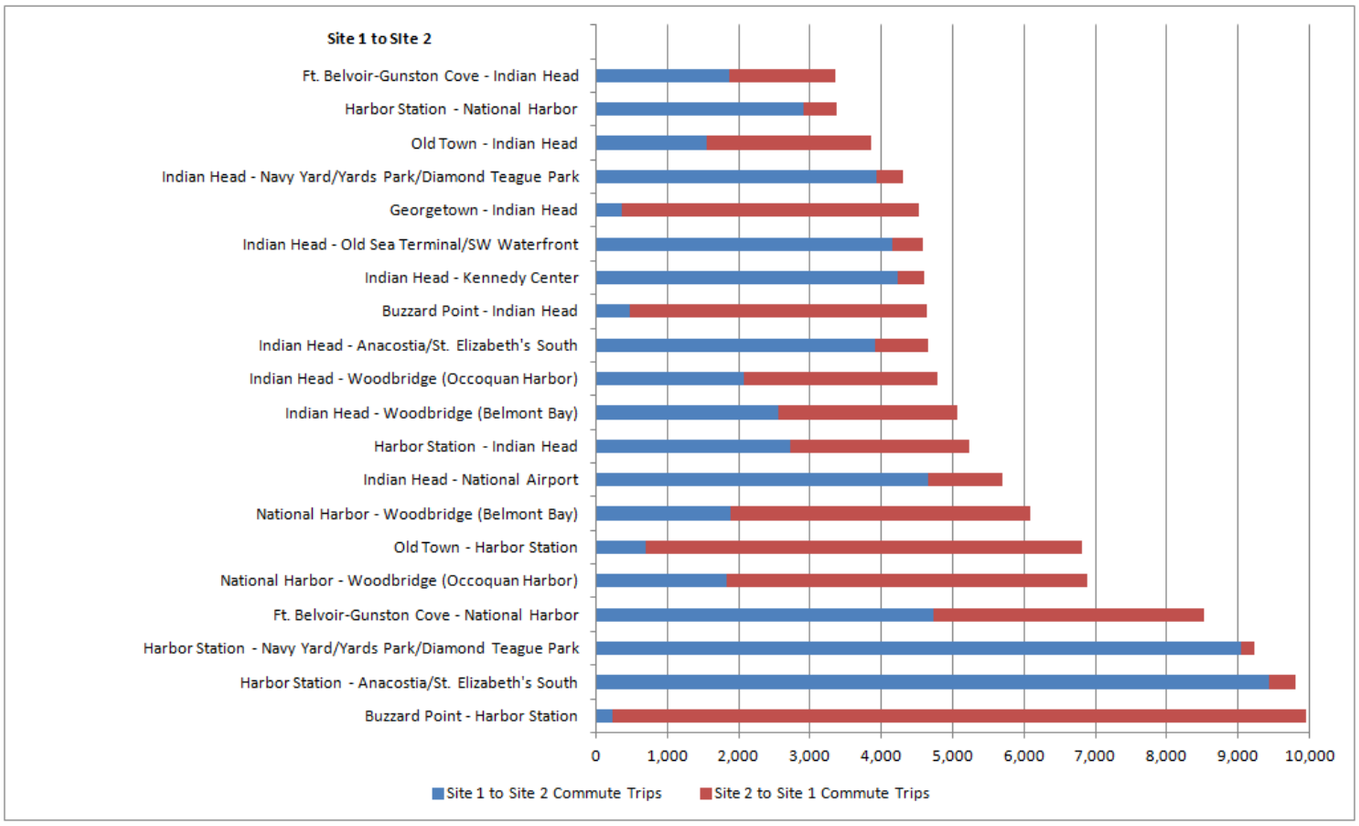
Figure 4-11 High Scoring Commuter Corridors

Site 2 Name	Site 1 Name	Total Commute Trips 5-Mile	*Commute Trips 5-mile: Weighted Score*	Total Tourist Trips 5-Mile	*Tourist Trips 5-mile: Weighted Score*	Total Off-Peak Trips: 5-mile	*Off-Peak 5-mile: Weighted Score*	MARKET SCORE	Market Subsets with Highest Score		
									Commute	Tourist	Off-Peak
National Airport	Old Town	209,163	*24*	21,852	*24*	737,928	*16*	**92**	X	X	X
National Airport	Georgetown	351,969	*24*	16,941	*24*	829,279	*16*	**92**	X	X	X
Navy Yard/Yards Park/ Diamond Teague Park	National Airport	322,808	*24*	17,587	*24*	808,164	*16*	**92**	X	X	X
National Airport	Anacostia /St. Elizabeth's South	301,759	*24*	22,482	*24*	864,453	*16*	**86**	X	X	X
Old Sea Terminal/SW Waterfront	National Airport	350,500	*24*	20,950	*24*	893,425	*16*	**86**	X	X	X
Old Sea Terminal/Southwest Waterfront	Old Town	175,255	*24*	15,822	*24*	497,374	*8*	**78**	X	X	
Buzzard Point	Old Town	178,221	*24*	16,443	*24*	535,654	*16*	**72**	X	X	X
Navy Yard/Yards Park/Diamond Teague Park	Old Town	164,106	*12*	13,196	*24*	451,755	*8*	**72**		X	
Joint Base/Anacostia Bolling/St. Elizabeths South	Old Town	174,733	*12*	19,549	*24*	612,039	*16*	**66**		X	X
National Harbor	Old Town	69,963	*12*	13,742	*24*	408,463	*8*	**66**		X	
National Harbor	Anacostia /St. Elizabeth's South	93,869	*12*	12,078	*24*	357,484	*8*	**66**		X	
National Harbor	National Airport	108,520	*12*	12,099	*24*	399,717	*8*	**66**		X	
National Airport	Buzzard Point	340,429	*24*	11,782	*12*	896,354	*16*	**60**			X

Low Market Scoring Corridors

Certain sites and corridors are of interest, but did not rise to the top in terms of potential. This is for several reasons; including low commute market or potential underestimating of trips from the MWCOG model. As a general metric, at least 10,000 commute trips per day between two terminals is necessary to generate 500 boardings per day on ferry service, assuming an aggressive 5% trip capture. Ten thousand trips equates to the 25th percentile in the 5-mile commute market ranges, thus corridors with fewer than 10,000 trips between them received 0 points. Figure 4-12 below shows the breakdown of trip patterns between sites with less than 10,000 daily trips. Some corridors are quite close to the threshold. Certain terminals have very high trips in one direction only, meaning they can be kept in consideration when building a future network of service. For example, there are a large number of people traveling from Harbor Station to the Navy Yard and St. Elizabeth's, but very few trips are being made from these areas to Harbor Station. It appears this is simply due to the lack of employment and commercial activity in the area around Harbor Station.

Figure 4-12 Low Market Potential Trip Pairs



To account for these discontinuities in directional demand or future demand, the scoring was analyzed in tandem. For example, a corridor with very high ferry time savings but with lower demand between terminal sites still might make a good ferry crossing, but with a lower scale ferry operation or if taken in tandem with corridors with high demand. Given that the purpose of this step of the study was to isolate terminal sites and potential corridors for further evaluation, particularly through the household survey, an approach was taken to take the top 25% of corridors by potential market demand and the top 25% of corridors by potential travel time savings. Some corridors fell into both categories. Figure 4-13 shows the results of that analysis.

Figure 4-13 Commuter Corridors For Further Evaluation

		Top 25% by potential market	Top 25% by Travel Time
Alexandria Old Town	Buzzard Pt.	x	x
Alexandria Old Town	Fort Belvoir		x
Alexandria Old Town	JBAB	x	x
Alexandria Old Town	National Harbor	x	x
Alexandria Old Town	Navy Yard	x	x
Alexandria Old Town	Old Sea	x	x
Fort Belvoir	Buzzard Pt.		x
Fort Belvoir	JBAB		x
Harbor Station	National Harbor		x
Harbor Station	Navy Yard		x
Indian Head	Alexandria Old Town		x
Indian Head	Fort Belvoir		x
Indian Head	Harbor Station		x
Indian Head	National Airport		x
Indian Head	Woodbridge		x
National Airport	Buzzard's Point	x	
National Airport	Georgetown	x	
National Airport	JBAB	x	x
National Airport	National Harbor	x	
National Airport	Navy Yard	x	
National Airport	Old Sea	x	

Military Commuter Market

A total of 17 potential corridors were evaluated to and from JBAB South and Fort Belvoir/ Gunston Cove. The top 25% scoring corridors in the market evaluation and time travel savings evaluation were culled from the group and are shown in Figure 4-14.

Corridors identified for further evaluation are:

- JBAB South to Old Town and National Airport
- Fort Belvoir to Indian Head, JBAB South, SW/SE District of Columbia

Figure 4-14 High Scoring Military Market Corridors

Site 1 Name	Site 2 Name	Top 25% by Market	Top 25% by Travel Time	Market				Travel Time			
				Total Commute Trips 5-Mile	Total Commute Trips 0.5 mile	**Total Off-Peak Trips: 5-mile**	Total Off-Peak Trips: 0.5 mile	Drive Difference (+ means ferry is faster)	Transit Difference (+ means ferry is faster)	Market Score	Travel Time Score
Old Town	JBAB South	X	X	174,733	12	612,039	68	71.1%	94.3%	66	48
JBAB South	National Airport	X	X	301,759	59	864,453	1468	56.8%	85.4%	86	48
Ft. Belvoir-Gunston Cove	National Airport	X		21,250	6	33,371	28	8.5%	52.5%	40	6
JBAB South	National Harbor	X		93,869	20	357,484	152	-131.4%	62.3%	66	6
Old Town	Ft. Belvoir-Gunston Cove		X	15,333	18	63,498	71	42.4%	72.2%	40	36
Ft. Belvoir-Gunston Cove	Indian Head		X	3,357	3	25,639	4	80.3%	92.4%	14	48
Ft. Belvoir-Gunston Cove	JBAB South		X	17,245	1	23,681	8	40.0%	77.8%	26	36
Buzzard Point	Ft. Belvoir-Gunston Cove		X	16,626	0	14,309	3	32.3%	71.0%	22	36

SUMMARY OF SCREENING RESULTS

What emerges from this exercise is that the following locations show up repeatedly with high potential:

- Old Town
- Navy Yard
- Old Sea Terminal
- Indian Head
- Harbor Station
- National Harbor
- National Airport
- Woodbridge

By combining these terminals into market areas, the following five commuter corridors emerge for further study:

- Old Town to National Harbor, Old Sea Terminal, Navy Yard
- National Airport to National Harbor, Old Sea Terminal, Navy Yard
- Indian Head to Woodbridge, Harbor Station, Old Town, National Airport
- Woodbridge or Harbor Station to Old Sea Terminal or the Navy Yard

Military Commuter Market

Based on analysis the corridors identified for further evaluation were:

- JBAB South to Old Town and National Airport
- Fort Belvoir to Indian Head, JBAB South, SW/SE District of Columbia

Water Taxi Market

Some water taxi sites have already been proven feasible based on currently operating service. The MWCOG model does not provide adequate granularity to assess these potential corridors as many of them are very short trips that may be pedestrian, bicycle and/or transit trips today and perhaps even within the same transportation analysis zone (TAZ). The terminals recommended for water taxi evaluation are:

- Georgetown
- Southwest Waterfront/Old Sea Terminal
- Buzzard's Point
- Navy Yard/Diamond Teague Park
- Poplar Point – this site was deleted as a commuter hub from the list of feasible terminals; however, as a link in the water taxi network this site may be of value

The water taxi potential needs a specialized market analysis to further assess the potential for reach link in the chain. Even then due to the nature of these trips, discretionary, very short, and lacking a reasonable evaluation framework that easily fits into the scope of this study, the water taxi corridors were set aside in terms of additional analysis. It is very likely that the market potential for each of these locations, if a workable terminal site can be established, will be tested and established by starting actual service through the efforts of current water taxi operations on the Potomac River.

5 MARKET RESEARCH

IDENTIFICATION OF MARKET AREAS

The market research potion of this project, by necessity, was more generalized due to the nature of the research. The area definitions below are intended to define the approximate boundaries of the high potential travel corridors identified in Section 4. Due to the nature of the research technique using random digit dialing, particularly to cell phone numbers, these descriptions should be considered to be "fuzzy" boundaries as they are not intended to absolutely include nor exclude immediately adjoining areas.

Alexandria –Generally, the city limits of Alexandria, the Potomac to I-395 and from I-495 to Four Mile Run Creek (Arlington/Fairfax County Line), creating sort of a wedge shape, but also including the portion of Alexandria northwest of I-395.

Indian Head – Charles County, Saint Mary's County, Calvert County

Woodbridge/Potomac Shores – Prince William County from the north boundary along I-95 east to the Potomac to the intersection of the south county boundary with I-95, but also including zip codes 22125, 22192, 22193, 22025 and 22172 to the west of I-95.

National Harbor – Zip codes 20744 and 20745

Southwest and Southeast DC. – The area bounded by I-695 to the north, Hwy 1 to the west and the Potomac/Anacostia river system to the south and east.

Southern Arlington (National Airport/Crystal City) – The area bounded by Hwy 1 and I-395, Four Mile Run Creek and the Potomac. Note that this area is generally contiguous to Alexandria.

Quantico – Included in the Woodbridge/Potomac Shores definition.

These geographies are identified in Figures 5-1 and 5-2 below.

Figure 5-1 Northern Household Survey areas

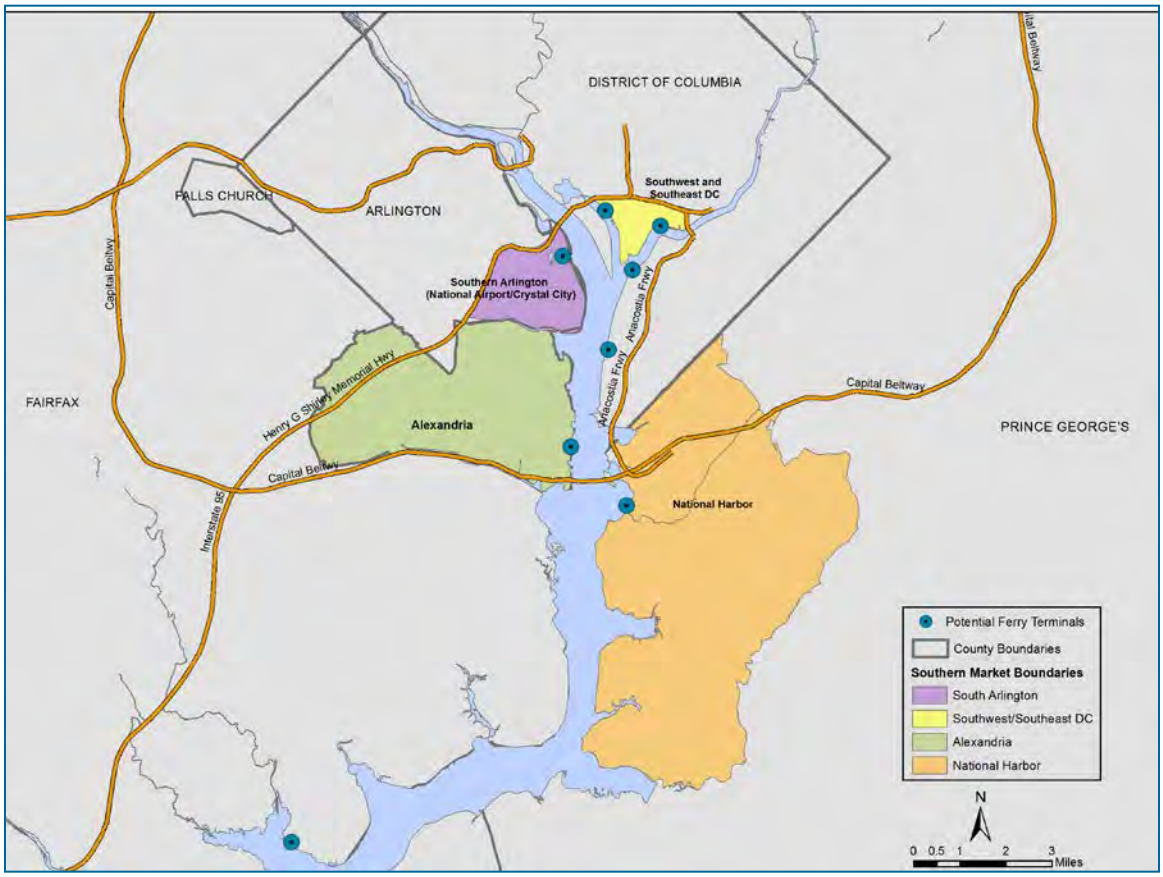
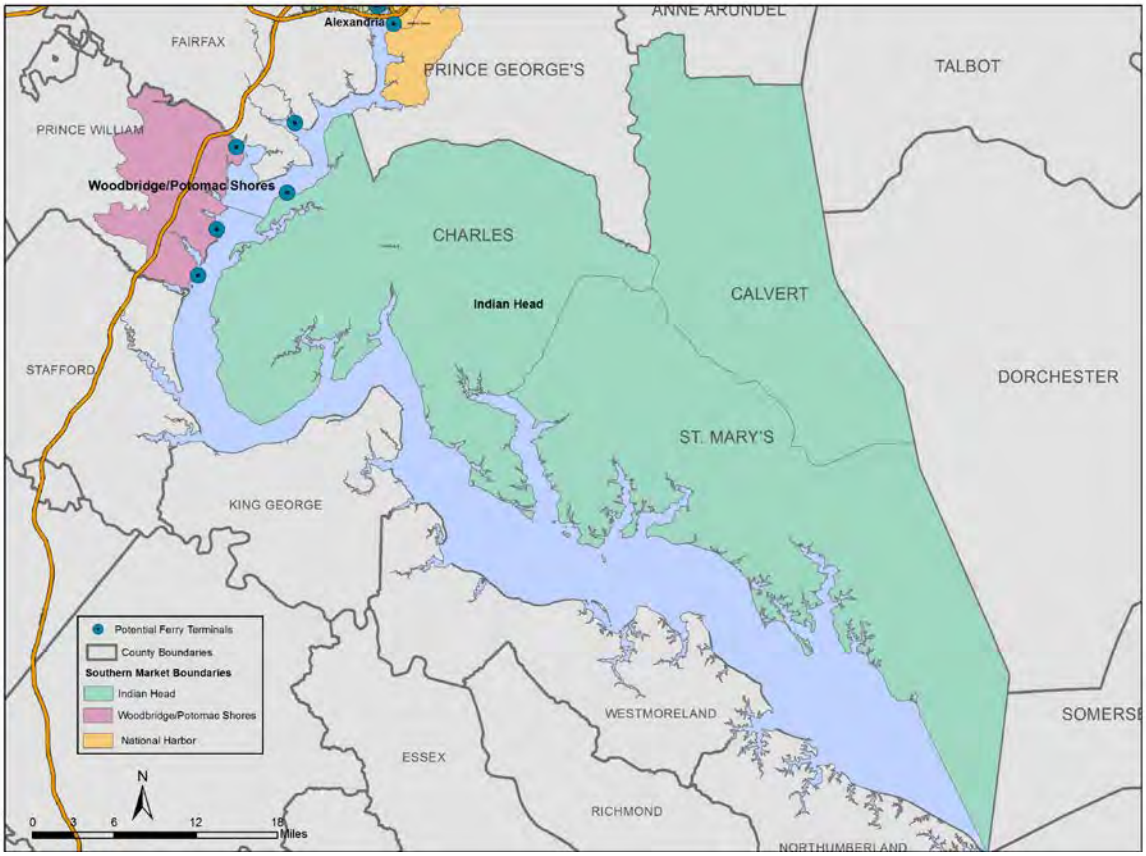


Figure 5-2 Southern Household Survey areas



CONDUCT OF THE SURVEY

In March and April 2013, a survey concerning the interest of area travelers in using a proposed ferry service operating on the Potomac River was conducted in above described areas. The survey includes 1,200 respondents each of whom completed a survey lasting approximately 15 minutes. The qualifying characteristics for inclusion in the survey were that the respondent had to be 18 years old, or older, and in a typical 30 day period would travel to one, or more, of the following areas: Washington, DC; Arlington or Alexandria, Virginia; Reagan Airport or Crystal City; National Harbor; Quantico, Fort Belvoir or Woodbridge, Virginia; Joint Base Anacostia Bolling; or southern Maryland, including Indian Head, or Charles, St. Mary's, and Calvert counties.

The sample was based on a random digit dial (RDD) methodology. Telephone numbers were drawn from the specific ZIP Codes that defined the sampled areas, in addition these were supplemented with cell phone listings associated with each zip code. The zip codes and target quotas for completed questionnaires in each area:

- Northern Virginia, including Alexandria, Arlington, Crystal City, and the National Airport: Quota 350, Zip Codes 22202, 22204, 22206, 22211, 22301, 22302, 22304, 22305, 22312, 22314
- Prince William County including Woodbridge, Potomac Shores: Quota 350, Zip codes 22025, 22026, 22172, 22191, 22192, 22193, and Quantico: 22134
- National Harbor: Quota 150, Zip codes 20744 and 20745

- Washington, DC: Quota 200, Zip Codes 20003, 20024, and 20319 (note this is only the SE and SW Waterfront areas of Washington, DC)
- Southern Maryland, including Indian Head and Calvert County, Maryland, Charles County, St. Mary's Counties: Quota 150

The survey was weighted based upon the population and age distributions within the sampled areas.

SURVEY INSTRUMENT

In conducting any survey the value of the results depends directly on the quality of the survey instrument used to collect the data. This particular survey had several objectives to achieve and, as such, was challenging to craft an instrument that would provide useful information.

The research objectives were:

- Create an understanding of how people feel about their current commute
- Understand the essential decision factors in mode choice
- Assess response to a new mode that people would have some familiarity with
- Assess response to a ferry mode with which people would not be familiar

The survey instrument is included in Appendix B.

TOP LEVEL MARKET RESEARCH RESULTS

Most area travelers currently travel on the potential ferry route for the purpose of getting to work (53%). Most people drive alone (60%). While some express concern with the other factors such as cost and travel time affecting their current trips, traffic congestion is the primary concern. This is especially true of travelers originating in Prince William County.

The market for Potomac ferry service is thus motivated primarily by a concern with traffic congestion and to a lesser extent by related issues such as ease of parking and its cost. However, area residents tend to consider their existing modes of transportation both convenient and affordable. In other words, traffic congestion is considered a significant problem by many local area travelers, but it is something most of them cope with as they drive on their usual area trips rather than using the existing alternatives. Thus, to become a “mode of choice,’ a ferry service would have to not only provide the benefit of avoiding traffic congestion, but would also have to be perceived as equally convenient and price effective.

There are no clear demographic patterns that define the potential ferry market. That is that the findings do not vary significantly by age group, gender, or ethnicity.

Half or more of the trips would be frequent because they would be work-related. This tendency appears to diminish among populations in the immediate Washington, DC area since there are more convenient ways to get to work if one lives and works in or near the District.

Questions in potential users’ minds about the ferry are for the most part not unique to ferry service, but are common to any form of public transportation – schedule, cost, convenience. Concern is expressed by a few people about being on the water or the effect of weather on the service, but by only a few. On the other hand, the ferry does appear to be perceived by many as unique and outside of their usual

experience. Thus, for example, more area travelers said they would try a bus operating in a special traffic free zone than would try a ferry. This appears to be because a bus is a more familiar mode in this region.

Many of those who do not use a train or bus for their usual trip have used alternative modes in the past. Thus it is not a lack of familiarity or willingness to try an alternative that keeps them in their vehicles (or carpools/sluglines). It is simply that they consider their current mode both relatively convenient and affordable.

Two aspects of the proposed ferry service that might have been thought to be serious obstacles to consumer interest appear not to be. The "final mile" question does not appear to be a major stumbling block. With the exception of 13% who were simply "not sure," travelers interviewed had a fairly realistic notion of how they would get from the docking point to their final destinations. Similarly, only 8% of potential travelers were put off by the probability that ferry service would be disrupted by freezing of the Potomac.

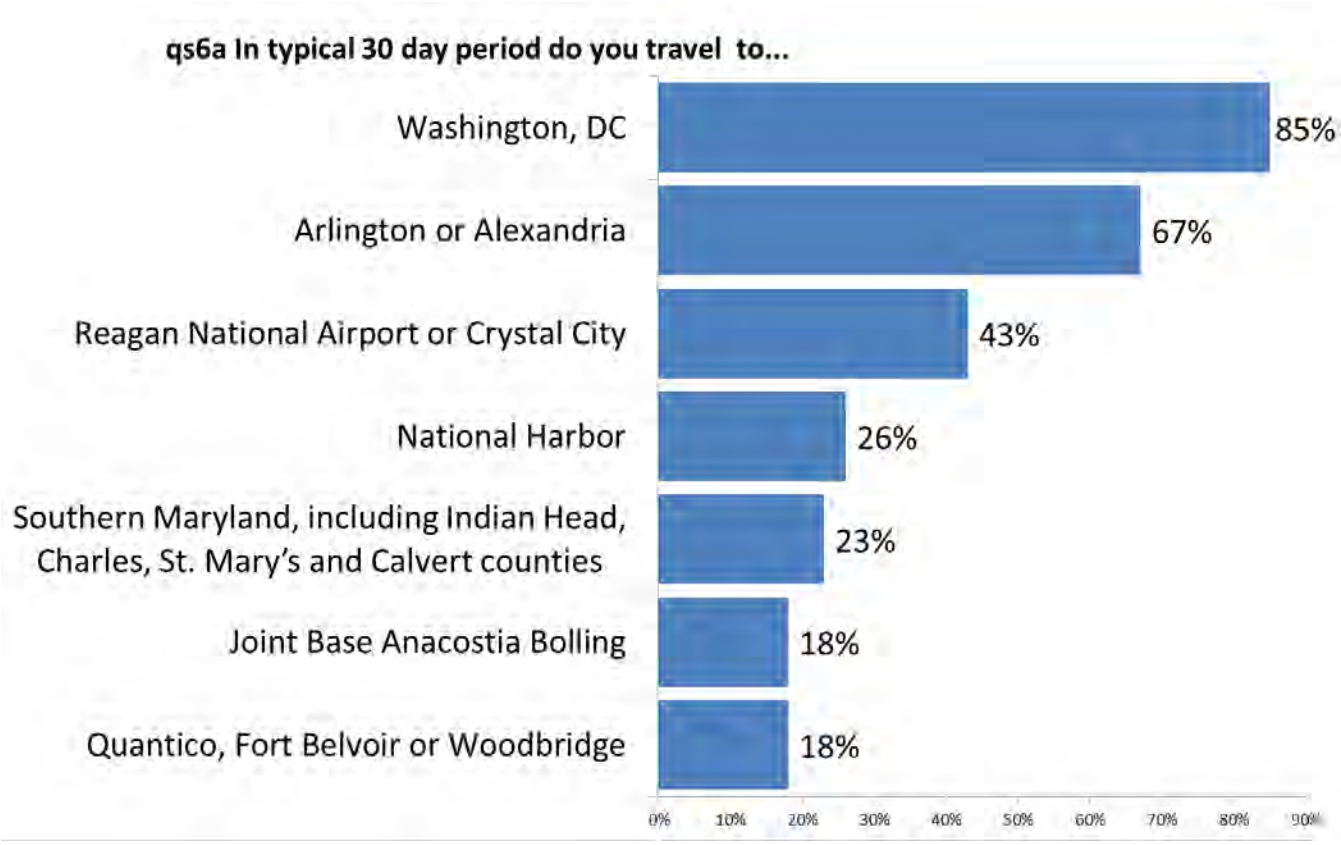
There is no great level of repressed demand to escape the traffic congestion problems associated with inter-city travel in the corridor to be served by the ferry. However, there is a tendency for those who perceive a host of challenges besetting their regional travel to be more willing than others to try a new service in the hope of alleviating some of the problems.

Fundamentally, there are no insurmountable perceptual barriers to using a ferry. For example, there was no out-of-hand rejection of the concept because it would adhere to the coastline and require connections at the destination, or concern that it would be unreliable because of freezing of the Potomac.

In many ways a ferry service is seen as both novel and at the same time a rather normal form of transportation. As such it has neither a special advantage nor any particular disadvantage over existing rail and bus service except that it is inherently coastal and thus places a greater requirement on the challenge of accessing the service and negotiating the "final mile" except for those travelers with destinations very close to docking points.

DETAILED HOUSEHOLD RESEARCH FINDINGS

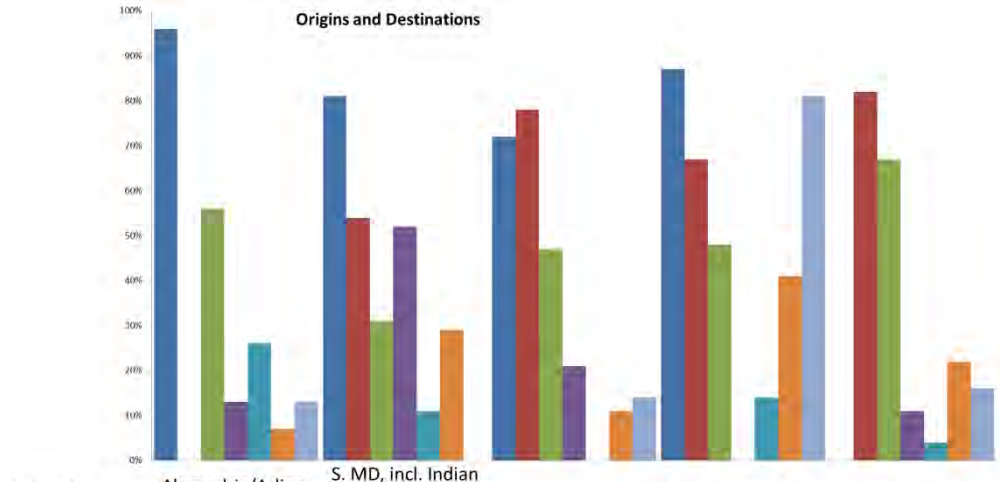
Figure 5-3 Destinations



Destinations

Seven primary destinations were under study in the survey. One criterion for inclusion of respondents in the survey was that they travel to one or more of these destinations in a typical 30 day period. The most common destinations in the sample are Washington, DC (85%) and the nearby suburbs of Arlington and Alexandria (67%). Crystal City and the Reagan National Airport (43%) are also common destinations. The other destinations also attract between 18% and 26% of the respondents saying they typically travel to the locations at least once every 30 days. The fact that such a high proportion of people travel to these areas suggests that the intra-area travel market is very substantial.

Figure 5-4 Origins and destinations



Coming from... / Going to...	Alexandria/Arlington/CrystalCity/ National Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC
Washington, DC	96%	81%	72%	87%	NA
N. VA Arlington or Alexandria	NA	54%	78%	67%	82%
Reagan Airport or Crystal City	56%	31%	47%	48%	67%
National Harbor	13%	52%	21%	0%	11%
Quantico, Fort Belvoir or Woodbridge	26%	11%	NA	14%	4%
Joint Base Anacostia Bolling	7%	29%	11%	41%	22%
S. MD , Indian Head, Charles, St. Mary's, Calvert cos.	13%	0%	14%	81%	16%

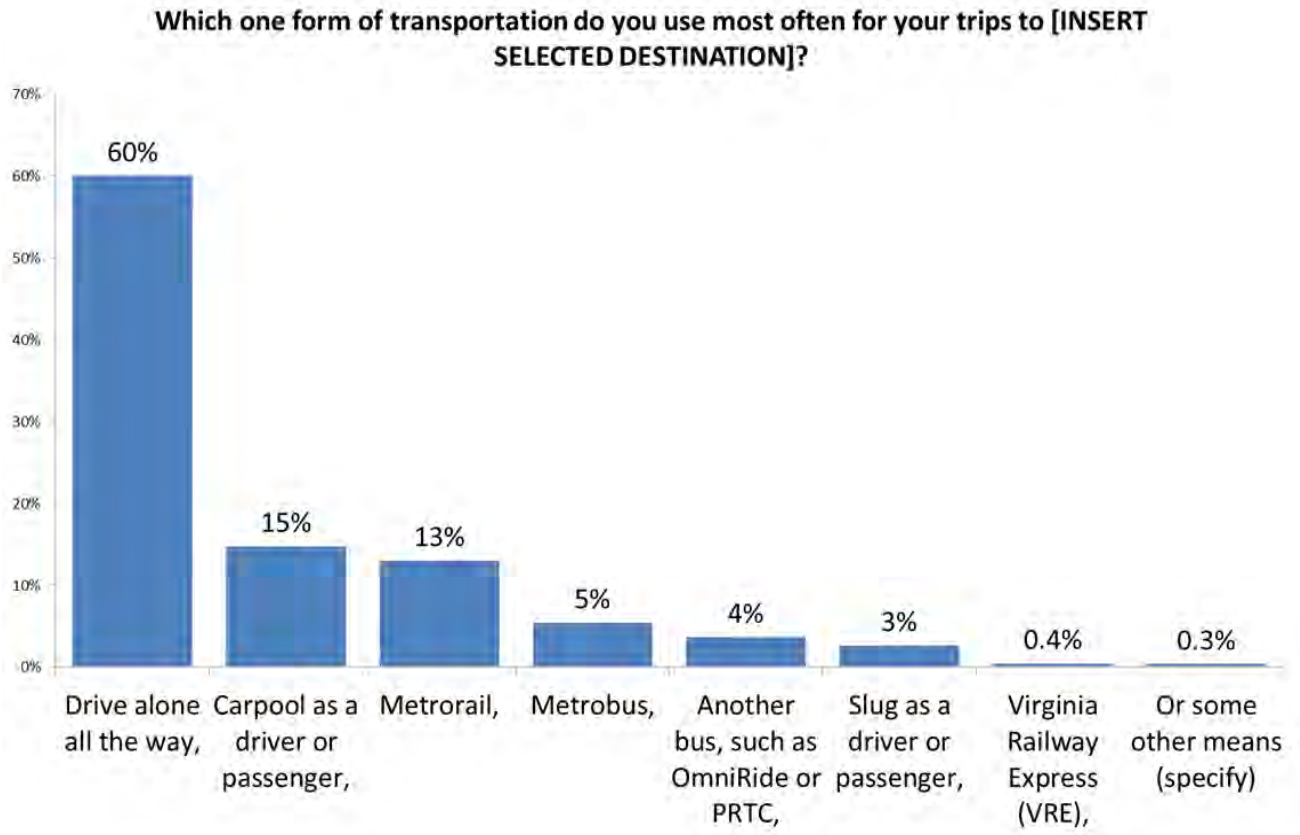
Origins and destinations

The origin destination pairs are shown both visually and numerically in the chart above. Washington, DC is a destination for more than 70% of the respondents from all five major market areas. More than 70% respondents from Prince William County travel frequently to the Washington, DC (72%) area, and the northern Virginia suburbs of Arlington and Alexandria (78%). Important to remember these responses include all trips taken in the past thirty days, not just work trips.

Many other pairs of origins and destinations also have high travel. For example, of those coming from Southern Maryland, including Indian Head; Charles, St. Mary's, and Calvert counties, 81% indicate they go to Washington DC at least once in a thirty day period.

Note that in the chart several cells are listed as "NA" because it was not considered germane to ask (for example) someone living in the Arlington or Alexandria areas about trips to those same areas. This was also true of Washington, DC, and Prince William County. Thus in the visual chart there is a blank space in place of numbers reflecting more local travel destinations.

Figure 5-5 Usual mode



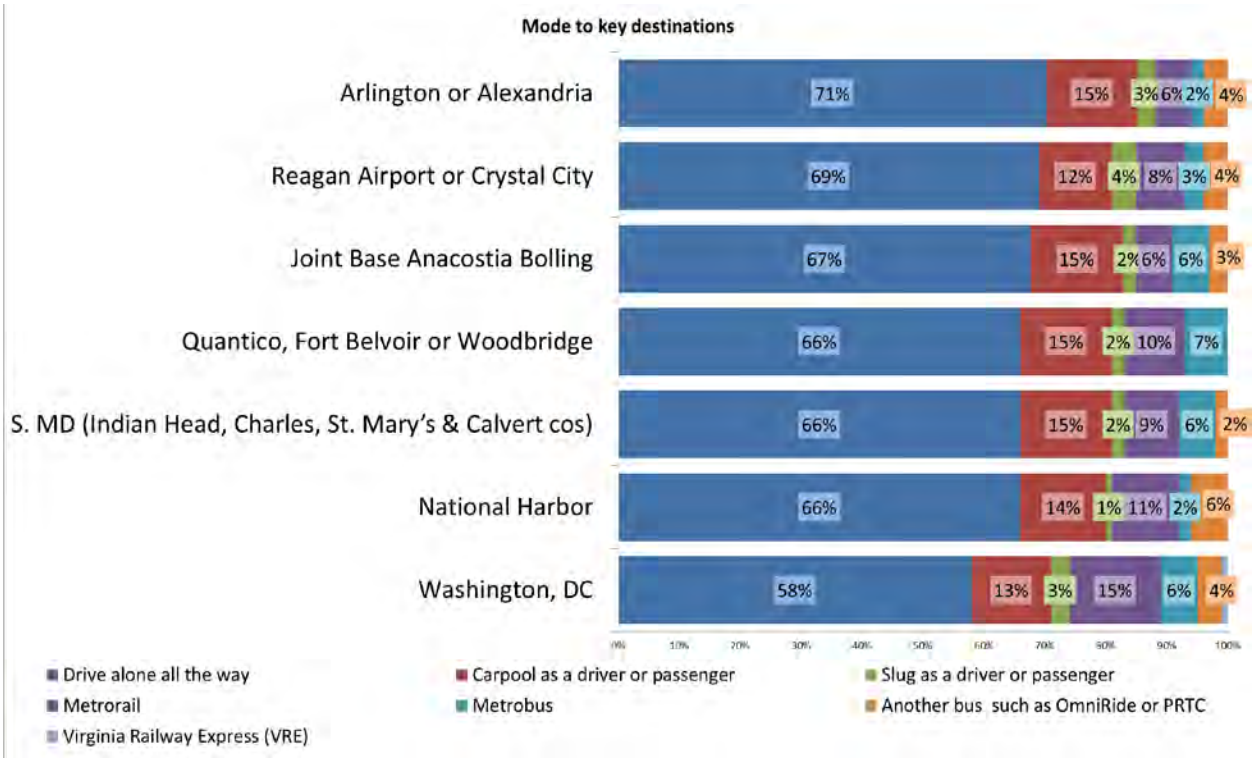
Usual mode

Respondents were asked what mode they used most often to make the trips being studied in the survey.

Those who combine modes were asked which mode was predominant. If the respondent indicated they were equal or was not sure, one of the modes used was selected at random.

As expected, the vast majority, 60%, indicated they drive alone the entire distance. A total of 18% ride with others, either as driver or passenger in a carpool (15%), or as a slug (3%). Similarly, 18% indicate they take Metro, either rail (13%) or bus (5%). A few take either OmniRide (4%), or Virginia Railway Express (0.4%).

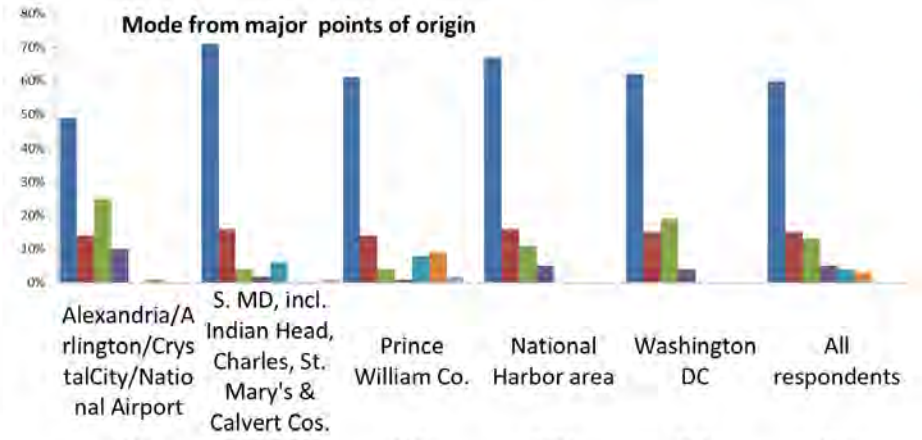
Figure 5-6 Mode to target destinations



Mode to target destinations

As one would expect, the single occupancy vehicle (SOV) dominates trips to all of the destinations. The percent indicating the carpool or slug is remarkably consistent among destinations, varying between only 12% and 15%. However, for obvious reasons, the use of Metrorail and Metro bus varies widely depending upon the destination, with trips to Washington DC having the highest incidence (21% combined, rail & bus) while Arlington and Alexandria are lowest with a combined 8% for bus and rail mode.

Figure 2-7 Mode usually used for trips from points of origin to usual destinations



	Alexandria/Arlington/CrystalCity/National Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC	All respondents
Drive alone all the way	49%	71%	61%	67%	62%	60%
Carpool as a driver or passenger	14%	16%	14%	16%	15%	15%
Metrorail	25%	4%	4%	11%	19%	13%
Metrobus	10%	2%	1%	5%	4%	5%
Bus, such as OmniRide	0%	6%	8%	0%	0%	4%
Slug as a driver or passenger	1%	0%	9%	0%	0%	3%
Virginia Railway Express (VRE)	0%	0%	2%	0%	0%	0%
Or some other means (specify)	0%	1%	0%	0%	0%	0%

Mode usually used for trips from points of origin to usual destinations

Trips originating in the northern Virginia areas of Alexandria, Arlington, Crystal City, and the National Airport are the most likely to utilize Metrorail or Metro bus, and least likely to be single occupancy vehicle trips. Trips originating in Prince William County are more likely than others to rely on regional transit mode such as OmniRide (8%), Virginia Railway Express (2%), or slugging (9%). However, SOV trips dominate travel to all of the destinations.

Figure 5-8 Why not use a bus or train for this trip?

Q9 Main reason respondent does not use a bus or a train?	
Availability/stations/stops not convenient to home/work/where I need to go	16%
Takes longer	9%
Prefer to drive/have a car (not specific)	8%
Schedules/frequency/don't run when I need them	7%
Need to walk or drive to station/stop	5%
Too expensive/wouldn't save any money	5%
Faster by car	4%
Need to transfer/make connections	4%
Flexibility/ want to be in control/come and go as i please	4%
For job/work need to have my vehicle with me	4%
Have baggage/groceries/tools for work to carry	3%
Don't commute on a regular basis/travel that often/that far	3%
Not convenient (not specific)	2%
Not familiar with the system/schedule	2%
Don't like waiting at station/stop	2%
Disabled/medical reason/old/can't manage	2%
Easier by car (not specific)	2%
Always have someone with me/additional passengers/kids	2%
Not direct/door to door service	2%
Unreliable/do not run on time/too many breakdowns	2%
Usually overcrowded/don't like contact with other people	2%
Would have to find parking at station/stop	1%
Usually have a number of stops to make/errands	1%
Don't like public transportation (not specific)	1%
Parking provided by my job/easy parking	1%
Safety/Do not feel safe on public transportation	1%
Unruly passengers	0%
Not good in inclement weather	0%
Have transportation with friend/family member	0%
Don't like buses (not specific)	0%
Other	1%
Don't know/refused	1%

In Figure 5-8 and in subsequent tables using the same model, the results presented are based upon multiple responses to a single question. Thus, rather than displaying the percentage of respondents offering a given answer, we present the percent of mentions of each theme.

Why not use a bus or train for this trip?

Those respondents who indicated they use a mode other than a bus or train were asked why they did not use a bus or train. Their coded responses appear in the table above. The results are fairly predictable, focusing on the relative inconvenience of buses and trains in terms of proximity to the traveler. For example, 16% indicate the stops are not convenient to home or work, while another 5% indicate they would need to walk or drive to the station/stop, and another 2% simply say it would not be convenient without defining convenience. Others express a concern about time: 9% said it would take longer, another 4% say it is faster by car. Others indicate a variety of obstacles that are consistent within this survey with respect to attitudes toward public transportation. For example, 7% indicate that the schedules would not be appropriate for them. Another 4% indicate they would need to transfer make connections. Others indicate that they want to come and go as they please, or that they need a vehicle at work. None of the barriers indicated by respondents are surprising and fairly normal for similar surveys taken anywhere in the US.

Figure 5-9 Main Reason to Drive Alone

Main reason you choose to drive alone	
No one else is going in my direction/going with me	22.3%
Flexibility/want to be in control/come and go as I please	15.4%
It's faster	9.7%
Always have someone with me/additional passengers/kids	6.2%
Only option available/only way I can get there	4.8%
For job/work need to have my vehicle with me	4.5%
Prefer to travel alone/don't want company	4.4%
Convenient (not specific)	3.4%
Door to door service/gets me directly to my destination	3.1%
Ease of use (not specific)	2.9%
Prefer to/like to drive (not specific)	2.4%
Availability/stations/stops/goes where I need to go/"convenient to home and work	2.2%
Don't have to wait at stations/stops	1.5%
Have a number of stops to make/do errands	1.5%
Have baggage/groceries/tools for work to carry	1.1%
Affordability (not specific)	1.1%
Don't have to pay for parking	1.0%
Schedule/frequency/available when I need it	0.9%
Don't travel that often/that far	0.8%
Disabled/medical reason/old/manageable	0.7%
Comfort/more comfortable (not specific)	0.6%
Safety/feel safer	0.6%
Reliable/runs on time	0.6%
No need to transfer/make connections	0.4%
Don't have to park/find parking/parking can be a problem	0.4%
Not familiar with routes/schedules of other transportation	0.3%
Free/subsidized by work	0.3%
Parking provided by my job/easy parking	0.3%
To take advantage of the hov lane	0.2%
Don't have to deal with traffic/drive	0.1%
Better for the environment/fewer cars on the road	0.1%
Other	1.1%
Don't know/refused	5.0%

Main Reason to Drive Alone

Those who drive alone on their usual trip were asked specifically why they choose to drive alone. Many (22.3%) of the reasons given begged the question by simply answering that no one else was going in that direction, implying that they would be willing to drive with someone else, but that they would drive nevertheless. They were responding to the word "alone" rather than to the reasons for which they drive. Others indicated that they wanted flexibility to come and go as they please (15.4%), or that driving is faster (9.7%).

Figure 5-9 displays percentages of mentions. Each respondent could cite several reasons to drive alone. The percentages reflect all mentions of the reason. If instead, the figure reported the count of persons mentioning a particular topic, the results look different. The key reason to drive alone, cited by 33% of those who drive alone, is a combination of speed, flexibility, and comfort. If the terms "convenience" and "ease," are added together, the total percent of those who usually drive alone who mention these reasons to drive is 62%.

From the list of reasons offered, it is clear that most of the respondents who drive alone simply prefer driving. There is little inherent in most of these responses that would prevent a person from using public transportation. It is mostly a matter of perspective and attitude.

There are, only a few responses that would preclude the use of public transit, or at least make it very difficult. For example, 6.2% indicated that they have additional passengers, particularly children. Another 4.8% indicate that driving alone is their only option, and another 5% indicate that they must retain a vehicle with them at work. In addition, others indicate that they must carry tools for work, or baggage, while a few indicated they are disabled. However, for the most part the obstacles cited are attitudinal matters of preference for speed, comfort, and convenience, and not structural obstacles.

Figure 5-10 Main Reason to Slug or Carpool

Slugs or carpools	
Always have someone with me/additional passengers/kids	21.0%
It's faster	10.0%
Affordability (not specific)	8.1%
Flexibility/want to be in control/come and go as I please	5.9%
Ease of use (not specific)	5.0%
Don't have to pay for parking	4.8%
Don't have a car/drive anymore	4.3%
Only option available/only way I can get there	3.7%
Don't have to deal with traffic/drive	3.6%
To take advantage of the hov lane	3.5%
Door to door service/gets me directly to my destination	3.2%
Convenient (not specific)	2.7%
Comfort/more comfortable (not specific)	2.7%
Saves gas	2.5%
Prefer to/like to drive (not specific)	2.3%
For job/work need to have my vehicle with me	2.2%
Don't have to park/find parking/parking can be a problem	2.0%
Disabled/medical reason/old/manageable	1.7%
Don't travel that often/that far	1.4%
Have a number of stops to make/do errands	1.0%
Don't have to wait at stations/stops	1.0%
Better for the environment/fewer cars on the road	0.9%
Availability/stations/stops/goes where I need to go/"convenient to home and work	0.8%
Prefer to travel alone/don't want company	0.7%
Have baggage/groceries/tools for work to carry	0.7%
Schedule/frequency/available when I need it	0.6%
Safety/feel safer	0.4%
Reliable/runs on time	0.4%
No need to transfer/make connections	0.2%
Free/subsidized by work	0.2%
Saves wear and tear on my car	0.2%
Parking provided by my job/easy parking	0.2%
Not familiar with routes/schedules of other transportation	0.2%
Other	0.4%
Don't know/refused	1.5%

Main Reason to Slug or Carpool

Many reasons were given for carpooling and/or slugging. Perhaps surprisingly, affordability was only the third most frequently mentioned reason (8.1%). More common (10%) was the idea that it was faster (presumably than public transit) and that the traveler always had someone with them anyway (21%).

When the percentages are converted to the percent of persons rather than percent of multiple mentions, the findings indicate that of those who carpool or slug the percentage citing affordability remains constant at 8%.

Figure 5-11 Main Reason to Use Metrorail or Metrobus

Uses Metrorail or Metrobus	
Availability/stations/stops/goes where I need to go/"convenient to home and work	28.3%
It's faster	9.5%
Don't have to deal with traffic/drive	9.2%
Don't have to park/find parking/parking can be a problem	8.7%
Ease of use (not specific)	6.8%
Affordability (not specific)	4.7%
Only option available/only way I can get there	4.3%
Don't have to pay for parking	3.9%
Free/subsidized by work	3.1%
Door to door service/gets me directly to my destination	2.4%
Reliable/runs on time	2.1%
Schedule/frequency/available when I need it	2.0%
Don't have a car/drive anymore	1.9%
Convenient (not specific)	1.9%
No need to transfer/make connections	1.5%
Saves gas	1.5%
Not familiar with routes/schedules of other transportation	1.5%
Don't travel that often/that far	1.5%
For job/work need to have my vehicle with me	1.2%
Better for the environment/fewer cars on the road	1.2%
Have a number of stops to make/do errands	0.9%
Saves wear and tear on my car	0.7%
Comfort/more comfortable (not specific)	0.6%
Parking provided by my job/easy parking	0.3%
Safety/feel safer	0.0%
Other	0.2%
Don't know/refused	0.0%

Main Reason to Use Metrorail or Metrobus

Using Metro is apparently motivated primarily by its ready availability and convenience (28.3% of mentions), by its speed (9.5%) and avoidance of traffic (9.2%) and having to park (8.7%). Many mentions were made also of cost savings such as saving gas, saving wear and tear on a car, "affordable," and other terms.

Converted to the percentage of individual persons citing these advantages, 13% cite affordability expressed in one way or another, while 27% indicate they avoid traffic and parking by using Metro. However, 55% mentioned one term or another that spoke of convenience. From these findings it can be assumed that any similar service such as a ferry will have to be perceived as providing similar levels of convenience and affordability to the niche market that would make use of it, if travelers were choosing that mode over the predominant SOV.

Figure 3 Main Reason to Use OmniRide or VRE

Uses VRE or OmniRide	
Availability/stations/stops/goes where I need to go/"convenient to home and work	27.1%
Don't have to deal with traffic/drive	10.1%
Only option available/only way I can get there	8.2%
Door to door service/gets me directly to my destination	8.0%
Convenient (not specific)	6.7%
Ease of use (not specific)	6.0%
Don't have a car/drive anymore	6.0%
No need to transfer/make connections	5.1%
Affordability (not specific)	4.5%
Free/subsidized by work	4.2%
Don't travel that often/that far	3.2%
Don't have to park/find parking/parking can be a problem	2.8%
Reliable/runs on time	2.1%
Comfort/more comfortable (not specific)	1.7%
Schedule/frequency/available when I need it	1.6%
Flexibility/want to be in control/come and go as I please	0.7%
It's faster	0.7%
Don't have to pay for parking	0.7%
Other	0.7%

Main Reason to Use OmniRide or VRE

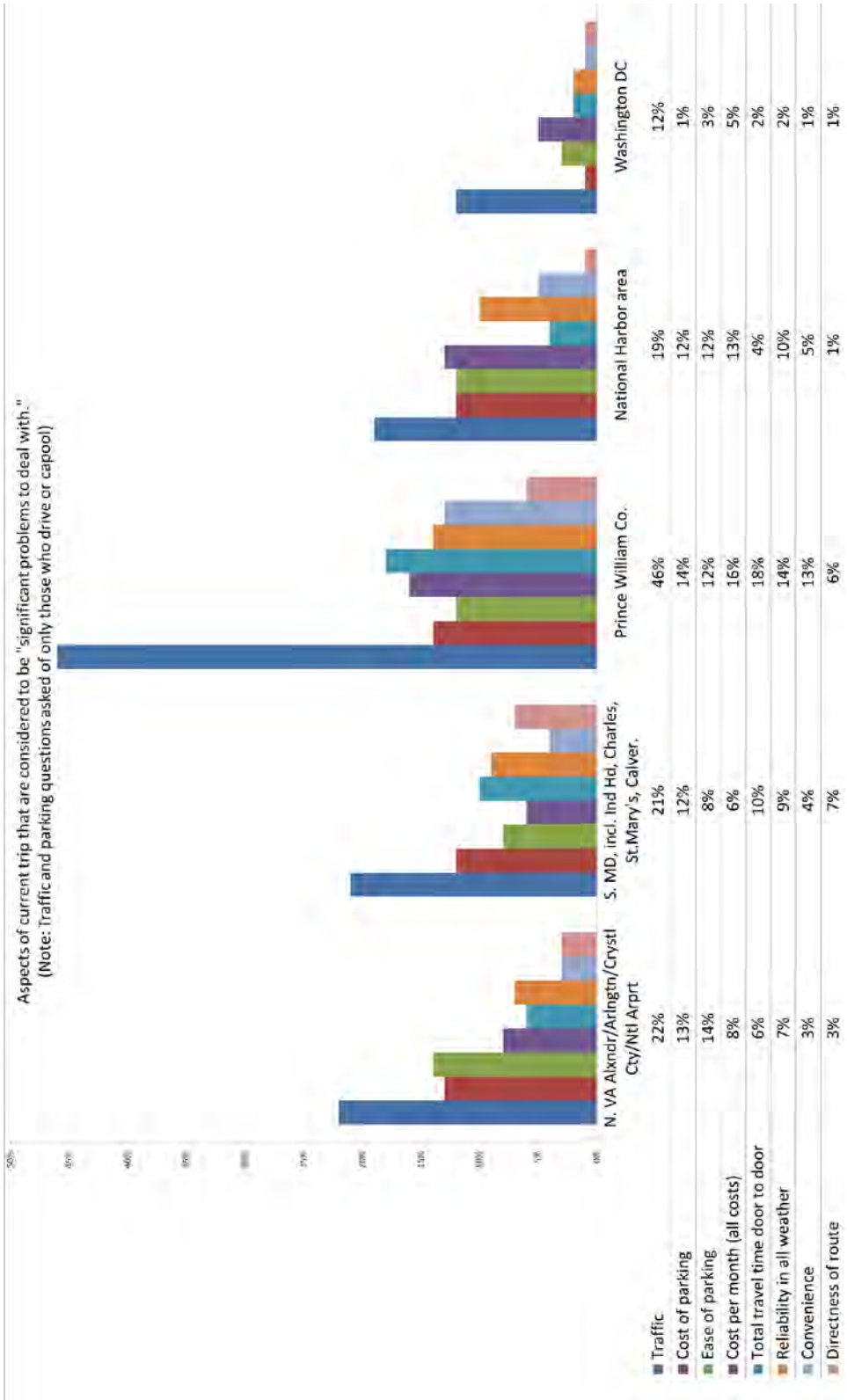
The reasons for using VRE or OmniRide also emphasize the availability and convenient location of these services (27.1%). Other reasons cited are related to convenience, such as "door to door service" (8.0%), non-specific mention of "convenience" (6.7%), and ease of use (6%).

Translated into the number of OmniRide/VRE users who mention convenience in some manner, the findings are that 47% cite some aspect of convenience, while 14% cite avoidance of traffic and/or parking. Only 7% cite any aspect of affordability.

Most of the comments concerning reasons to use a non-SOV mode involve convenience, including easy access to the mode. Avoiding traffic congestion, which one might assume would loom large in a corridor as congested as this one, perhaps is indirectly related to the perception of convenience, but it was cited less frequently than one might have thought it would be.

Trip Profile: Challenges, Costs, Duration

Figure 4 Aspects of current trip considered to be "significant problems to deal with."



Aspects of current trip considered to be "significant problems to deal with."

Respondents who usually drive were asked a series of eight questions about the challenges, including traffic and parking with which they must deal on their usual trip. Respondents who use public modes were asked the same questions, with the exception of dealing with traffic and parking. The wording of the question was “Thinking about the trips you make to (the name of their usual destination was inserted here) during a typical month, how would you rate several aspects of your current trips? Are they very easy to deal with, somewhat easy to deal with, a problem to deal with, or a significant problem to deal with?” The chart above shows only the percent responding that a given factor was a “significant problem to deal with.”

It was pointed out previously in this section that traffic was cited less frequently in open-end questioning than one might have expected as a reason to use alternative modes. However, it was the leading aspect of the trip in terms of respondents who usually drive citing it as a “significant problem.” This was especially true for respondents from Prince William County (46%) who must contend with the heavy traffic of the I-95 corridor, but to a lesser extent it was also true of the other markets surveyed. Moreover, the combination of traffic with the ease and costs of parking indicate substantial concerns with all of these aspects of driving.

All aspects of travel except for parking at the destination were perceived as more acute by respondents from Prince William County than by others, presumably because their trip is the longest and likely the most congested.

Figure 5-14 Sources of Concern with Existing Trip

Thinking about the trips you make to [INSERT SELECTED DESTINATION] during a typical month, how would you rate several aspects of your current trips? Are they very easy to deal with, somewhat easy to deal with, a problem to deal with or a significant problem to deal with?

		N. VA Alexandria/Arlington/Crystal City/Ntl Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC	All respondents
Traffic	A significant problem	22%	21%	46%	19%	12%	27%
	A problem	30%	39%	30%	27%	23%	32%
	Somewhat easy to deal with	30%	15%	18%	28%	39%	23%
	Very easy to deal with	19%	24%	7%	26%	26%	18%
Cost per month (all costs)	A significant problem	8%	6%	16%	13%	5%	10%
	A problem	16%	31%	26%	22%	10%	23%
	Somewhat easy to deal with	31%	28%	29%	21%	28%	29%
	Very easy to deal with	44%	36%	29%	44%	57%	39%
Ease of parking	A significant problem	14%	8%	12%	12%	3%	11%
	A problem	23%	17%	17%	9%	5%	17%
	Somewhat easy to deal with	18%	17%	17%	11%	27%	17%
	Very easy to deal with	46%	57%	55%	68%	65%	55%
Cost of parking	A significant problem	13%	12%	14%	12%	1%	12%
	A problem	20%	17%	16%	13%	6%	17%
	Somewhat easy to deal with	22%	18%	11%	7%	15%	16%
	Very easy to deal with	46%	53%	59%	68%	78%	55%
Total travel time door to door	A significant problem	6%	10%	18%	4%	2%	9%
	A problem	18%	20%	27%	21%	8%	20%
	Somewhat easy to deal with	40%	34%	30%	22%	32%	34%
	Very easy to deal with	36%	36%	25%	54%	58%	37%
Directness of route	A significant problem	3%	7%	6%	1%	1%	4%
	A problem	13%	14%	13%	17%	7%	14%
	Somewhat easy to deal with	28%	24%	24%	19%	17%	25%
	Very easy to deal with	56%	54%	58%	62%	74%	57%
Reliability in all weather	A significant problem	7%	9%	14%	10%	2%	9%
	A problem	21%	25%	26%	22%	19%	23%
	Somewhat easy to deal with	36%	28%	31%	29%	33%	32%
	Very easy to deal with	36%	38%	29%	39%	46%	36%
Convenience	A significant problem	3%	4%	13%	5%	1%	6%
	A problem	15%	13%	20%	12%	9%	15%
	Somewhat easy to deal with	28%	33%	26%	23%	26%	28%
	Very easy to deal with	54%	50%	42%	59%	64%	51%

Sources of Concern with Existing Trip

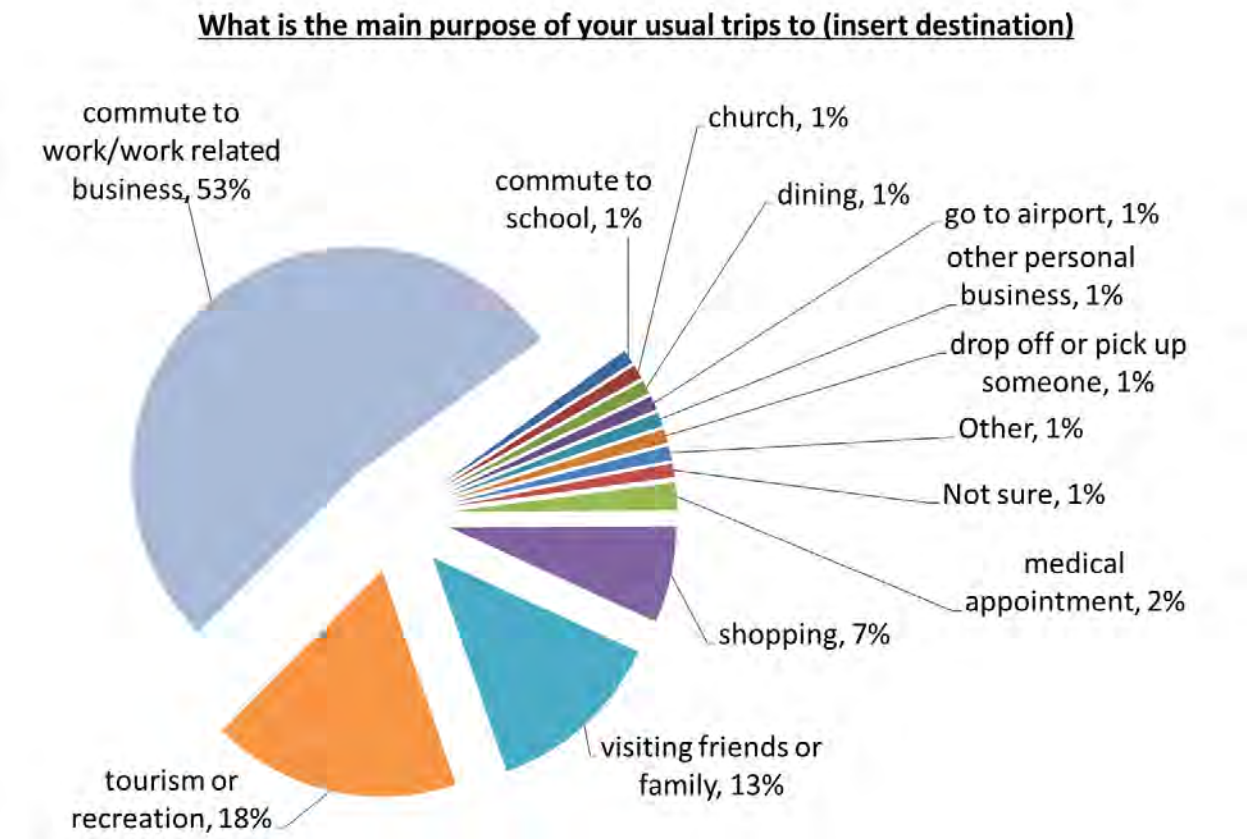
In Figure 5-14 a more detailed breakdown is provided to show subtleties in the responses to questions about problems faced during the usual trip. This chart also includes a summary column indicating the perceptions of all respondents taken together.

Considering only the column labeled “all respondents,” we can see that those who consider traffic to be either a problem or a significant problem total 60%, clearly the highest level of perceived problematic aspects of the trips under study. Total cost of the trips as the second highest percentage of people saying that poses a problem or a significant problem, with 33% falling into those categories. Clearly, then, traffic

is the major concern, with cost also playing a significant role. Other aspects also tend to fall in the same range, with 28% citing ease of parking and 32% reliability and weather concerns. Total travel time door-to-door and the cost of parking both show a perceived problem level of 29%. In addition he results indicate that overall convenience (21%) and directness of route (18%) have the lowest level of perceived problems.

Traffic congestion is the one aspect of current trips that is very widely perceived to be a problem by 60% of travelers. All other aspects are considered problematic by roughly 1/5 to 1/3 of the travelers in this market.

Figure 5 Trip purpose



Trip purpose

Slightly more than half the trips under study, 53%, involve commuting to work or to work-related business events. Another 1% involved commuting to school. Thus a total of 54% involve what we might consider regular, routine trips. Other trip purposes include tourism or recreation (18%), visiting friends or family (13%) and shopping (7%), all of which are, by nature, occasional trips.

Figure 5-16 Trip purpose by origin

What is the main purpose of your trips from (area shown) to [SELECTED DESTINATION]?

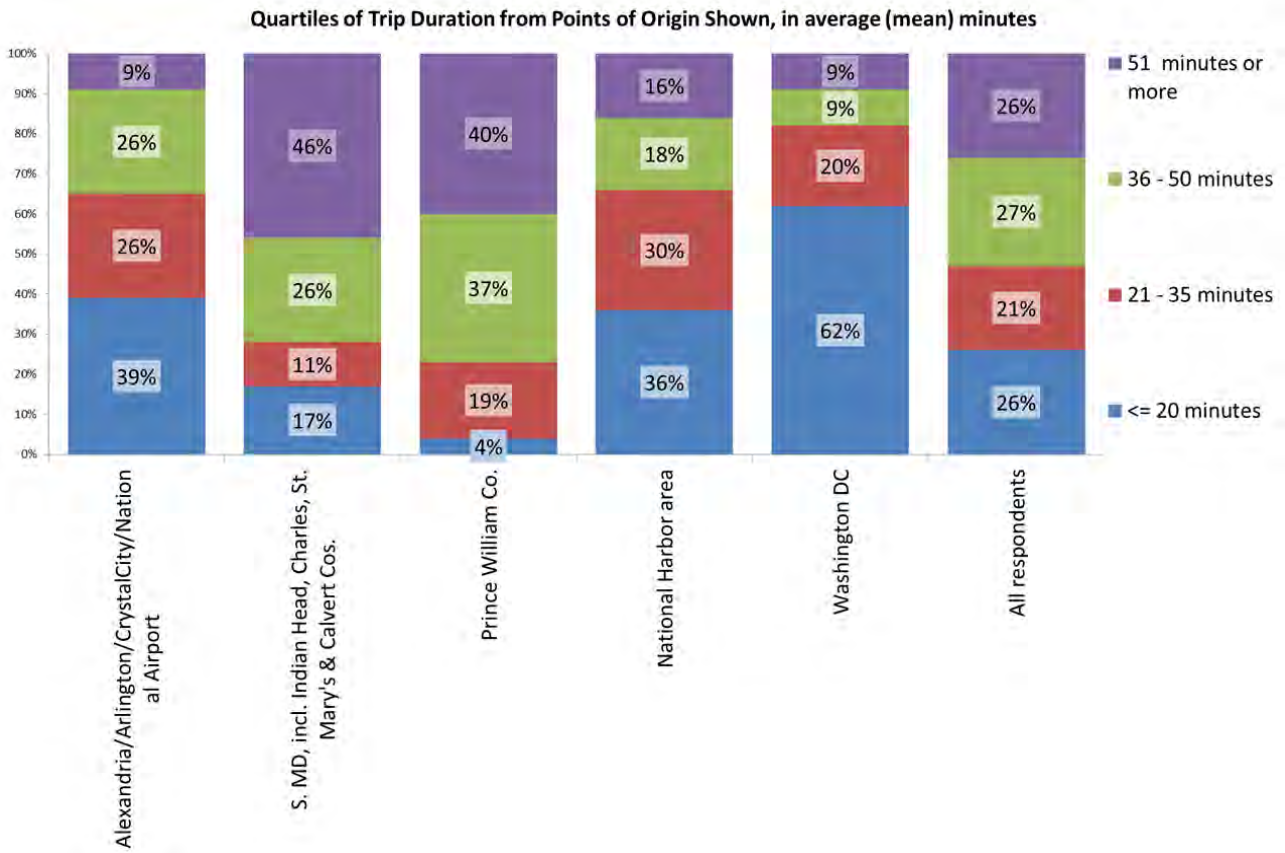
Which of the following areas best describes where you live?	Alexandria/Arlington/CrystalCity/National Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC	All respondents
commute to work/work related business	53%	50%	65%	51%	15%	53%
tourism or recreation	24%	20%	12%	6%	10%	18%
visiting friends or family	11%	18%	12%	17%	10%	13%
shopping	3%	4%	3%	15%	53%	7%
medical appointment	2%	4%	3%	2%	0%	2%
commute to school	1%	0%	0%	1%	1%	1%
church	1%	1%	0%	4%	0%	1%
dining	1%	0%	0%	0%	2%	1%
to catch a plane/go to airport	0%	0%	1%	0%	4%	1%
other personal business	1%	1%	1%	1%	0%	1%
dropping off/picking up someone (not specific)	0%	1%	1%	0%	0%	1%
Other	1%	0%	1%	2%	0%	1%
don't know/refused	2%	1%	1%	1%	4%	1%

Trip purpose by origin

The purpose of trips varies considerably depending upon the point of trip origin. Respondents who reside in the Washington DC area tended to say (53%) that their trips commonly involve shopping, while in other areas 50% percent or more indicated that the trips were work-related. Why this discrepancy? We can probably assume that many of the Washingtonians would not only live, but also work in the Washington DC area. As we saw in Figure 5-4, Washington DC residents were not asked about trips to Washington DC but only about their trips to other areas since these were the only trips germane to the purpose of the survey. Most of the responses to that question among Washington DC respondents indicated that their trips were to Arlington, Alexandria, Crystal City, or the Reagan National Airport area. This probably accounts for the observed differences.

Those who live in close proximity to the capital, specifically Washington DC, and the National Harbor area, are less likely than others to cite tourism or recreation as the reason for their trips, and more likely to cite shopping.

Figure 5-17 Trip duration (quartiles)

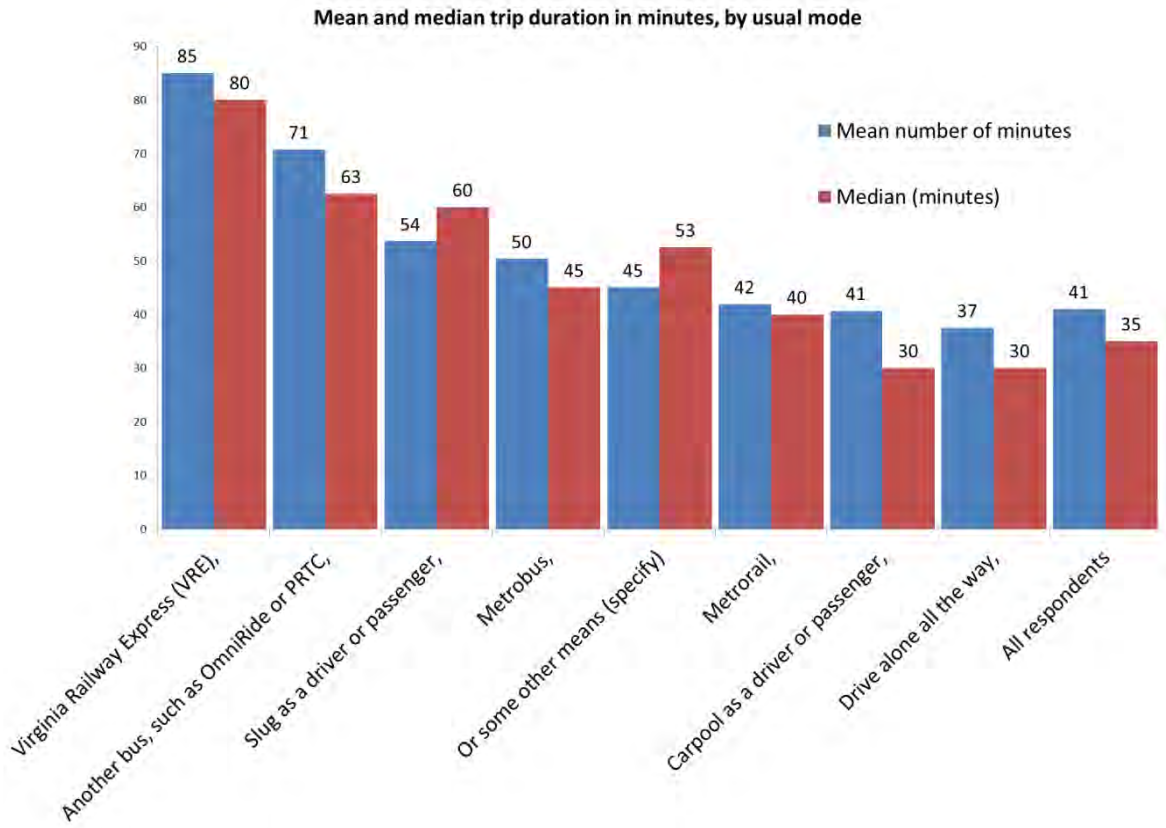


Trip duration (quartiles)

Respondents were asked to estimate the total number of minutes their trips took. Their various estimates were then divided into approximate quartiles as shown in the chart above in the column "All respondents."

The largest groups of travelers with short trips were the Washington DC residents, where 62% indicated that the trips took less than 20 minutes. As one would expect, the areas with the trips of longest duration were in southern Maryland, and in Prince William County. In those areas 46% in the southern Maryland area, and 40% in Prince William County indicated that their usual trip took 51 minutes, or more, and another 26% and 37% respectively, said that their trips took between 36 and 50 minutes.

Figure 5-18 Trip duration



Trip duration

We can look at trip duration also in terms of both mean and median number of minutes as shown in the chart above. In this case rather than breaking the trip duration down by point of origin, we have broken it down by mode. The trips of longest duration are on Virginia Railway Express (VRE) with the mean estimated duration of 85 minutes, and median of 80 minutes. With a median of 80 minutes, this indicates that more than half spend more than one hour and twenty minutes in travel. The next longest are on bus services such as OmniRide, with a mean indicated duration of 71 minutes, and median of 63 minutes.

Part of the reason for this extended duration is probably due to the mode, but more importantly it is also due to distance that a person must travel when using these services (see inset table).

Trip duration and point of origin

Which of the following areas best describes where you live?	Total trip time in Mean	Median
Alexandria/Arlington/CrystalCity/National Airport	32	30
S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	55	50
Prince William Co.	52	45
National Harbor area	35	30
Washington DC	27	20

One aspect of the perceived relative convenience of driving alone is the fact that, in spite of the traffic, the perceived mean duration of the trip is the shortest of all, at 37 minutes, with a median of 30 minutes.

Among all respondents taken together, the mean trip length is 41 minutes, and the median 35 minutes.

Figure 5-19 Estimated trip cost, by mode

	N. VA, Alexandria/Arlington/Crystal City/National Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC	All respon-dents
Drive or carpool						
No cost to $5.00	41%	15%	18%	28%	68%	27%
More than $5 to $10	24%	24%	39%	33%	17%	28%
More than $10	36%	62%	43%	39%	15%	45%
Bus or train						
No cost to $5.00	39%	15%	10%	30%	53%	31%
More than $5 to $10	53%	38%	8%	38%	38%	42%
More than $10	9%	47%	82%	33%	8%	27%
Any mode						
No cost to $5.00	40%	15%	16%	29%	64%	28%
More than $5 to $10	36%	25%	33%	34%	23%	32%
More than $10	24%	60%	51%	38%	13%	40%

Estimated trip cost, by mode

Respondents were also asked to estimate the cost of their trip. They were asked to include all aspects of the trip, not just gasoline, but parking, tolls, and any other costs to make a round trip from their usual point of origin to their usual destination and back. It is to be understood that people tend to underestimate the costs, particularly of driving. However, the figures they give represent their perceptions, and perceived cost is the primary factor in determining response to price. The dollar and cent costs given by the respondents were converted to whole dollars, and then broken into groups of 33% of the range of costs ranging from no cost to more than $10.

As one would expect, the estimated cost varies considerably, depending upon both mode and point of origin, with the highest costs for all modes being trips from southern Maryland and Prince William County. Trips from the National Harbor area also had high percentages in the highest cost category (more than $10). Presumably because of proximity, and the ready availability of public transportation, trips from Northern Virginia and Washington DC have the lowest cost profile.

Figure 5-20 Estimated current trip cost - detail by mode

Estimated cost per trip, by mode

Mode		q12a Total dollar and cent cost of trip by driving or carpool	q12b Total dollar and cent cost by train or bus
Drive alone all the way	Mean	$14.58	*
	Median	$10.00	*
Carpool as a driver or passenger	Mean	$15.35	*
	Median	$10.00	*
Slug as a driver or passenger	Mean	$11.26	*
	Median	$10.00	*
Metrorail	Mean	*	$8.93
	Median	*	$7.00
Metrobus	Mean	*	$5.86
	Median	*	$5.00
Another bus such as OmniRide or PRTC	Mean	*	$12.89
	Median	*	$12.00
Virginia Railway Express (VRE)	Mean	*	$18.20
	Median	*	$20.00
All respondents	Mean	$14.58	$9.10
	Median	$10.00	$7.00

Estimated current trip cost - detail by mode

When the estimated costs of travel are examined in detail, the results display the pattern in which automotive transport tends to be perceived as more costly than other modes. The exception is VRE which, at a mean of $18.20, and median of $20 is estimated to be the most expensive option. It is interesting to note that the estimated cost of carpooling is actually slightly higher, at $15.35 than driving alone at $14.58. One should probably not read much into that difference, but it is interesting to note that one might expect carpooling to be perceived as considerably less expensive for both drivers and riders, but that is not the case. It could also mean that those engaged in using carpool/slugging as a primary means to travel to work have more carefully considered the costs of driving alone and are, therefore, more in touch with what the real costs of driving might be. The median perceived cost of driving alone, carpooling, and slugging are all $10.

Metrorail and Metro bus are perceived to be the least expensive alternatives while the relatively long distance trips that would be taken on OmniRide or VRE are perceived to be the more costly alternative.

Interest In Trying Alternative Modes

Figure 5-21 History of having tried modes other than mode used most frequently

Modes tried by those who do not use a bus or train for their usual trip to the target destinations (78% of respondents)

		N. VA Alexandria/Arlington/CrystalCity/ National Airport	S. MD, incl. Indian Head, Charles, St. Mary's & Calvert Cos.	Prince William Co.	National Harbor area	Washington DC	All Respondents
q7 Have you ever seriously considered using a bus or train for all or part of this trip to [INSERT SELECTED DESTINATION]?	Yes	53%	37%	38%	29%	50%	42%
	No	46%	63%	62%	70%	50%	58%
	Don't recall	0%	1%	0%	1%	0%	0%
(Of those who considered it) q8 Have you actually used a bus or train, or have you just considered it?	Used	47%	22%	27%	24%	44%	32%
	Considered	6%	15%	11%	5%	6%	10%
Which of the following modes have you ever used for all or part of this trip to (insert destination)							
q8a Metrorail		39%	10%	11%	18%	38%	20%
q8b Metrobus		15%	4%	4%	9%	7%	8%
q8c Another bus such as OmniRide		4%	1%	9%	1%	1%	3%
q8d Virginia Railway Express		2%	0%	7%	0%	0%	2%

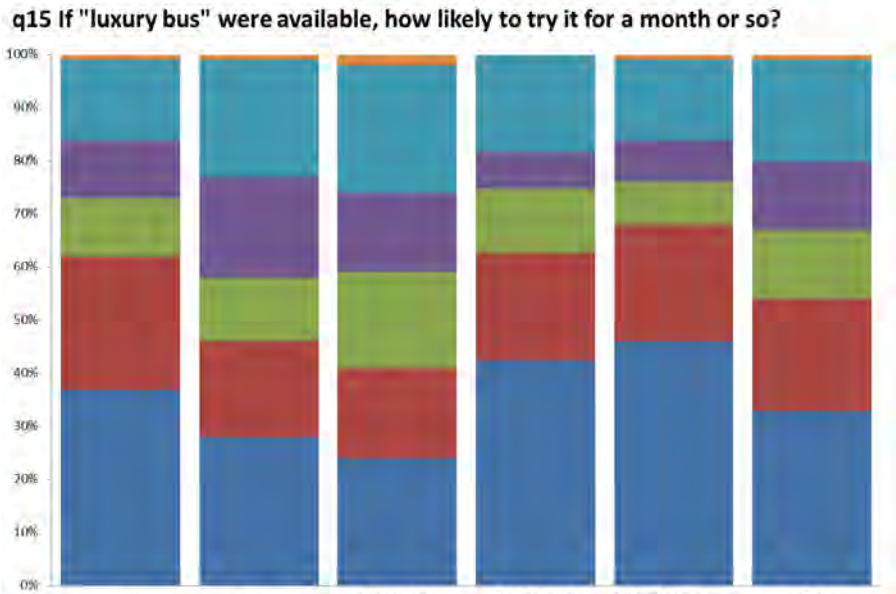
History of having tried modes other than the used most frequently

Respondents who do not use a bus or a train for their usual trip, including those who drive alone, carpool, or slug were asked whether they had ever seriously considered using a bus or train for all, or part, of their trip. If they indicated they had considered it, they were asked whether they had only considered it or actually had used the alternative, and, if so, which alternative(s) had they tried. Overall, 42% of all respondents indicated they had seriously considered alternatives. Fifty percent (50%) in the Washington DC and Northern Virginia samples indicated they had seriously considered alternatives. Among southern Maryland residents interviewed, 37%, and among Prince William County residents interviewed 38% indicated that they had seriously considered a bus or train. In addition 29% of the National Harbor area residents interviewed said they had considered these options.

When those groups are broken down into those that have only considered the alternatives and those that have used them, the survey found that the tendency has been to actually use them. Thus, for example, of the 53% of Northern Virginia residents who said they had seriously considered using a bus or train for all or part of their trip, 47% said that they had actually done so, and only 6% indicated that they had merely considered that option. Substantial proportions of respondents in other markets responded in the same manner, with considerable majorities saying that they had used an alternative as opposed to only considering it. The alternatives considered, of course, depend, in part, on the point of origin. Thus travelers from Prince William County were more likely than others to have used OmniRide or VRE. As one would expect, in the Northern Virginia and Washington, DC areas the dominant alternative considered and tried was Metrorail, which was considered and tried by 39% and 38%, respectively.

Even among those traveling from a distance, there was consideration of using Metrorail or Metro bus. For example, among travelers coming from Prince William County, 11% said they had considered using Metrorail and another 4% Metro bus. Probably, they had considered using those alternatives from a park-and-ride or as the last leg of a multimodal trip.

Figure 5-22 Interest in trying an alternate, traffic-free bus



	N. VA	S. MD	Prince William Co.	National Harbor area	Washington DC	All Respondents
Not sure	1%	1%	2%	0%	1%	1%
Definitely try it	15%	22%	24%	18%	15%	19%
Be very likely to try it	11%	19%	15%	7%	8%	13%
Be likely to try it	11%	12%	18%	12%	8%	13%
Be only somewhat likely to try it or	25%	18%	17%	20%	22%	21%
Would you not be likely to try it	37%	28%	24%	42%	46%	33%

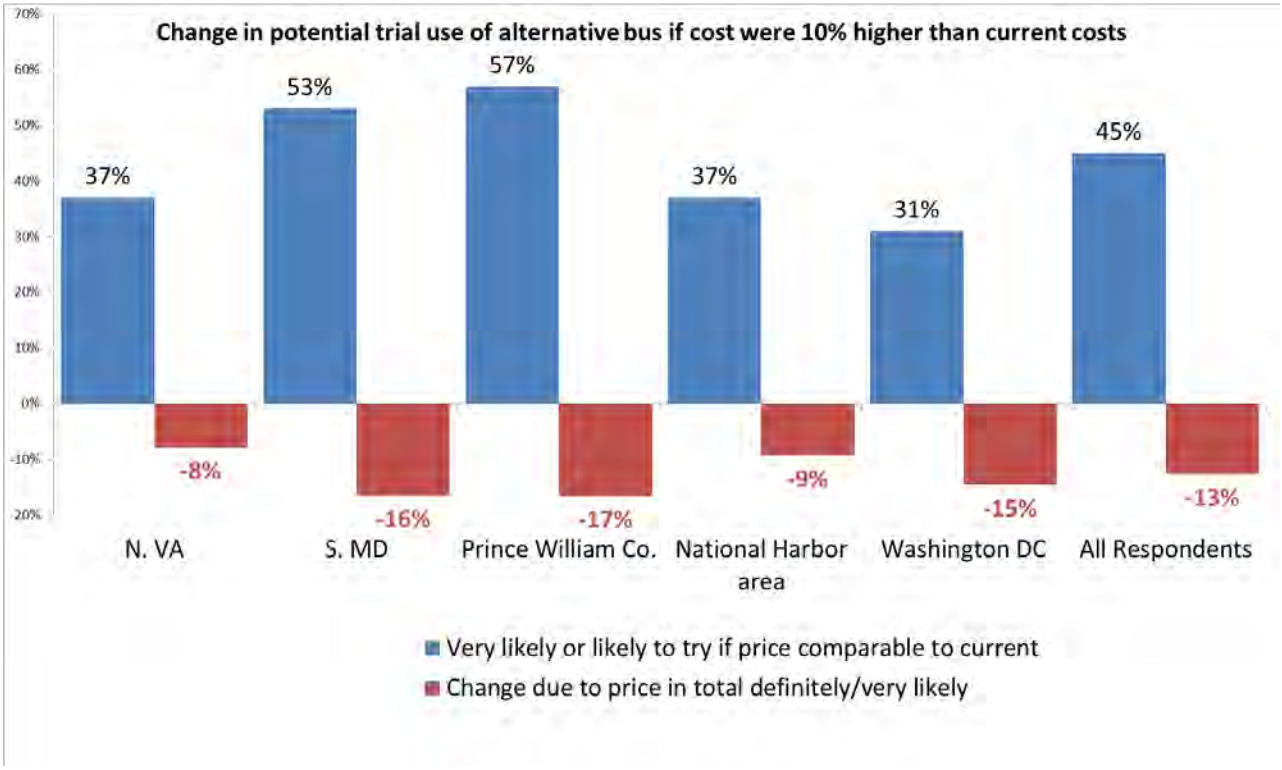
Interest in trying an alternate, traffic-free bus

In constructing the survey questionnaire, the research team acted on the assumption that respondents needed to be asked about a more familiar transportation option before being asked about a ferry service. The reason for this was that if they were asked about the ferry service and rejected it we would not know whether they had rejected it because of the uniqueness of and unfamiliarity with ferry service, or whether they were simply not interested in any alternative modes of travel. For this reason the team developed the hypothetical concept of a bus which would travel in a separate right-of-way without traffic and for which the fare would be comparable to what they were now incurring for their trips.

Although such a service is completely unrealistic, the respondent would not know that, and this would give us an opportunity to understand demand for traffic-free transportation apart from waterborne transportation. Respondents were not asked whether they would replace their current mode with such a hypothetical new service, but rather whether they would be likely to "try it for a month or so."

Among all respondents, 19% indicated they would definitely try it, while another 13% said they would be very likely to do so, and another 13% said they would be likely to try it. Others, totaling 54% indicated less willingness to try. Interest in the service was greatest in southern Maryland and Prince William County, where 22% and 24%, respectively, said they would definitely try it.

Figure 5-23 Price sensitivity of interest in trying an alternative bus service



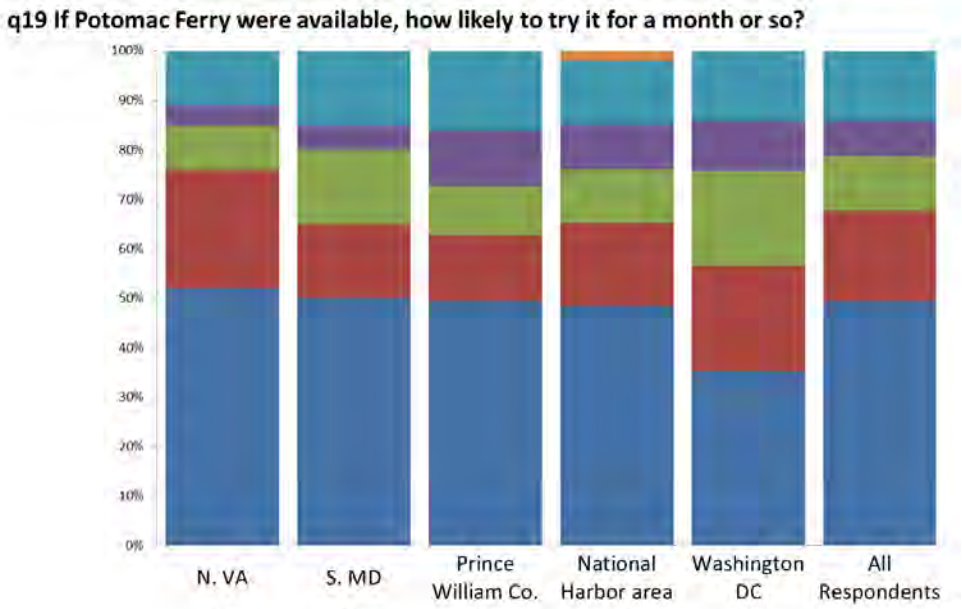
Price sensitivity of interest in trying an alternative bus service

Although as reported earlier that cost was not among the major concerns (Figure 5-13) price sensitivity is nevertheless a concern in substitution of mode. Price may not be a determining factor in most cases, but a major cost differential would certainly discourage potential users.

Those who said they would definitely try the alternative bus service, or were very likely or likely to do so, were asked if they would still do so if the price were 10% higher than they now pay. Given that most perceive that their cost for a round trip is in the order of $10 to $15, this would not be a large increase in absolute terms, but it could be significant in terms of consumer response.

Among all respondents, 45% indicated some likelihood of trying the service, and this was diminished by 13% when a cost increase was stipulated. This negative response varied from only 8% in Northern Virginia suburbs to 17% in Prince William County.

Figure 5-24 Interest in trying a ferry as an alternative, traffic-free mode



	N. VA	S. MD	Prince William Co.	National Harbor area	Washington DC	All Respondents
Not sure	0%	0%	0%	2%	0%	0%
Definitely try it	11%	15%	16%	13%	14%	14%
Be very likely to try it	4%	5%	11%	9%	10%	7%
Be likely to try it	9%	15%	10%	11%	19%	11%
Be only somewhat likely to try it or	24%	15%	13%	17%	21%	18%
Would you not be likely to try it	52%	50%	49%	49%	35%	49%

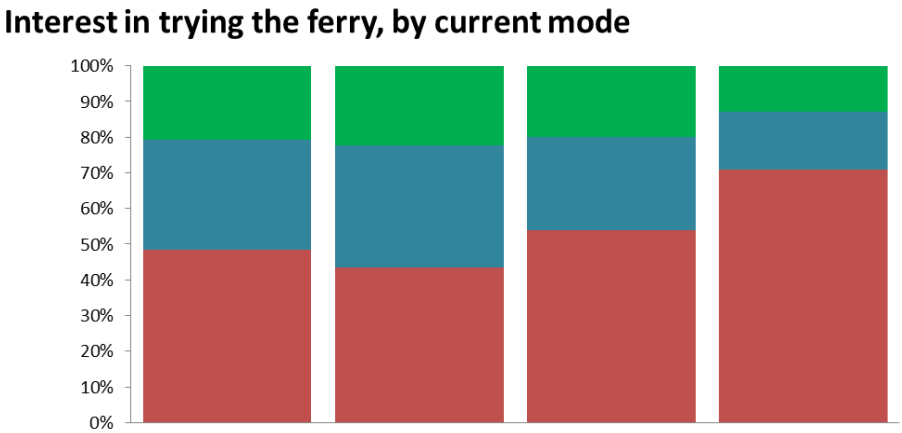
Interest in trying a ferry as an alternative, traffic-free mode

Having established that there is significant interest in an alternative mode of public transportation free of traffic, the questionnaire turned to the matter of ferry service on the Potomac River. Among respondents, there was a reduction in interest compared to the more familiar, even though hypothetical, concept of a bus operating in a dedicated, traffic-free roadway. While overall 19% indicated they would definitely try the bus service, this slipped to 14% in the case of the ferry.

The total percent saying they would definitely, be very likely, or likely to try the ferry service totals 32% compared to 45% for the comparable bus service. Therefore, the concept of using a ferry is in itself appealing to fewer people than an adaptation of existing modes of travel. The positive response to the ferry diminished in similar ways among the several market areas.

This is not to say that there is insignificant potential for the ferry. With 14% of the total area travelers and between 11% and 16% in each of the sub areas saying they would definitely try it, this is an indication that there is substantial interest.

Figure 5-25 Current mode and Interest in trying the ferry



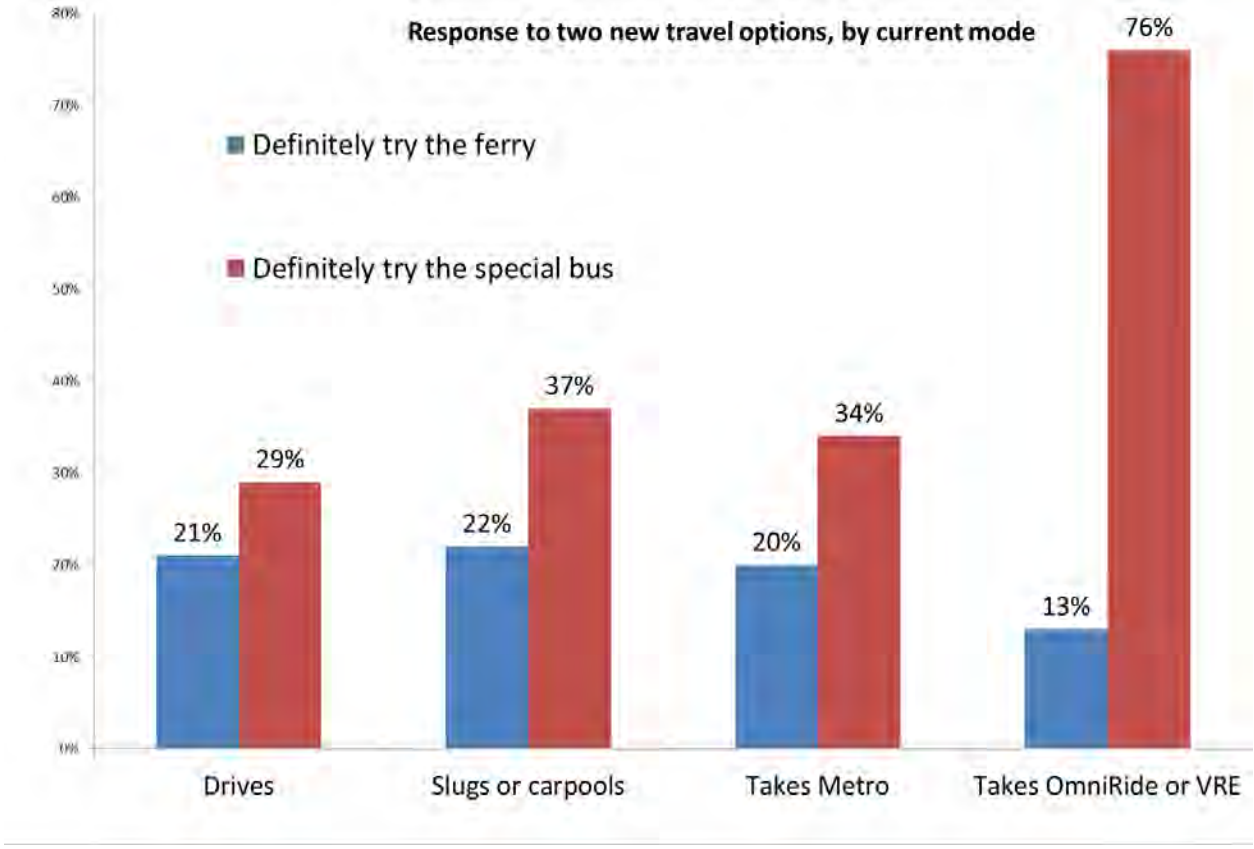
	Drives	Slugs or carpools	Takes Metro	Takes OmniRide or VRE
Definitely try	21%	22%	20%	13%
Very likely or likely	31%	34%	26%	16%
Only somewhat likely or not likely	49%	43%	54%	71%

Current mode and Interest in trying the ferry

How does the current mode used by travelers relate to the likelihood of trying a ferry? To simplify the table, the strongest category (definitely would try) was retained. Those saying they were very likely to try or likely to try it were combined, and the balance were combined into a set of persons who said they were only somewhat likely or unlikely to try the ferry.

Figure 5-25 indicates that those who already use OmniRide or VRE are less likely than others to be interested in trying the ferry, presumably because they believe they have already achieved a solution to their travel challenges. Among users of other modes, between 20% and 22% indicate that they have substantial interest. Given that more people drive (60%) then use any of the other modes, the fact that 21% indicated they would definitely try it is an indication that there is a significant potential market. Realization of that market potential would, of course, depend on many factors including ease of access to the service, proximity to travelers eventual destinations, costs, and other factors.

Figure 5-27 More likely to try ferry or special bus



More likely to try ferry or special bus

Preference is stronger for the hypothetical bus service than for the ferry regardless of current mode used. However, as has already been pointed out, the relative preference for the bus is much stronger among those who are already using an alternative mode. However, the number of people using those services is relatively small compared to the 60% who drive. For this reason it is clear that the 21% of those who drive alone and who say they are likely to try the ferry constitute a much larger potential market than the 13% who might be attracted from other transportation options.

Figure 5-27 Why would you prefer the bus over the ferry?

Why prefer the special bus service over the ferry?

Bus would be more direct	24%
Not a fan of the water/don't feel safe on the water/bus seems safer	15%
Ferry is not conveniently located to home/destinations not close to the water	15%
Bus would be faster	8%
Bus would have more stops available	7%
Familiar with bus/bus routes	6%
Would not have to transfer to other transportation	5%
Wouldn't want to use the ferry in inclement weather	4%
Bus would be more comfortable/relaxing	3%
Cost/bus would be less expensive	2%
Bus would be easier (not specific)	1%
Bus would have dedicated lanes	1%
Bus would be more reliable/run on time	1%
Too much unknown about the ferry	1%
Bus would run more frequently	1%
Convenient (not specific)	1%
Less traffic (not specific)	0%
Other	2%
Don't know	1%

Why would you prefer the bus over the ferry?

Respondents who expressed a greater likelihood of using the bus than the ferry were asked in an open-end manner why they held that preference. It is interesting that although respondents would seem to have no grounds for this conclusion based on the way in which the question was asked, that 24% of the reasons mentioned assumed that the bus would provide more direct service than the ferry. Possibly this is related to the fact that the ferry would inherently be coastal, whereas a bus would clearly travel somewhat inland. Another 15% of the reasons mentioned for preferring the bus involved the related concept of the distance from home to the water.

Some reasons given involved a sense of discomfort with taking a boat. Fifteen percent (15%) of reasons given specifically noted this sense of discomfort, and another 4% indicated they would not want to use the ferry in inclement weather. Others cited various reasons concluding that the bus would be the faster of the two or would have more available stops. Some indicated simply that they were more familiar with buses.

Figure 5-28 Why would you prefer the ferry over the bus?

Why prefer the ferry over the bus?	
It's different/a new experience	16%
Ferry would be closer to where i live/to my destination	13%
Like the water/ferries/boats	11%
Would be fun/enjoyable/entertaining	8%
Ferry would be more reliable/run on time	6%
Don't like buses (not specific)	5%
Relaxing/comfortable ride	4%
Pretty/scenic/can sightsee	4%
Can move around/out in the open/not confined	4%
Wouldn't have to drive/deal with traffic	4%
Ferry would be faster	4%
Would be exciting/an adventure/would try out of curio	3%
Convenient (not specific)	2%
Safer (not specific)	1%
Wouldn't be as crowded as the bus	1%
Familiar with ferries/popular elsewhere	1%
Don't have to worry about parking	1%
Not familiar with bus routes	1%
Makes more sense (not specific)	0%
Other	4%
Don't know	6%

Why would you prefer the ferry over the bus?

The reason given most frequently was simply that it is a different concept, a new experience (16%). Another 13% of reasons given indicated that the ferry would operate closer than their current mode to where they live or to their destinations. Another set of respondents, 11%, indicated that they simply like boats and the water, and 8% indicated that it would be enjoyable.

Figure 5-29 What would be the most important reason to try the ferry?

What would be the most important reason to try the ferry?
(Among those more likely to try it)

Not have to deal with traffic/do the driving	15.5%
Faster/to see if it was faster	10.3%
A different/a new experience	10.3%
Like the water/boats/ferries	9.3%
Stops where I need to go/depends on stops (not specific)	7.8%
Relaxing/comfortable ride/no stress	6.3%
Fun/entertaining/recreational	5.4%
Sounds good/I would try it (not specific)	4.0%
An alternate means of transportation	3.6%
Affordability/depends on cost	3.2%
If I was going to a game/to the stadium	3.1%
Kids/family would enjoy it	2.4%
Pretty/scenic ride	2.4%
No need to worry about parking	2.1%
Ease of use	1.9%
Non-stop/direct	1.6%
Convenient (not specific)	1.5%
Exciting/an adventure	1.4%
Amenities	1.3%
Ambiance/romance	1.1%
Save wear and tear on my car	0.9%
If I were going to the airport	0.8%
Saves gas	0.8%
Reliability/if it runs on time	0.7%
Safety (not specific)	0.6%
Better for the environment/fewer cars on the road	0.6%
If I were commuting on a regular basis	0.1%

What would be the most important reason to try the ferry?

Those who indicated that they were at least likely to try the ferry were asked what the most important reason would be to try the ferry. More of the reasons given involved not having to deal with traffic or do the driving (15.5%) than any other response. In addition 6.3% indicated that it would be relaxing and without stress. Various other responses reflected advantages such as no need to worry about parking, that they assumed it would be "nonstop" and "direct," that it would seem convenient. A few reasons given involved the fascination with something new. Thus, for example 10.3% said they thought that it might be faster they would try it to see if it was faster, or that it was simply a different and new experience, also 10.3%. Another 9.3% simply said that they liked boats, while a few said that it seemed exciting, and adventurous (1.4%) or even romantic (1.1%).

Figure 5-30 Among those interested in trying the ferry, for what reasons might it NOT be worth trying?

On the other hand, for what reasons do you think the ferry might not be worth trying? (Among those more likely to try it)	
Need transportation to/from ferry	14.2%
Uncomfortable with baggage/groceries/tools for work	10.5%
Disabled/medical reason/old/can't manage	8.4%
Time/would take longer/not save any time	6.4%
Schedule/frequency/not available when I need it (not specific)	5.9%
Affordability/depends on cost/would not save any money	5.3%
Concerned about traveling in inclement weather	4.2%
Happy with present transportation (not specific)	3.7%
Not direct/door to door service	3.6%
For job/work need to have my vehicle with me	3.4%
Don't commute on a regular basis	2.8%
Don't travel that far/that often	2.4%
Prefer to drive/like to drive (not specific)	2.3%
Don't like waiting/might have to wait for next ferry	1.1%
Not fond of the water/don't feel safe/don't like boats/ferries	1.0%
Not convenient (not specific)	0.9%
Would be overcrowded	0.5%
Would have to transfer/make connections	0.4%
Would have to worry about parking	0.4%
Faster to drive	0.3%
Would have to pay for parking	0.1%
Metro is convenient for me/use the Metro	0.1%
None/no reason	18.3%
Don't know/refused	3.7%

Among those interested in trying the ferry, for what reasons might it NOT be worth trying?

Those who indicated they were likely to try the ferry were also asked why it might not be worth trying. Not unexpectedly, the reason given most often (14.2% of reasons mentioned) was that the traveler would have to get to the ferry and from the ferry to the destination. A second reason was one common to all surveys of potential users of transit, that using the service would make carrying things like baggage or tools difficult (10.5%). Some (8.4%) indicated that a disability might prevent them from using it.

Some indicated that lack of speed or scheduling might present problems. A few, expressed concern about inclement weather (4.2%) or simply that they were uncomfortable on the water (1%).

Figure 5-31 If a friend told you about ferry service, what questions might you ask?

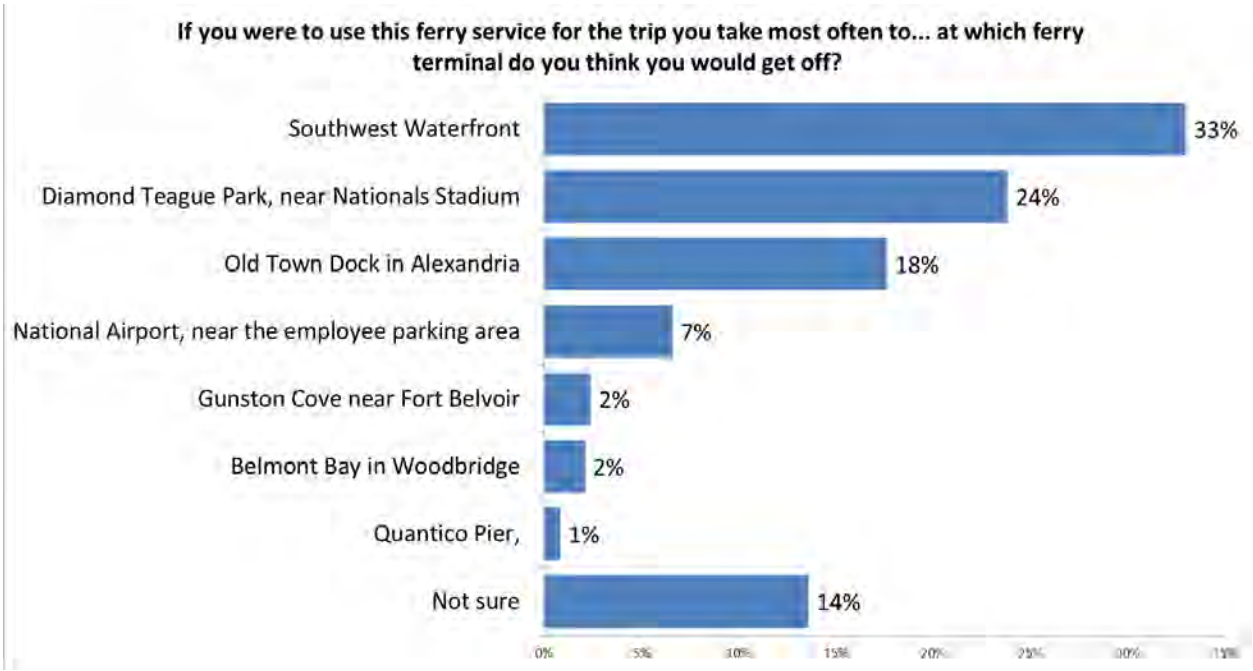
Questions you would have about ferry service?

Cost	20.3%
Schedule/frequency/how often it runs	13.0%
How long does it take/is it quick/did it shorten your commute	12.0%
Pick-up/drop-off/where does it dock/leave from/go to	10.6%
Did they enjoy it/was it worth it	3.8%
How difficult to get from dock to where you need to go/will other transportation be coordinated with it	3.1%
How safe is it/did you feel safe	2.8%
Is it reliable/does it run on time	2.4%
Parking/where would you park/is parking available	2.2%
What about inclement weather/are you protected in inclement weather	2.2%
Would it be crowded/was it crowded	2.0%
Would it be comfortable/was it comfortable (not specific)	1.7%
Were there amenities/tea/coffee/wifi	1.3%
How big is it/what is the capacity	1.2%
How much does parking cost	0.9%
How do i find more about it	0.8%
What is the company providing the service	0.7%
How soon will the service be available	0.6%
Do you have to stand/were there seats	0.6%
Can you buy a monthly pass	0.6%
Was it a smooth ride/did you get sick	0.6%
How was the customer service	0.5%
Can you use a metrocard/smartcard	0.4%
Was it better than driving	0.4%
What are the credentials/training of the crew	0.4%
Ease of use (not specific)	0.4%
Is it child friendly/can i bring my kids	0.3%
How/where do you sign up/get tickets	0.3%
Was it easy to board/get on and off	0.3%
What did you see/was it scenic	0.3%
The other passengers/what were they like	0.2%
Was it clean	0.2%
Do they allow bicycles	0.2%
Other	2.5%
None/not interested	7.5%
Don't know	2.9%

If a friend told you about ferry service, what questions might you ask?

Respondents were asked what questions they might have if a friend told them about a ferry service.The major questions a potential user might ask about a ferry service tend not to be unique to a ferry, but to revolve around practicalities central to any public transportation service, cost, schedule, speed, and access. Of course there are also questions particular to a ferry service such as aspects of docking and weather. But, in general, the questions involved either basic transportation matters or matters of simple curiosity about an unfamiliar, but interesting, concept.

Figure 5-32 Likely terminal



Likely terminal

Respondents were read a list of terminals and asked at which one they thought they would leave the ferry. Three locations stood out in this respect, the Southwest Waterfront (33%), the Diamond Teague Park/Nationals' Stadium (24%), and Old Town Dock in Alexandria (18%).

Figure 5-33 Mode from ferry to destination

How would get from ferry to final destination?	
Walk	21.4%
Metrorail	20.5%
Metrobus	16.8%
Taxi	11.1%
Car/drive myself	4.2%
Picked up by family member/friend	3.6%
Another bus such as OmniRide	3.1%
Shuttle bus/Old Town shuttle	2.2%
Bus (not specific)	1.9%
Bike	1.1%
VRE	0.4%
Trolley	0.2%
Other	0.9%
Don't know/refused	12.6%

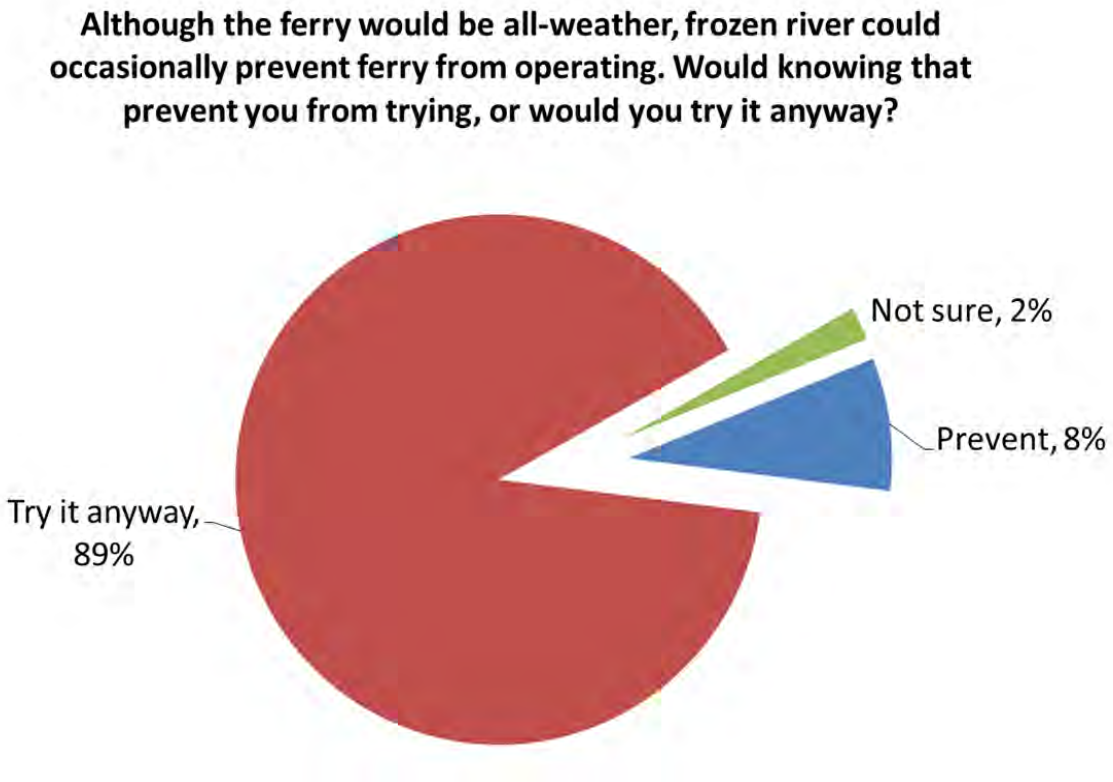
Mode from ferry to destination

A key to any service such as this is the "last mile" challenge. Those who said they were at least "somewhat likely" to use the ferry were asked how they would get from their point of disembarkation to their final destination. Most were able to respond clearly, although 13% indicated they were unsure.

For the most part, the trips would be from southern origins to northern urban destinations. Thus the metro system would play a large part, as would walking. The modes once leaving a ferry include walking (21%), Metrorail (21%), Metrobus (17%), the shuttle buses (2%) bus (not specific to Metrobus or shuttle, 2%), being picked up (4%), and bike (1%). For occasional trips, a taxi could suffice (11%). It might be feasible to combine a ferry trip from north to south with VRE or OmniRide, though these would appear to be unlikely combinations. It seems unlikely, however, that a traveler could drive him or herself (4.2%) since the ferry was described in the question as a passenger ferry only.

The vast majority of those with at least some interest in the ferry appear to have a reasonable idea of how they could proceed from the ferry to their final destinations.

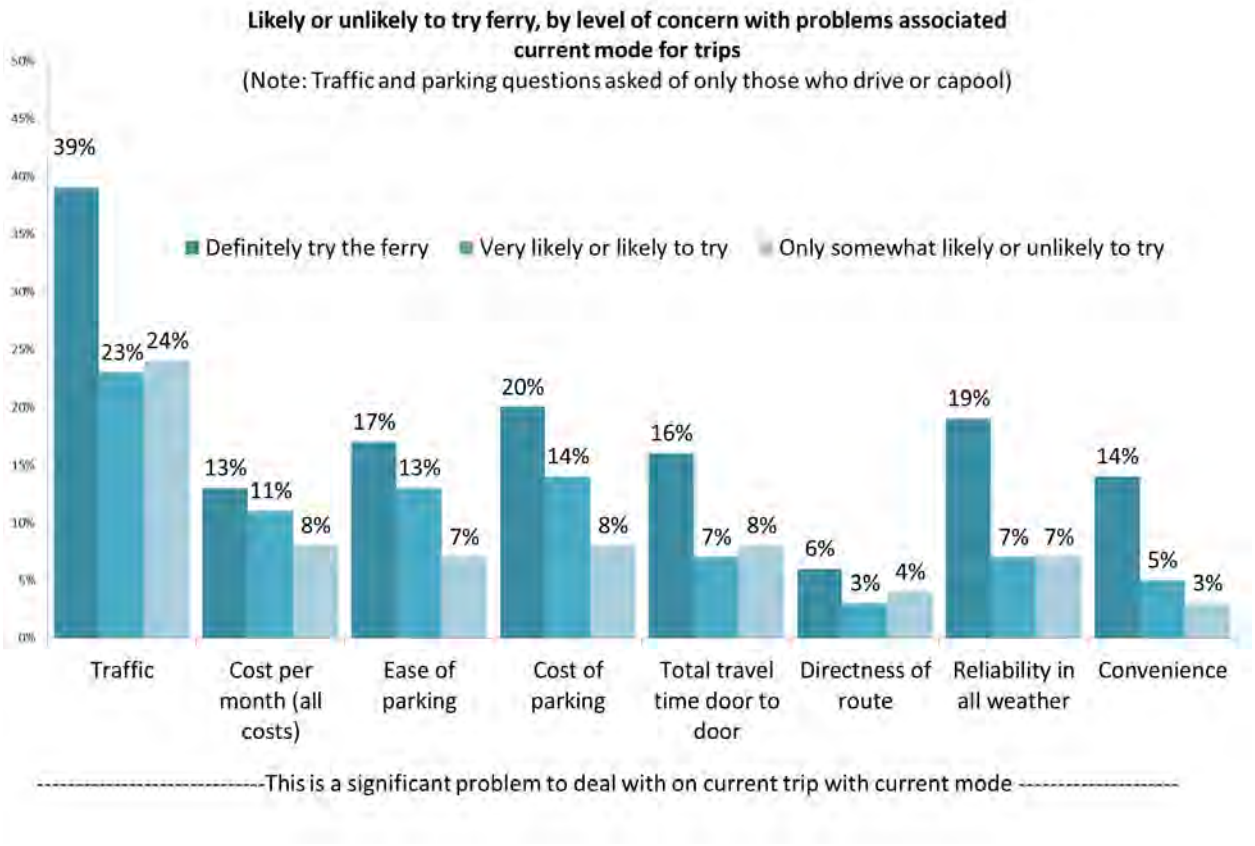
Figure 5-34 Ice and the ferry



Ice and the ferry

The potential disruption of service by freezing of the river could be a matter of concern to potential users of ferry service. Respondents who said they were very likely to try the ferry or who would definitely do so were asked whether they would still try the ferry knowing that occasionally the freezing of the river could disrupt service. Overwhelmingly (89%) they indicated it would not deter them.

Figure 5-35 Interest in trying ferry by "significant problems" to deal with on current trips



Interest in trying ferry by "significant problems" to deal with on current trips

Is interest in the possibility of using a ferry at all related to the perception of current problems faced in making trips in the area? Yes, to some extent, but primarily with regard to traffic congestion. The chart above includes only those who consider each aspect of a trip to be a significant problem. The chart breaks these travelers down according to the likelihood that they would try using a ferry.

The basic message of the chart is that those who consider each problem cited in the chart to be a "significant problem to deal with" are more likely to say they would definitely try the ferry than that they would be less likely to try it or unlikely to try it. This is especially true of traffic problems. Among those who said they consider traffic congestion to be a significant problem, 39% said they would definitely try the ferry while 24% said they would be only somewhat likely or unlikely to try it. In each case those who consider the problem to be significant are more likely to say they would definitely try the ferry.

One of these relationships seems paradoxical. Those who consider reliability in all weather conditions to be a significant problem were considerably more likely than others to say they would definitely try the ferry. In other cases, however, (cost, directness of route) the difference is negligible.

Figure 5-36 A "Problem Index" and interest in trying the ferry

If ferry service were provided, how likely to try it for a month or so?

	Definitely try it	Very likely or likeloy to try it	Only somewhat likely or unllikely to try it
High problem perception	50%	42%	31%
Moderate problem perception	30%	33%	33%
Low level problem percepetion	21%	25%	36%

A "Problem Index" and interest in trying the ferry

Another way to think about the relationship among perceived problems and interest in trying the ferry is to combine all of the perceived travel problems into a single composite "index" of problem perceptions. This is done very simply by taking the sum of all the "problem scores." This assumes, of course, that all problems have the same weight. But it does give a general idea of who perceives a constellation of travel problems, and who does not. For simplicity of presentation the scores are broken down into high, moderate, and low sets which include, respectively, 39%, 32% and 29% of all respondents, or roughly thirds of all respondents in each "problem" group.

When those with a high problem perception score are compared with those having a low score, one can see that while the relationship is not perfect, in general, the higher the problem score, the greater likelihood that the respondents will feel they want to try the ferry. The sense one gets from this table is that those who perceive a constellation of problems are looking for a way out. In this sense the specifics of individual challenges such as reliability in all weather and cost and directness of routes etc., are less important than the overall perception.

Figure 5-37 Detail of interest in trying ferry by "significant problems" to deal with on current trips

Thinking about the trips you make to [INSERT SELECTED DESTINATION] during a typical month, how would you rate several aspects of your current trips? Are they very easy to deal with, somewhat easy to deal with, a problem to deal with or a significant problem to deal with?

		Definitely try the ferry	Very likely, likely to try	Only somewhat likely or unlikely to try	All respon-dents
Traffic	A significant problem	39%	23%	24%	27%
	A problem	27%	28%	36%	32%
	Somewhat easy to deal with	15%	30%	22%	23%
	Very easy to deal with	19%	18%	18%	18%
Cost per month (all costs)	A significant problem	13%	11%	8%	10%
	A problem	22%	27%	21%	23%
	Somewhat easy to deal with	28%	30%	28%	29%
	Very easy to deal with	38%	33%	44%	39%
Ease of parking	A significant problem	17%	13%	7%	11%
	A problem	20%	20%	14%	17%
	Somewhat easy to deal with	16%	21%	15%	17%
	Very easy to deal with	47%	46%	64%	55%
Cost of parking	A significant problem	20%	14%	8%	12%
	A problem	14%	25%	12%	17%
	Somewhat easy to deal with	20%	16%	15%	16%
	Very easy to deal with	47%	45%	66%	55%
Total travel time door to	A significant problem	16%	7%	8%	9%
	A problem	25%	21%	18%	20%
	Somewhat easy to deal with	26%	38%	34%	34%
	Very easy to deal with	33%	34%	40%	37%
Directness of route	A significant problem	6%	3%	4%	4%
	A problem	18%	11%	13%	14%
	Somewhat easy to deal with	22%	30%	23%	25%
	Very easy to deal with	55%	56%	59%	57%
Reliability in all weather	A significant problem	19%	7%	7%	9%
	A problem	21%	23%	23%	23%
	Somewhat easy to deal with	32%	36%	30%	32%
	Very easy to deal with	28%	34%	40%	36%
Convenience	A significant problem	14%	5%	3%	6%
	A problem	20%	14%	14%	15%
	Somewhat easy to deal with	19%	34%	29%	28%
	Very easy to deal with	47%	48%	55%	51%

Detail of interest in trying ferry by "significant problems" to deal with on current trips

The table above requires no extended comment. It simply provides additional detail in support of the discussion of Figure 5-36.

Demographics of Those Interested in Trying the Ferry

Figure 5-38 Demographics: Demographic characteristics of those interested (or not) in trying the ferry

Demographics of the more and less likely ferry user				
Characteristics of the ferry user groups (Read % vertically)		Definitely try the ferry	Very likely, likely to try	Only somewhat likely or unlikely to try
Employment	Employed outside the home	51%	50%	49%
	Employed and student	8%	4%	8%
	Student only	5%	5%	2%
	Federal employee	15%	22%	25%
	Active military	2%	6%	3%
	Homemaker or retired	18%	13%	13%
Age quartiles	<= 36	17%	36%	27%
	37 - 43	24%	23%	23%
	44 - 55	34%	21%	25%
	56+	26%	20%	26%
Gender	Male	41%	35%	37%
	Female	59%	65%	63%
Annual household income	Less than $30,000	8%	7%	4%
	$30 to <$75,000	29%	27%	21%
	$75 to <$150,000	36%	38%	46%
	$150,000 or more	26%	28%	29%
Education	Elementary School	1%	2%	1%
	High school	15%	12%	10%
	Some college	19%	16%	12%
	Two year college	5%	6%	5%
	Four year college	26%	25%	32%
	Graduate degree	34%	39%	40%
Ethnicity	African-American	40%	30%	29%
	American indian or Alaska Native	0%	1%	2%
	Asian	5%	6%	2%
	Native Hawaian	0%	1%	1%
	White	46%	47%	55%
	Other	9%	12%	6%
	Refused	1%	2%	5%

Demographics: The demographic characteristics of those interested (or not) in trying the ferry

There are no strong and distinctive demographic patterns related to likely use of a ferry. Several relationships have statistical significance, although none are very strong. Among those who are relatively more likely to try the ferry there is a *slightly* greater tendency to:

- Have household incomes below $75,000.
- Have education below the level of a two-year college degree.
- Consider themselves African-American.

There is no statistical significance in the relationships by age, employment, or gender.

Figure 5-39 Demographics: Interest in ferry within demographic segments

Interest in trying the ferry within the several demographic segments

Likely use of the ferry by each demographic group (Read % left to right)		Definitely try the ferry	Very likely, likely to try	Only somewhat likely or unlikely to try
Employment	Employed outside the home	21%	30%	49%
	Employed and student	25%	19%	57%
	Student only	30%	45%	25%
	Federal employee	14%	29%	57%
	Active military	12%	46%	43%
	Homemaker or retired	26%	28%	45%
Age quartiles	<= 36	12%	39%	49%
	37 - 43	21%	30%	49%
	44 - 55	27%	25%	48%
	56+	22%	25%	53%
Gender	Male	23%	28%	49%
	Female	19%	31%	49%
Annual household income				
	Less than $30,000	32%	36%	32%
	$30 to <$75,000	25%	33%	42%
	$75 to <$150,000	19%	28%	53%
	$150,000 or more	20%	30%	50%
Education	Elementary School	7%	50%	43%
	High school	27%	31%	41%
	Some college	27%	33%	40%
	Two year college	19%	34%	47%
	Four year college	18%	27%	55%
	Graduate degree	18%	30%	52%
Ethnicity	African-American	26%	28%	46%
	American indian or Alaska Native	7%	24%	69%
	Asian	26%	46%	29%
	Native Hawaian	0%	46%	54%
	White	18%	28%	54%
	Other	22%	43%	35%

Demographics: Interest in ferry within demographic segments

Examining the differences within the demographics groups in the tendency to be interested in trying the ferry reinforces the picture describe in Figure 5-38. For example, of those identifying themselves as African-American, 26% indicated they would definitely try a ferry, while 46% would be quite unlikely to try it. For those considering themselves to be white, the comparable percentages are 18% and 54%.

In other words, a slightly higher percentage of the African-American than the white population say they would definitely try the ferry, although the difference is relatively small.

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6 COST MODEL FORMATION

WHAT IS A COST MODEL

The cost model provides a tool to assess combinations of fixed characteristics with respect to vessels, routes or corridors, service levels and fare levels. The results of the model are the operating and capital costs and the ridership required to meet specific levels of farebox recovery based on the fixed factors. The cost model does not predict ridership response, that is covered in the next section and entails using the MWCOG regional travel demand model and pivot point analytical techniques.

FERRY VESSEL SELECTION AND COSTS

A selection of generic ferry vessels were "constructed" for use in this analysis and are described in Figure 6-1. These generic vessels are roughly patterned after the vessel pictured in Figure 6-2 and the assumptions about capital cost, crew compliment, speed, and fuel consumption were vetted with the owner of the Sophie, Potomac Riverboat Company. Early in the analysis, it appeared that smaller vessels, with less draft and lower passenger capacities would be more suitable to what was rising to the top as the most likely corridors. Consequently, the generic ferry vessels were sized accordingly. Larger vessels than those shown below are certainly possible, although the draft and wake/wave propagation characteristics become increasingly less suited to operating on the Potomac River as well as less suited to the intended service.

Figure 6-1 Generic Vessel Characteristics

Characteristic	Sea Shuttle	Sea Shuttle EX	Long Distance	Long Distance EX
Passenger capacity	35	49	75	120
Speed (MPH)	29	34.3	34.3	34.3
Assummed lifecycle (years)	12	12	12	12
Unit costs				
Capital cost (millions)	$ 0.70	$ 0.98	$ 2.06	$ 3.30
Operating, exc fuel, incl annual main.	$ 110.00	$ 110.00	$ 125.00	$ 150.00
Regular Mainenance	$ 12.00	$ 12.00	$ 20.00	$ 30.00
Lube oil and Consummables	$ 3.00	$ 3.00	$ 5.00	$ 5.00
Crew Cost	$ 95.00	$ 95.00	$ 100.00	$ 115.00
Fuel consumtion (gals per hour)	60	70	80	85

Figure 6-2 Model Vessel Photos

CORRIDOR COST MODEL

The corridor cost model then contains the characteristics of the corridor (distance and operating time) which are combined with the vessel characteristics and the service characteristics (frequency, span of service, days of week) which then provides results for the cost characteristics of the service. An assumed fare per trip can then be entered which will result in the model displaying the level of ridership (annual, per weekday and per weekday trip) required to reach various farebox recovery levels.

Obviously, there are many, many permutations and combinations of this model that can be run and many were in the course of completing the study. What is shown is a relative optimization to test differing levels of fare against different levels of service to see what ridership would be required to reach various levels of farebox recovery. These levels of fare and service were then used in the next step of the process, described in Section 7, to assess the actual demand for the service. Some sample cost model output is displayed in Figure 6-3, simply to show the parameters of the cost model. The actual data used in the demand determination is included within Section 7 of the document. In Figure 6-3, cells with a yellow highlight represent fixed parameters that are entered by the model user. The green highlighted cells are fields that are calculated by the model based on the parameters entered.

It should be noted that the fare level simply generates an assumed amount of total revenue, it does not take into account actual demand or price sensitivity. What it does do, however, is allow a process of equilibration to test service and fare levels against possible levels of ridership and, perhaps more importantly ensures that the vessel capacity (see passengers per trip in the bottom row) is sufficient to carry the required number of customers. This helps to ensure the cost versus carrying capacity of the corridor are in balance and that a situation is not occurring where a vessel cannot, due to capacity constraints, carry enough people on each trip to balance operating expense when a reasonable fare is charged. The opposite can also happen where the vessel is oversized for the potential demand at a given fare level and the result is a level of ridership required that would be improbable given the corridor. This process of equilibration was informed by current transit characteristics in the area including fare levels and the current level of demand between points in the network. This helped to ensure the assumptions were not an outlier or what was being analyzed was beyond the potential demand in the corridor. Importantly, this equilibration effort provided an informed starting point for the pivot point analysis described in the next section.

The cost model was constructed as an Excel spreadsheet that can be modified to test any number of different parameter selections. The spreadsheet model is on file with the Northern Virginia Regional Commission as part of this study effort.

Figure 6-3 Sample Cost Model Results

Route corridor		**Alexandria to SW DC**	**Alexandria to SE DC**	**Belmont Bay to SE DC**	**National Airport to SW DC**
From Terminal		**Old Town**	**Old Town**	**Belmont Bay**	**National Airport**
To Terminal		**Old Sea**	**Diamond Teague**	**Diamond Teague**	**Old Sea**
				No Speed Restrictions	
Route Characteristics					
Route distance (statute miles)		4.92	5.46	29.58	6.25
route time (min.)		10.2	11.3	51.7	12.9
docking/unloading/loading time (min.)		5	5	5	5
extra time for approach issues (min.)		8.7	0	0	13.7
Total Travel Time one way		18.9	11.3	51.7	26.6
Cycle Time (two way)		47.8	32.6	113.5	63.3
Vessel Charateristics		**Sea Shuttle**	**Sea Shuttle**	**Sea Shuttle EX**	**Sea Shuttle**
Assumed fuel price (per gallon)		$ 4.00	$ 4.00	$ 4.00	$ 4.00
Service Level Characteriscs					
service frequency peak (min)		15	15	20	15
hours in peak (total AM and PM)		6	6	6	6
service frequency off-peak		30	30	60	15
hours in off-peak		16	16	0	16
service frequency weekend		30	30	30	30
hours in weekend		16	16	0	16
vessels required		4	3	6	5
weekday hours		56	50	36	110
weekday trips		112	112	36	176
number of weekdays		255	255	255	255
weekend hours		32	32	0	48
weekend trips		64	64	0	64
number of weekend days		105	105	105	105
Annual hours		17,640	16,110	9,180	33,090
Annual trips		35,280	35,280	9,180	51,600
Weekday trips		28,560	28,560	9,180	44,880
Cost Characteristics					
Total route cost per year (includes vessel cap)		$ 6,407,333	$ 5,813,500	$ 4,070,200	$ 11,873,167
Operating only per year		$ 6,174,000	$ 5,638,500	$ 3,580,200	$ 11,581,500
Fuel Cost (also included in operating cost)		$ 4,233,600	$ 3,866,400	$ 2,570,400	$ 7,941,600
Fare Charateristics	**FAREBOX REC.**				
Average Fare per rider ($ per one way)		$ 8.00	$ 10.00	$ 10.00	$ 11.00
Annual Ridership Required at Recovery of	50%	400,458	290,675	101,755	539,689
Capital (vessel only) and Operating	75%	600,688	436,013	305,265	809,534
	100%	800,917	581,350	407,020	1,079,379
Weekday Ridership Required at Recovery of	50%	1,271	923	399	1,841
Capital (vessel only) and Operating	75%	1,907	1,384	1,197	2,761
	100%	2,543	1,846	1,596	3,682
Weekday per trip Ridership Required at Recovery of	50%	11	8	11	10
Capital (vessel only) and Operating	75%	17	12	33	16
	100%	23	16	44	21

7 MARKET IDENTIFICATION

The purpose of this task was to evaluate the modeled level of interaction (trips by all modes) between market areas and assess the degree to which a new mode could attract some amount of those interactions based on assumed levels of service and fare. The preliminary stages of the analysis also helped to identify any necessary adjustments to the model to better identify market interactions. Overall, this process provided a valuable tool to narrow the list of potential corridors based on the market for various trip types between terminal areas.

The following subsections describe the list of markets that were assessed, how they were defined and evaluated, the results of the assessment, the refinement of evaluation criteria, and the narrowing of the initial list to a reduced set for further analysis in latter tasks.

HIGH LEVEL MARKET ASSESSMENT

Based on the work described in previous tasks the focus of the study has been narrowed to a few prime corridors for further analysis. There are three classifications of corridors identified for further evaluation: potential commuter routes; a subset of commuter routes that are military commuter routes; and water taxi corridors. Each of these three has a separate analytical approach listed in the summary below.

Commuter Corridors Analytical Approach

The following bullets describe the steps followed to analyze the commuter corridors:

- Use MWCOG model to assess travel choice factors
- Acquire travel market/employment data from airport authority
- Use random digit dial in target market areas to assess potential based on travel choice
- Target Market Research areas:
  - Alexandria
  - Indian Head
  - Woodbridge/Harbor Station
  - National Harbor
  - Southwest and Southeast DC.
  - Southern Arlington (National Airport/Crystal City)
  - Quantico

Military Commuter Corridors Analytical Approach

- Investigate MWCOG model baseline data and modify accordingly, then test modal preference
- Direct survey by employment site at:
  - Joint Base Anacostia/Bolling
  - Department of Homeland Security Headquarters (USCG)
  - Fort Belvoir[4]

INITIAL LIST OF MARKETS TO BE ASSESSED AND SELECTION CRITERIA

The next step in the process was to define the market area for each one of the identified corridors. It was expected that many of these corridors possess the potential for two way demand while some would be more suited to a peak directional demand. The following descriptions define the primary and secondary market areas for each of these corridors, by direction. It is within these market areas where it is appropriate to further analyze the market potential for each leg of the corridor.

The market research potion of this project, by necessity, is more generalized and easily described. The definitions below are intended to define what is meant by each of the more general descriptions. These should be considered to be "fuzzy" boundaries as they are not intended to absolutely include nor exclude immediately adjoining areas. More detail on the boundaries used for the market research is found at the beginning of Section 5 of this report. The Transportation Analysis Zones (TAZ's) used in the numeric part of the analysis were, on the other hand, very descriptive with absolute boundaries and no overlap. The TAZ's selected were based on the following descriptions of market areas that were used for the household survey.

Alexandria –Generally, the city limits of Arlington, the Potomac to I-395 and from I-495 to Four Mile Run Creek (Arlington/Fairfax County Line), creating sort of a wedge shape, but also including the portion of Alexandria northwest of I-395. Note that this area is generally contiguous to Southern Arlington.

Indian Head – Charles County, Saint Mary's County, Calvert County

Woodbridge/Potomac Shores – Prince William County from the north boundary along I-95 east to the Potomac to the intersection of the south county boundary with I-95, and including areas to the west of I-95.

National Harbor – The zip codes 20744 and 20745 that include the areas along the Potomac north and south of National Harbor from Washington Highlands to Fort Washington.

Southwest and Southeast DC. – The area bounded by I-695 to the north, Hwy 1 to the west and the river system to the south and east.

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[4] This was the intention of the study at the beginning of this phase, however, the command (at the time) at Fort Belvoir elected not to participate further. Subsequent to this decision Fort Belvoir was excluded from further consideration as a potential market for ferries. Indeed, a viable market may be present at Fort Belvoir, but this study was unable to make a determination on that point due ot lack of data.

Southern Arlington (National Airport/Crystal City) – The area bounded by Hwy 1 and I-395, Four Mile Run Creek and the river. Note that this area is generally contiguous to Alexandria.

Quantico – Included in the Woodbridge/Potomac Shores definition.

One of the conditions of ferry markets is that the origin travel shed is typically much larger than the destination travel shed. Another interesting characteristic is that the size of the origin travel shed is almost always related to the size and condition of the destination travel shed and the spectrum alternative transportation linkages between the two points. The following table is intended to further define the potential market areas for each of the corridors. In general, these are defined by a time/distance relationship. Buffer distances are smaller for primary areas and larger for secondary areas to reflect potential demand and access to terminal sites (walk/bike/transit access vs. transit/single-occupancy vehicle access). Each corridor is described based on directionality, primary and secondary production area to primary and secondary attraction area in Figure 7-1 below.

Figure 7-1 Corridor Market Areas (Production & Attraction)

Corridor	Primary Production area	Secondary Production area	Primary Attraction area	Secondary Attraction area
Alexandria to National Harbor	1 mile from Old Town Dock	5 miles from Old Town Dock	Inside I-95/MD 210 and .5 mile south from dock	
National Harbor to Alexandria	Inside I-95/MD 210 and .5 mile south from dock		0.5 miles from Old Town Dock	2 miles from Old Town Dock
Alexandria to Southwest waterfront	1 mile from Old Town Dock	5 miles from Old Town Dock	0.4 miles from foot of 7th Street	0.75 miles from the foot of 7th
Southwest Waterfront to Alexandria	.4 miles from foot of 7th Street	0.75 mile from foot of 7th	0.5 miles from Old Town Dock	2 miles from Old Town Dock
Alexandria to Southeast Waterfront	1 mile from Old Town Dock	5 miles from Old Town Dock	0.5 miles from Diamond Teague Park	1 mile from Diamond Teague Park
Southeast Waterfront to Alexandria	0.5 miles from Diamond Teague Park	1 mile from Diamond Teague Park	0.5 miles from Old Town Dock	2 miles from Old Town Dock
National Airport to National Harbor	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon	Inside I-95/MD 210 and 0.5 mile south from dock	
National Harbor to National Airport	Inside I-95/MD 210 and 0.5 mile south from dock		0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon

Corridor	Primary Production area	Secondary Production area	Primary Attraction area	Secondary Attraction area
National Airport to Southwest waterfront	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon	0.4 miles from foot of 7th Street	0.75 miles from the foot of 7th
Southwest waterfront to National Airport	0.4 miles from foot of 7th Street	0.75 mile from foot of 7th	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon
National Airport to Southeast Waterfront	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon	0.5 miles from Diamond Teague Park	1 mile from Diamond Teague Park
Southeast Waterfront to National Airport	0.5 miles from Diamond Teague Park	1 mile from Diamond Teague Park	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon
Indian Head to Belmont Bay	1.2 miles from the extension of Fraser Rd with the River	10 miles from the extension of Fraser Rd with the River	0.75 miles from the Belmont Bay Marina	2 miles from the Belmont Bay Marina
Belmont Bay to Indian Head	0.75 miles from the Belmont Bay Marina	5 miles from the Belmont Bay Marina not including Fort Belvoir	1.2 miles from the extension of Fraser Rd with the River	3 miles from the extension of Fraser Rd with the River
Indian Head to Potomac Shores	1.2 miles from the extension of Fraser Rd with the River	10 miles from the extension of Fraser Rd with the River	1 mile from the Cherry Hill Marina	
Potomac Shores to Indian Head	1 mile from the Cherry Hill Marina		1.2 miles from the extension of Fraser Rd with the River	3 miles from the extension of Fraser Rd with the River
Indian Head to Alexandria	1.2 miles from the extension of Fraser Rd with the River	5 miles from the extension of Fraser Rd with the River	0.5 miles from Old Town dock	2 miles from Old Town Dock
Alexandria to Indian Head	1.0 miles from Old Town dock	5 miles from Old Town dock	1.2 miles from the extension of Fraser Rd with the River	3 miles from the extension of Fraser Rd with the River

Corridor	Primary Production area	Secondary Production area	Primary Attraction area	Secondary Attraction area
Indian Head to National Airport	1.2 miles from the extension of Fraser Rd with the River	5 miles from the extension of Fraser Rd with the River	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon
National Airport to Indian Head	0.5 miles from the Metro Station	1.5 miles from Metro but NOT including the Pentagon	1.2 miles from the extension of Fraser Rd with the River	3 miles from the extension of Fraser Rd with the River
Indian Head to Quantico	1.2 miles from the extension of Fraser Rd with the River	5 miles from the extension of Fraser Rd with the River	0.5 miles from Quantico Pier	
Quantico to Indian Head	0.5 miles from Quantico Pier		1.2 miles from the extension of Fraser Rd with the River	3 miles from the extension of Fraser Rd with the River
Belmont Bay to Southwest/Southwest DC	0.75 miles from the Belmont Bay Marina	5 miles from the Belmont Bay Marina not including Fort Belvoir	0.75 mile from Diamond Teague Park	2 miles from Diamond Teague Park
Potomac Shores to Southeast/Southwest DC	1 mile from the Cherry Hill Marina		0.75 mile from Diamond Teague Park	2 miles from Diamond Teague Park
Military Corridors				
National Airport to JBAB South	0.5 miles from the Metro Station	1.75 miles from Metro including the Pentagon	0.75 miles from the south boat	2 miles from the south boat basin but only including JBAB and the DHS campus
JBAB South to National Airport	0.75 miles from the south boat basin	2 miles from the south boat basin but only including JBAB and the DHS campus	0.5 miles from the Metro Station	1.75 miles from Metro including the Pentagon
Alexandria to JBAB South	1.0 miles from Old Town dock	5 miles from Old Town dock	0.75 miles from the south boat basin	2 miles from the south boat basin but only including JBAB and the DHS campus

Corridor	Primary Production area	Secondary Production area	Primary Attraction area	Secondary Attraction area
Southeast/Southwest DC to Fort Belvoir	0.75 mile from Diamond Teague Park	2 miles from Diamond Teague Park	2 miles from the western wharf in Gunston Cove	
Indian Head to Fort Belvoir	1.2 miles from the extension of Fraser Rd with the River	10 miles from the extension of Fraser Rd with the River	2 miles from the western wharf in Gunston Cove	
JBAB South to Fort Belvoir	0.75 miles from the south boat basin	2 miles from the south boat basin but only including JBAB and the DHS campus	2 miles from the western wharf in Gunston Cove	
Fort Belvoir to JBAB South	2 miles from the western wharf in Gunston Cove		0.75 miles from the south boat basin	2 miles from the south boat basin but only including JBAB and the DHS campus
Belmont Bay to JBAB South	.75 miles from the Belmont Bay Marina	5 miles from the Belmont Bay Marina not including Fort Belvoir	0.75 miles from the south boat basin	2 miles from the south boat basin but only including JBAB and the DHS campus
Indian Head to Southeast Waterfront	1.2 miles from the extension of Fraser Rd with the River	5 miles from the extension of Fraser Rd with the River	0.75 mile from Diamond Teague Park	2 miles from Diamond Teague Park

To produce an accurate list of TAZs for each corridor unique buffers were created for each terminal site based on primary and secondary production and attraction areas listed in Figure 7-1. Any TAZ's that fell within the buffers established were included in the list. For TAZs that were not wholly within the buffer, they were only included if 50% or more of their area fell within the buffer. Some exceptions to this rule were provided to account for the unique nature of the military bases and to ensure that TAZs from across a river were not included in a given terminals list. As noted in the Figure 7-1, a total of 34 unique corridors were identified with both primary and secondary production and attraction areas for both ends of corridor (where applicable) for each. The buffer distances vary by location to reflect the nature of the land use around each terminal site and access to that site.

Based on the GIS analysis a list of TAZ's for each market area was generated. This list of TAZs was used to query the MWCOG Travel Demand Model to produce the level of interactions (year 2020)

within each corridor for four different trip purposes. A word here about "interactions," in the travel demand model interactions reflect a relationship between an assumed person who lives in one location and is attracted by some activity (work, school, shopping, recreation, etc.) to travel to another location. Therefore, an interaction represents about one half the daily number of trips generated by this home origin, "production" and the destination, "attraction." These trips, at this point are not assigned to any particular mode, they represent a travel need or desire. This data was acquired from the MWCOG travel demand model trip tables. The three trip types are:

- Home-based work
- Home-based other
- Non-home-based work

Once the level of interactions were extracted from the model they were tabulated for each corridor. The following section summarizes the results of this analysis.

RESULTS OF INITIAL ASSESSMENT

The results of the initial travel market analysis are shown in the table below. This table summarizes the total interactions between terminal pairs including:

- Home-based work
- Home-based other
- Non-home-based work

Figure 7-2 Modeled Interactions by Corridor

		Primary Production Area to Primary Attraction Area	Primary Production Area to Secondary Attraction Area	Secondary Production Area to Primary Attraction Area	Secondary Production Area to Secondary Attraction Area
	Commuter Corridors				
1	Alexandria to National Harbor	89	0	732	0
2	National Harbor to Alexandria	60	398	0	0
3	Alexandria to Southwest waterfront	81	575	989	7,049
4	Southwest Waterfront to Alexandria	15	95	63	392
5	Alexandria to Southeast Waterfront	204	472	2,597	5,939
6	Southeast Waterfront to Alexandria	31	207	82	547
7	National Airport to National Harbor	28	0	70	0
8	National Harbor to National Airport	130	260	0	0
9	National Airport to Southwest waterfront	99	647	253	1,690
10	Southwest waterfront to National Airport	108	235	413	917
11	National Airport to Southeast Waterfront	244	542	622	1,398
12	Southeast Waterfront to National Airport	198	441	540	1,200
13	Indian Head to Belmont Bay	0	0	11	11
14	Belmont Bay to Indian Head	0	0	11	11
15	Indian Head to Potomac Shores	0	0	0	0
16	Potomac Shores to Indian Head	0	0	0	0
17	Indian Head to Alexandria	8	64	27	195

		Primary Production Area to Primary Attraction Area	Primary Production Area to Secondary Attraction Area	Secondary Production Area to Primary Attraction Area	Secondary Production Area to Secondary Attraction Area
18	Alexandria to Indian Head	5	5	51	51
19	Indian Head to National Airport	26	56	84	168
20	National Airport to Indian Head	2	3	6	6
21	Indian Head to Quantico	1	0	4	0
22	Quantico to Indian Head	0	0	0	0
23	Belmont Bay to Southeast DC	27	129	662	3,238
24	Potomac Shores to Southeast/Southwest DC	24	107	0	0
	Military Corridors				
25	National Airport to JBAB South	15	133	44	332
26	JBAB South to National Airport	38	89	108	239
27	Alexandria to JBAB South	28	163	305	1,891
28	Southeast/Southwest DC to Fort Belvoir	17	0	118	0
29	Indian Head to Fort Belvoir	8	0	27	0
30	JBAB South to Fort Belvoir	5	0	14	0
31	Fort Belvoir to JBAB South	1	12	0	0
32	Belmont Bay to JBAB South	2	17	49	399
33	Indian Head to Southeast Waterfront	29	57	92	177
34	Belmont Bay to Southwest Waterfront	6	34	154	883

An analysis of these results revealed a strong level of Home-based Work interaction between the following corridors:

- Alexandria and Southwest/Southeast Waterfronts (and reverse)
- National Airport and Southwest/Southeast Waterfronts (and reverse)
- Belmont Bay and Southwest/Southeast Waterfronts

A breakdown of the results also revealed that the Home-Based Other and Non-Home Based Work Trips were also significant for the same corridors. Based on feedback from stakeholders regarding changes in population and employment, and projected population and employment, a more detailed analysis of the MWCOG land use forecasts that are an input to the travel demand model was undertaken. A review of existing documentation related to BRAC, compared to the land use forecasts, made it apparent that it would be necessary to make some land use adjustments to the model.

REFINEMENT OF CRITERIA

In addition to the land use adjustments several production/attraction areas were manually adjusted to better capture local land use around potential terminals. This was done for three terminals: Potomac Shores, Indian Head, and Joint Base Anacostia Bolling (JBAB).

On the land use side, more accurate 2020 land use values including population, households, and employment were procured from stakeholders for Fairfax County, Ft. Belvoir, Quantico, the Navy Yard, and JBAB. The consultant team also verified that the land use values for the Potomac Shores and Indian Head areas were accurately reflected in the existing forecasts and did not require any adjustments.

The land use figures for the aforementioned areas were updated and a portion of the model re-run to update the trip tables. The person trip tables of the MWCOG models were updated, using the "Fratar process" based on the updated population and employment data of specific TAZ's. It is expected that the updated population and employment would be on the trip ends of specific travel zones, and will not have notable impact the traffic condition or service condition on the road network or transit system.

This revised analysis (already reflected in Table 7-2) increased the number of interactions between various origin terminals and Southeast DC (Navy Yard) and JBAB. The only large increase in interactions based on percentage was between Alexandria/National Airport and JBAB. In addition, the results from the previously best performing corridors were strengthened. Based on this analysis a refined list of the top ten corridors was established based on the total number of interactions within a corridor.

REFINED LIST OF TOP TEN CORRIDORS

Figure 7-3 lists the top ten corridors in terms of daily interactions (trips between primary and secondary production and attraction areas) and ranks them 1 through 10.

Figure 7-3 List of Top Ten Corridors

Corridor	Total Daily Interactions	Rank
Alexandria to Southwest DC	7,050	1
Alexandria to Southeast DC	5,950	2
Belmont Bay to Southeast DC	3,250	3
Alexandria to JBAB	1,900	4
National Airport to Southwest DC	1,700	5
National Airport to Southeast DC	1,400	6
Southeast DC to National Airport	1,200	7
Southwest DC to National Airport	900	8
Belmont Bay to Southwest DC	900	9
Southeast DC to Alexandria	550	10

This table summarizes the total daily interactions between the top 10 performing corridors for ***all*** trips types. In short, this is what the model is projecting for the number of daily trips between these areas in 2020. Interestingly, eight of the corridors include either an origin or a destination of Alexandria or National Airport and the top six corridors all include destinations in southwest DC, southeast DC, or JBAB. This is not surprising given the concentration of employment at these locations.

While these results obviously show high demand from the west side of the river (Alexandria/Airport) to southwest, southeast and JBAB, there is also significant demand from Belmont Bay to Southeast, JBAB, and Southwest. In fact, if one combines the interactions between Belmont Bay and these locations you would have nearly 4,500 daily interactions. Belmont Bay to JBAB alone has 400 daily interactions.

While this analysis doesn't provide the actual number of commuters, or the demand for potential ferry service, it does indicate the level of interaction between these areas projected by the model in 2020 based on future land use.

REFINED LIST OF TOP FIVE CORRIDORS

Based on the results of modeled interactions the list of corridors was further refined from ten down to five to focus on the locations with the highest level of daily interactions. The purpose of this refinement was to focus the remaining aspects of the study on the corridors with the highest potential for successful ferry service.These are shown in Figure 7-4.

Figure 7-4 Refined List of Top Five Corridors

Corridor	Total Daily Interactions	Rank
Alexandria to Southwest DC	7,050	1
Alexandria to Southeast DC	5,950	2
Belmont Bay to Southeast DC	3,250	3
Alexandria to JBAB	1,900	4
National Airport to Southwest DC	1,700	5

8 PIVOT POINT MARKET DEMAND ASSESSMENT

WHAT IS A PIVOT POINT MODEL

A frequent approach to modeling, which can substantially enhance the accuracy of the model, is to formulate the model as predicting changes relative to a base-year situation. In this case a pivot point mode choice model was created to predict changes in response to a mode not previously included in the travel demand model. Pivot point analysis provides functionality to allow the number of trips for a new mode to be predicted based upon the most similar existing mode. This is identified as the trip estimate. The main functionality of model is aimed at predicting the changes in the number of trips for each defined mode based on changes to the existing levels of service.

The general procedure of the pivot-point analysis is described in the following steps (with the calculation of each origin-destination pair within the primary and secondary market segments):

1. Determine the existing transit share (from the existing model);
2. Determine the travel time and travel cost of existing transit service (from the model), including in-vehicle time, wait time, walk time, drive access time and fare/cost;
3. Determine the travel time and travel cost if using the ferry service (from data generated in previous study tasks, see Section 6, as well as data from the model);
4. Calculate the utility (general cost) of existing transit path and the ferry path ;
5. Calculate the difference of the utility between the existing transit path and the ferry path;
6. Calculate the change of share with the new ferry service
7. Calculate the split of trips for the new ferry service.

One limitation of this technique is that it assumes and endless “supply” of trips that might be attracted to the ferry, or new mode. In this case the team knew from the household survey that most of the potential riders were among current SOV users. Given the relative volumes of ferry passengers versus current SOV mode share this was determined to not be an issue in the analysis and likely represents a fairly real-world situation.

INITIAL INPUTS AND MODEL FORMATION

The basic process of the pivot point approach is to evaluate the change of travel demand (or ridership level) with respect of the change of the transportation system (e.g., the change of travel time and travel cost associated to the transit system). The basic inputs for the pivot point process are:

- Zonal trip tables by travel mode in the baseline condition

- Transit travel cost/time matrices in the baseline condition, including calculating the following cost/time elements separately:
    - In-vehicle time
    - Wait-time
    - Walk-time
    - Fare
    - Number of transfers
    - Travel cost/time matrices in the “build” scenario

These inputs are obtained from the MWCOG regional model. Also, the basic parameters to derive the utility (or generalized cost) are derived from the MWCOG model. However, it should be pointed out that to better reflect the drive and walk access times to the proposed ferry terminals these distances and access times were manually calculated using a combination of aerial photography (to identify residential generators and employment attractors at both terminal ends), Google Maps, and GIS.

After comparing drive access times from the model with manually generated values it was determined that the best approach was to use the drive access distance data from the model and then estimate drive access times based on certain assumed speeds from the manual analysis.

For walk access time the model can only estimate travel distance between zone centroids. This process is not reliable as it doesn't consider actual land use conditions. Thus the walk access times were manually calculated for all primary markets (those roughly within ½ miles) for all potential ferry terminals.

These manually estimated access times were used as input to the model and combined with updated transit fare/parking cost for passengers traveling from/to secondary markets which would require transfer from bus (or auto). The purpose of all of these exercises was to ensure that the parameters in the model reflect real world conditions for potential users of a ferry service to increase the confidence in the model results. If access times, transfer times, transfer fare, and parking costs were not accurately reflected in the model this could unduly inflate the potential ferry ridership.

The output of the process described above is a new transit trip table that includes a new ferry linkage between the assumed terminal areas. The new origin-destination pairs that will use the new ferry service were identified and used to derive the total ridership of the new ferry service.

RESULTS AT VARYING LEVELS OF FARE

After updating the parameters of the MWCOG model the pivot point model was run to estimate the ridership for the five most promising corridors based on the market analysis. The following table provides a summary of the service characteristics for each corridor. Figure 8-1 summarizes the route characteristics which were derived using the cost model described in Section 6.

From these values the total one-way travel time and two-way cycle times are calculated. The service level characteristics are also provided in the table. These make up a portion of the model input and significantly impact potential ridership of any ferry service.

For the fare sensitivity tests the model incorporates the "values of time" (for various work and non-work trips) and based on these values estimates the ridership under various fare structures.

The fare elasticity is calculated after the ridership results are acquired (by comparing the ridership differences of two fare scenarios).

Figure 8-1 Top Five Corridor Service Characteristics

Route corridor	Alexandria to SW DC	Alexandria to SE DC	Belmont Bay to SE DC	National Airport to SW DC	National Airport to SE DC
From Terminal	Old Town	Old Town	Belmont Bay	National Airport	National Airport
To Terminal	Old Sea	Diamond Teague	Diamond Teague	Old Sea	Diamond Teague
			No Speed Restrictions		
Route Characteristics					
Route distance (statute miles)	4.92	5.46	29.58	6.25	6.79
route time (min.)	10.2	11.3	51.7	12.9	14.0
docking/unloading/loading time (min.)	5	5	5	5	5
extra time for approach issues (min.)	8.7	0	0	13.7	6.1
Total Travel Time one way	18.9	11.3	51.7	26.6	20.1
Cycle Time (two way)	47.8	32.6	113.5	63.3	50.3
Service Level Characteristics					
service frequency peak (min)	15	15	20	15	15
hours in peak (total AM and PM)	6	6	6	6	6
service frequency off-peak	30	30	60	15	15
hours in off-peak	16	16	0	16	16
service frequency weekend	30	30	30	30	30
hours in weekend	16	16	0	16	16

The weekday work and non-work ridership results from the pivot point model are provided in Figure 8-2 by corridor. The daily ridership numbers already include the return trips. It should be noted that there is extensive existing transit service between Alexandria and Downtown Washington, DC. As a result, the ridership figures reflect the fact that any new ferry service would have to compete with this existing transit service to attract new customers. In addition, the fare of the existing transit services is less expensive than the assumed ferry service one-way fare of $10. However, Figure 8-2 also depicts the predicted ridership at various fare levels by corridor. The

results illustrate the predicted pivot point model ridership at various fares, with all other service characteristics remaining constant. Due to the complexity travel to National Airport and known issues with the MWCOG model in accurately predicting the type travel experienced at the airport it was determined that additional sensitivity tests were warranted for corridors to/from National Airport.

Figure 8-2 Pivot Point Model Ridership and Fare Sensitivity Results

Ridership Estimates	Alexandria to SW DC	Alexandria to SE DC	Belmont Bay to SE DC	National Airport to SW DC	National Airport to SE DC
	Old Town	Old Town	Belmont Bay	National Airport	National Airport
	Old Sea	Diamond Teague	Diamond Teague	Old Sea	Diamond Teague
Fare Level	$10	$10	$20	$15	$15
Weekday total riders	**831**	**757**	**22**	**414**	**344**
Work trip riders	664	626	21	285	288
Non-work trip riders	167	131	1	129	56
Fare Sensitivity Tests					
Ferry Fare Level	Daily Riders	Daily Riders	Daily Riders	Daily Riders	Daily Riders
$3	1,897	1,405		1,159	752
$4	1,704	1,294		1,088	711
$5	1,524	1,190	117	1,018	671
$6	1,359	1,091		949	633
$7	1,207	999		880	595
$8	1,069	914		814	560
$9	944	832		748	526
$10	831	757	70	684	493
$11				623	461
$12				567	430
$13				514	400
$14				463	371
$15				414	344
Average Base Transit Fare in Corridor	$3.24	$3.40	$6.38	$2.38	$2.54

The results in Figure 8-2 show that at the existing transit fare level of approximately $3, the pivot point model predicts very robust ridership in all Alexandria and National Airport corridors. The strongest corridor in terms of ridership is Alexandria to Southwest DC with a two-way daily ridership of just under 1,900. Alexandria to Southeast DC is also strong with just over 1,400 two-way daily riders. National Airport to Southwest DC has nearly 1,200 daily riders and National Airport to Southeast DC, though significantly lower than the other corridors, is still strong with 752 predicted daily riders.

The fare sensitivity estimates reveal that if the ferry fare increases by 200 % (from about $3.5 to $10.0), the ridership decreases by almost 100%, implying a fare elasticity of about 0.5. This is similar to the fare elasticity of transit service from other national studies. At a fare level of $5 the model predicts only 117 daily riders for the Belmont Bay to Southeast DC corridor. At a fare level of $10 the ridership drop to 70 daily riders. This is not entirely unexpected given that several transit options already existing in this corridor with similar or better travel times.

The results of the pivot point model ridership forecasts at various fare levels show that the shorter connections between Alexandria and DC and National Airport and DC appear to have enough market potential that they could be pursued. With some amount of public subsidy to establish adequate shore-side facilities and assist in service start-up, these are likely long-term, viable markets that could add depth to the greater Metropolitan DC transportation options. These services could also potentially be expanded further to offer circulation to National Harbor as well as along the DC waterfront.

Long distance services that parallel VRE and I-95 might make sense, long-term, as capacity supplements if other plans are determined to be infeasible or as potential construction mitigation. Based on the results of this study, long distance commuter services must be paired with other viable markets to make the operations viable in the current environment.

ISSUES AND LIMITAITONS OF THE PIVOT POINT MODEL

Of critical importance in these particular markets, the MWCOG model does not account for tourism trips, nor as indicate below for air traveler trips. The corridors of high potential are either highly attractive to tourist trips (to/from Alexandria and Washington, DC) or air traveler trips (to/from National Airport). For example, as reported by Potomac Riverboat Company nearly 10% of the current trips on the water taxi service from Alexandria to National Harbor are people moving to and from National Airport, without benefit of any formal connection from Old Town to the Airport. This indicates a very high likelihood of potential ferry volumes for National Airport well in excess of those indicated in the though the pivot point model once more accurate data is provided to reflect air travelers.

Indicated trips to and from National Airport: In general, non-work trips way outnumber work trips to the airport on a daily basis. But they seem to be vastly under-represented in the model results. The MWCOG Travel Demand Model does not include the air passenger trips in the person trip tables. The model does have separately vehicle trip tables for air passengers/taxi. However, the vehicle trip tables are just used for the "highway assignment", i.e., loading the vehicle trips to the highway network. It has been related that these trip tables were derived very long time ago

and have not been updated for quite some time Therefore, the reliability of these vehicle tables is questionable.

The model shows that the impact of fare on non-work trips is higher than that work trips. If fare increases, the proportion of non-work trips will slightly decrease. The impact on National Airport corridor is higher than the impact on the Alexandria corridors. In general, the ridership for National Airport corridor is more sensitive because of more transit options (including Metro) serving the National Airport corridors. Perhaps a few facts collected from the Metropolitan Washington Airport Authority will help to shed some light on this issue.

National Airport is an origin/destination airport with nearly 75% of all trips either starting or ending at this airport, as opposed to transferring planes (2012 MWAA Passenger Survey Annual Report). At 20,810,387 passenger trips in 2014 (MWAA website) that suggests about 15 million people per year, about 41,000 per day either arrive at or depart from National Airport. Roughly 70 % of these are non-local travelers or about 28,700. The remaining 12,300 are trips by residents from the adjacent area. About 30% of those are from Washington, DC or about 3,700 per day. Between visitor trips and local area residents there are about 30,000 trips, per day in a potential ferry market. If, in addition to the work trips indicated by the pivot point analysis, even a relatively small portion of these air travelers were to access the airport by ferry, the pivot point model results could easily double and potentially triple depending on the final destinations of passengers.

Also reported by Potomac Riverboat, daily tourist volumes exceed 700 passengers per day between Old Town Alexandria and National Harbor. The service operates approximately hourly with an $8.00 one way fare. The daily volume includes practically no employment travel. Given the strong employment travel indicated in the pivot point analysis on the major corridors and the highly attractive nature of the corridors, the pivot point model creates a very conservative estimate of potential ridership based on this real world experience. It also suggests the tourism market would be a strong sector for ferries travelling strong tourist desire lines. Coupled with the allure of seeing Washington, DC from the water, these ferry routes present a very real potential.

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9 RESULTS SUMMARY

The body of work documented in this report is considerable and generally points to and concludes that there is substantial potential for ferry operations in the Washington, DC metro region that could be financially sustainable and very likely commercially sustainable and attractive. The following walks through the results of each of the top corridors and the results from a combination of the pivot point model and the cost model. Once results from the pivot point model were known, the cost model was used to optimize the balance between indicated demand at a given fare level versus the overall cost of the service. In most cases, the optimal farebox recovery was determined to be optimal at somewhat lower fare values than the initial assumptions used in the pivot point model. That optimization is indicted in the following section.

With limited exceptions for the longer distance market, the results show that smaller ferry vessels such as the generic Sea Shuttle are ideally sized to develop this ferry market. Quite literally, these vessels are the sea-going equivalent of a regular transit bus with a capital cost similar to a diesel powered articulated transit bus. What the pivot point analysis showed was the importance of maintaining a simple and frequency level of service in terms of attracting and retaining riders. These smaller, somewhat less opulent vessels are the perfect match to create maximum utility to reach the potential market.

RESULTS AND CONCLUSIONS BY CORRIDOR

Alexandria to SW DC (Old Seaport, the Wharf)

The service characteristics are recorded below, note the assumption that this route uses the sea Shuttle.

Route Characteristics		
Route distance (statute miles)		4.92
Cycle Time (two way)		47.8
Vessel Charateristics		**Sea Shuttle**
passenger capacity		35
speed (MPH)		29
Service Level Characteriscs		
service frequency peak (min)		15
hours in peak (total AM and PM)		6
service frequency off-peak		30
hours in off-peak		16
service frequency weekend		30
hours in weekend		16

vessels required		4
weekday hours		56
weekday trips		112
number of weekdays		255
weekend hours		32
weekend trips		64
number of weekend days		105
Annual hours		17,640
Annual trips		35,280
Weekday trips		28,560
Cost Characteristics		
Total route cost per year (includes vessel cap)		$ 6,407,333
Operating only per year		$ 6,174,000
Fuel Cost (also included in operating cost)		$ 4,233,600
Fare Charateristics	**FAREBOX REC.**	
Average Fare per rider ($ per one way)		$ 8.00
PIVOT POINT MODEL RESULT	42%	336,385
Annual Ridership Required at Recovery of	50%	400,458
Capital (vessel only) and Operating	75%	600,688
	100%	800,917
PIVOT POINT MODEL RESULT	42%	1,068
Weekday Ridership Required at Recovery of	50%	1,271
Capital (vessel only) and Operating	75%	1,907
	100%	2,543
PIVOT POINT MODEL RESULT	42%	10
Weekday per trip Ridership Required at Recovery of	50%	11
Capital (vessel only) and Operating	75%	17
	100%	23

Conclusion: Including the very high potential for year around tourism on this route, this is very likely a commercially viable service that would see daily ridership vary seasonally from about 1,200 trips per day up to about 2,000 trips per day, potentially higher as Old Seaport and the Wharf continue development and the ferry becomes an artifact of everyday life as well as a tourist attraction in and of itself.

Alexandria to SE DC (Diamond Teague Park, National's Park, The Navy Yard)

Route Characteristics		
Route distance (statute miles)		5.46
Cycle Time (two way)		32.6
Vessel Charateristics		**Sea Shuttle**
passenger capacity		35
speed (MPH)		29
Service Level Characteriscs		
service frequency peak (min)		15
hours in peak (total AM and PM)		6
service frequency off-peak		30
hours in off-peak		16
service frequency weekend		30
hours in weekend		16
vessels required		3
weekday hours		50
weekday trips		112
number of weekdays		255
weekend hours		32
weekend trips		64
number of weekend days		105
Annual hours		16,110
Annual trips		35,280
Weekday trips		28,560
Cost Characteristics		
Total route cost per year (includes vessel cap)		$ 5,813,500
Operating only per year		$ 5,638,500
Fuel Cost (also included in operating cost)		$ 3,866,400
Fare Charateristics	**FAREBOX REC.**	
Average Fare per rider ($ per one way)		$ 10.00
PIVOT POINT MODEL RESULT	41%	238,354
Annual Ridership Required at Recovery of	50%	290,675
Capital (vessel only) and Operating	75%	436,013
	100%	581,350
PIVOT POINT MODEL RESULT	41%	757
Weekday Ridership Required at Recovery of	40%	923
Capital (vessel only) and Operating	75%	1,384
	100%	1,846
PIVOT POINT MODEL RESULT	41%	7
Weekday per trip Ridership Required at Recovery of	50%	8
Capital (vessel only) and Operating	75%	12
	100%	16

Conclusion: Including the very high potential for year around tourism on this route, this is very likely a commercially viable service that would see daily ridership vary seasonally from about 800

trips per day up to about 2,000 trips per day. The annual average for this route is likely to be even higher as presently commercially viable service operates from Old Town Alexandria to National's Park for Nationals home games with a typical game attracting 200 to 300 attendees on the ferry service. In addition to the potential for tourism the added traffic of the Nationals will bring the annual average volume into the 1,700 to 1,800 boarding per day range. Those statistics, as seen above, brings this route to the threshold of commercial viability. One positive caveat, a potential landing site at the current Diamond Teague Park dock is about a three block walk to the USDOT office building which employs people from throughout the region. This existing employment site, as well as many others already developed and under development in the Capital Riverfront area will be highly effective in terms of providing potential daily riders for this service.

National Airport to SW DC

Route Characteristics		
Route distance (statute miles)		6.25
Cycle Time (two way)		63.3
Vessel Charateristics		**Sea Shuttle**
passenger capacity		35
speed (MPH)		29
Service Level Characteriscs		
service frequency peak (min)		15
hours in peak (total AM and PM)		6
service frequency off-peak		15
hours in off-peak		16
service frequency weekend		30
hours in weekend		16
vessels required		5
weekday hours		110
weekday trips		176
number of weekdays		255
weekend hours		48
weekend trips		64
number of weekend days		105
Annual hours		33,090
Annual trips		51,600
Weekday trips		44,880
Cost Characteristics		
Total route cost per year (includes vessel cap)		$ 11,873,167
Operating only per year		$ 11,581,500
Fuel Cost (also included in operating cost)		$ 7,941,600

Fare Charateristics	AREBOX REC.	FA
Average Fare per rider ($ per one way)		$ 11.00
PIVOT POINT MODEL RESULT	17%	184,574
Annual Ridership Required at Recovery of	50%	539,689
Capital (vessel only) and Operating	75%	809,534
	100%	1,079,379
PIVOT POINT MODEL RESULT	17%	630
Weekday Ridership Required at Recovery of	50%	1,841
Capital (vessel only) and Operating	75%	2,761
	100%	3,682
PIVOT POINT MODEL RESULT	17%	4
Weekday per trip Ridership Required at Recovery of	50%	10
Capital (vessel only) and Operating	75%	16
	100%	21

See conclusions under the next corridor National Airport to SE DC.

National Airport to SE DC

Route Characteristics		
Route distance (statute miles)		6.79
Cycle Time (two way)		50.3
Vessel Charateristics		**Sea Shuttle**
passenger capacity		35
speed (MPH)		29
Service Level Characteriscs		
service frequency peak (min)		15
hours in peak (total AM and PM)		6
service frequency off-peak		15
hours in off-peak		16
service frequency weekend		30
hours in weekend		16
vessels required		4
weekday hours		88
weekday trips		176
number of weekdays		255
weekend hours		32
weekend trips		64
number of weekend days		105
Annual hours		25,800
Annual trips		51,600
Weekday trips		44,880
Cost Characteristics		
Total route cost per year (includes vessel cap)		$ 9,263,333
Operating only per year		$ 9,030,000
Fuel Cost (also included in operating cost)		$ 6,192,000
Fare Charateristics	**AREBOX REC.**	
Average Fare per rider ($ per one way)		$ 13.00
PIVOT POINT MODEL RESULT	17%	117,573
Annual Ridership Required at Recovery of	25%	178,141
Capital (vessel only) and Operating	75%	534,423
	100%	712,564
PIVOT POINT MODEL RESULT	17%	401
Weekday Ridership Required at Recovery of	50%	608
Capital (vessel only) and Operating	75%	1,823
	100%	2,430
PIVOT POINT MODEL RESULT	17%	2
Weekday per trip Ridership Required at Recovery of	50%	3
Capital (vessel only) and Operating	75%	10
	100%	14

Conclusions: The two National Airport routes share common traits and so are coupled together for conclusions. As seen above the service model for these services suggests the need for a high frequency service throughout a long service day. This is an important assumption for a service intended to service an airport. However, that assumption also drives the daily cost upwards when compared to the services in and out of Alexandria. An encouraging characteristic of National Airport is that there is presently no ready-made ferry terminal on the MWAA property or even on adjacent lands. This fact allows more time to refine what is likely one of the highest potential ferry routes in this study. The pivot point analysis, as documented at the end of the last section of the report, needs additional work to more accurately predict ridership. The farebox recovery is a product of an assumed significant level of service, warranted by the target market,verses what the pivot point model currently predicts as lower ridership. This issue needs further investigation and refinement. However, even within these limitations the model is predicting substantial daily ridership just from airport employment. Once a correction is made to account for air travelers, the daily volumes will easily reach 1,000 to 1,500 daily rides with higher volumes possible.

National Airport needs to have access from the Potomac River to serve this potential market. Given the potential commercial viability and the opportunity to grow the service over time to what the cost model envisions, this service has very high potential to start at a lower level of service gradually increasing as the market grows. National Airport is a highly attractive destination with moderate access issues. While a ferry will not solve those issues, it would certainly add to the options one can use to reach the airport thus providing significant benefit to airport travelers.

Belmont Bay to SE DC

Route Characteristics						
Route distance (statute miles)		29.58		29.58		29.58
Cycle Time (two way)		195.7		113.5		113.5
Vessel Charateristics		**Long Distance EX**		**Sea Shuttle**		**Sea Shuttle EX**
passenger capacity		120		35		49
speed (MPH)		34.3		34.3		34.3
Service Level Characteriscs						
service frequency peak (min)		30		60		20
hours in peak (total AM and PM)		6		6		6
service frequency off-peak		60		60		60
hours in off-peak		0		0		0
service frequency weekend		60		30		30
hours in weekend		0		0		0
vessels required		7		2		6
weekday hours		42		12		36
weekday trips		24		12		36
number of weekdays		255		255		255
weekend hours		0		0		0
weekend trips		0		0		0
number of weekend days		105		105		105
Annual hours		10,710		3,060		9,180
Annual trips		6,120		3,060		9,180
Weekday trips		6,120		3,060		9,180
Cost Characteristics						
Total route cost per year (includes vessel cap)		$ 7,172,900		$ 1,705,450		$ 4,070,200
Operating only per year		$ 5,247,900		$ 1,361,700		$ 3,580,200
Fuel Cost (also included in operating cost)		$ 3,641,400		$ 979,200		$ 2,570,400
Fare Charateristics				**FAREBOX REC.**		**FA**
Average Fare per rider ($ per one way)		$ 20.00		$ 10.00		$ 10.00
PIVOT POINT MODEL RESULT	2%	7,173	25%	42,636	5%	18,316
Annual Ridership Required at Recovery of	50%	179,323	50%	85,273	25%	101,755
Capital (vessel only) and Operating	75%	268,984	75%	127,909	75%	305,265
	100%	358,645	100%	170,545	100%	407,020
PIVOT POINT MODEL RESULT	2%	28	25%	167	5%	72
Weekday Ridership Required at Recovery of	50%	703	50%	334	25%	399
Capital (vessel only) and Operating	75%	1,055	75%	502	75%	1,197
	100%	1,406	100%	669	100%	1,596
PIVOT POINT MODEL RESULT	2%	1	25%	14	5%	2
Weekday per trip Ridership Required at Recovery of	50%	29	50%	28	25%	11
Capital (vessel only) and Operating	75%	44	75%	42	75%	33
	100%	59	100%	56	100%	44

Conclusions: This route shares very different characteristics than the previous four in that is much longer and parallels heavily used and congested transportation corridors in I-95, US-1 and VRE. One would expect the corridor to produce more enthusiastic response from the travel demand. As seen above several different vessel and service allocation scenarios were tried, but none succeeded in forcing the travel demand model to produce a result that might be considered positive. Daily ridership, depending on fare and service levels would linger in the 25 to as much as 125 boardings per day. This level of ridership creates very low farebox recovery and very high cost per passenger. Those projections point to a route that does not appear to attract enough market demand for a financially sustainable service. That said, not every conclusion drawn from a travel demand model is reflective of reality and certainly factors that mold travel demand, habits, and attitudes change every day.

Part of the issue, referenced in an earlier section of this report, is that demand in this corridor is largely one way. So, for example a vessel moving from Washington, DC to Woodbridge/Belmont Bay in the morning would likely be completely empty as there is very little employment in the immediately adjacent area. Finding a complementary market could offer an opportunity to try a service from Woodbridge. Two such possible markets exist; one is the potential for commuter service from Washington DC to Fort Belvoir which is immediately adjacent to Belmont Bay. Should the Army decide to further explore the opportunity of opening water access to the base, there may be enough demand to create a two-way market that could sustain and develop the market in the opposite direction, namely Woodbridge residents commuting into Washington, DC.

The other potential complementary market may be Woodbridge to National Harbor as a result of constructing the casino on site. This is somewhat speculative, but makes sense to be explored more deeply as the casino begins operations and market areas become better known. It certainly has the potential to create a midday and evening market to supplement the commuter market.

Aside from complementary markets there may be opportunities arise that could create a need for an alternative mode from Woodbridge into Washington, DC. For example the CSX trestle over the Potomac is very old and likely beyond useful life. At some point in the not too distant future some level of repair and rehabilitation will be required to ensure the bridge remains functional. It is unknown what capacity constraints this might impose on VRE, but should that happen, a parallel ferry route could assist in creating alternate capacity. Similar situations could occur with other vehicle bridges over the Potomac, such as the Key Bridge or Memorial Bridge. Should either of those become capacity constrained traffic will spill over to I-95 creating even greater back up and delay. This could also provide an opportunity to create an alternate bypass route with a ferry from Woodbridge.

Lastly, there is the issue that arose in the household survey, while households in Woodbridge did not appear to be significantly different in this respect from households throughout the region, there is a skepticism about ferries which seems to have root in the fact that they have been so long absent from the river system. People see the rivers as scenic or places to recreate, but the idea of using it for transportation is not within the common vernacular of many residents. An approach to begin shifting this view is to establish ferry service on lower risk, higher potential services as a first step; a proof of concept. With successful operational experience in the public eye, the view of water transportation will begin to shift, creating a more positive environment in which to start services with lower potential, and higher risk.

MILITARY CORRIDORS

Conclusions: Out of several potential military corridors at the start of the study, one high potential corridor remains that is, perhaps, the best positioned in terms of starting a new service of all the services evaluated with high potential. A service from Alexandria to Joint Base Anacostia/Bolling and the adjacent headquarters of the United States Coast Guard at the Department of Homeland Security Headquarters (the former St. Elizabeth's Hospital) makes a strong candidate corridor for several reasons:

1.) The potential riders are known and easily communicated with through well-established channels.

2.) DHS Headquarters was constructed under Capital Area Planning regulations requiring no more than one parking space for every 4 employees. Therefore, employee parking is at a

premium and many employees are actively seeking and using alternative transportation to reach work each day.

3.) All employees at both facilities have access to the federal employee transit subsidy ($130 per month, but could increase to $250 per month) to help defray the needed fare, about $7 per one way trip, to support the full cost of vessel operation.

4.) Two possible facilities exist in Alexandria (see discussion in Executive Summary regarding Jones Point Park and Old Town) and a facility exists at JBAB, which with minor modification can easily meet the needs of a commuter ferry.

5.) A viable case was made to the FTA and in return FTA has awarded a $3.3 million capital grant ($4.8 million with local match) to acquire vessels and modify terminals, related to this service.

6.) The travel demand model suggests about 1,900 people make the trip from Alexandria to JBAB/DHS every day for work. More accurate data from the Navy commands at JBAB and DHS have set the number at about 1,900 people within Alexandria, proper. This is comprised of about 800 from Navy Commands including military and civilian personnel, but not including Defense Intelligence Agency (DIA) personnel. DIA personnel, based on a recent survey, include about 400 people living in Alexandria proper. These numbers do not account for other commands that are housed on JBAB which could add to that total, but have not been estimated. DHS reports that about 700 people work for the USCG at DHS headquarters and live in Alexandria proper. While not intended to be a 100% precise number, the sources corroborate a workable market if about 10% of the people who live in Alexandria take advantage of the ferry service. The resulting daily ridership will be about 400 boardings per day.

7.) The cost model suggests the route which is 2.2 miles long will break even using 35 passenger vessels (generic Sea Shuttle), operating every 20 minutes for 2 hours in each peak period if the fare is $7.00 per day (about $294 per month per person) and the ridership is 400 per day.

8.) The commands and transportation personnel at JBAB and DHS are enthusiastic about the opportunity to provide relief from the traffic congestion on I-295 that has noticeably increased since DHS began occupying the St. Elizabeth's site in August 2014.

9.) The Navy has been interested in a cooperative venture to resolve potential security issues for people accessing JBAB .

10.) The Navy and DHS are collaborating to work out a land side shuttle system to ensure employees reach their posts in a convenient manner.

WATER "TAXI" OPERATIONS

The study found that there is very high travel demand for short local trips between various locations along the Washington DC waterfront. Terminal sites at Georgetown, National Mall, Old Seaport (along the Southwest Waterfront), Buzzard's Point (adjacent to the new soccer stadium), Navy Yard (along the Southeast Waterfront and adjacent to Nationals Park) and Poplar Point, (along the Anacostia), were all identified as potential stops for a water taxi operation. The level of analysis scoped for this study was more focused on commuter trips as the baseline trip to determine demand, while travel between these points is more discretionary and in competition with walk, bicycle, and transit trips as the primary market from which they would draw customers. These locations are better suited to the type of analysis used to determine locations for bike share stations rather than analysis that looks at commuter trips being drawn from longer distance corridors and at a larger scale. Therefore, the study did not further develop the potential of these sites as water taxi terminals. Many of these points are already served by water taxi type operations and have evolved over the years to the current level of operation. These services, unless there is a substantial pool of public resource available to act as a catalyst to accelerate development, are likely best left to the current private sector operators to continue the market development of water taxi service as a way to interconnect these points along the DC Waterfront. However, the current private operation does provide a significant starting point for public-private ventures should development of short haul ferries become a priority as a way to improve the multi-modal mobility choices within the National Capital Region and funding is available to further develop these services.

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10 POSSIBLE NEXT STEPS

Recommended Activities to Develop Ferry Service

Governance

The Northern Virginia Regional Commission has been the convener and financial institution for a group of jurisdictions, all who contributed funds to accomplish this market analysis. This arrangement has served all parties well and significant progress made toward the prospect of adding ferries to the multi-modal transportation mix that already exists in the Washington, DC metro area. The longer term question is NVRC the right structure to continue the project forward into implementation? Certainly, there are alternatives to be considered, but ultimately several disparate organizations such as Washington, DC (DDOT),VDOT, MDOT, City of Alexandria, DoD and several branches of the US Military, USDOT - MARAD and FTA, DHS, DOI/NPS, Arlington, Fairfax County, Prince William County, Prince George County, WMAA, MWCOG, and others must find a forum and a decision-making body through which they all have a voice and can agree on future steps. Without such a structure the progress of potential ferry service will struggle to move through the different policy making bodies which represent five different levels of government.

The purpose of establishing this need in this document is not to recommend a specific strategy, but simply to recognize it is one of the more formidable challenges to progress on ferry operations.

Funding

While some level of grant funding has been secured through FTA, it is insufficient to move potential ferry operations much beyond an initial starter route, which was exactly the intention of the grant application. As seen in the cost model section, ferry operations come at a cost. Some source for operational start-up funds and further development of ferry terminals, e.g. at National Airport, will need to be created. It is possible, as has been the case in New York City, that on-going operating subsidies are necessary to maintain desired, but financially difficult, ferry operations until demand and the market develops. As with governance there is no readily identifiable source of funds to finance ferry operations beyond the start-up service described in the FTA grant application. The region continues to work to find solutions to fund operation, maintenance and improvement of all area transportation systems ranging from highways and freeways to MetroRail and local bus systems. To date the process is a continual process of establishing and finding the highest priorities. How ferries may fit into that overall process is difficult to know, for sure. What is known, however, is that creating funding streams will not be a simple task.

Environmental

Given the involvement of federal agencies and potential expenditure of federal funds, some level of environmental process and documentation will need to occur under NEPA. This will require the appointment of a lead agency that will carry out the environmental process to the level necessary to ensure decisions are reached with full awareness of the environmental consequences. The purpose here is not to establish the breadth of environmental review that may be necessary, only to recognize that completion of some review will be a necessity to move the project forward.

Other Issues

There is a range of other issues that are likely to arise if ferries move to operational status beyond the water taxis operating on the Potomac today. Some of these might include:

Regulatory issues and resolution – For example the speed limit/no wake zones are under the jurisdiction of Washington, even on the Alexandria waterfront as a result of the originally defined boundaries for Washington, DC. At the same time much of the shoreline south of the Woodrow Wilson Bridge, lies within the state of Maryland as the state boundary is against the west bank of the Potomac.

Development of Terminal Facilities – each new facility will require planning, environmental analysis and development of funding. Seemingly a lackluster task, with terminals, there are no ferries. This effort could also be used to establish minimum criteria for development of ferry terminals up to and including the look and feel of the facility and what amenities may be provided.

Economic Development opportunities and considerations – There is potential for improved development conditions if new ferry services are established on the Potomac. For waterfront development it could be an attractive addition, potentially even to the point of helping to fund operations. Aside from development potential, the start of expanded ferry service will certainly mean creation of new jobs. While unlikely to be a “job factory”, the potential exists for people to gain knowledge and experience and leverage that to land improved jobs in the maritime industry.