Crystal City/Potomac Yard Corridor Interim Transit Improvement Project

Draft Technical Memorandum:

Service Implementation Plan

December 2005

1.0 INTRODUCTION

1.1 Overall Concept and Project Phasing

The Crystal City/Potomac Yard Corridor Interim Transit Improvement Project is focused on developing an implementation program for interim transit improvements in the corridor running between the Pentagon/Pentagon City and Crystal City, in Arlington, to Potomac Yard and the Braddock Road Metrorail Station in Alexandria. These improvements will coincide with the development of Potomac Yard and redevelopment in Pentagon City and Crystal City. It is anticipated that this interim plan would precede implementation of a higher capacity transit system in the corridor. This memorandum outlines the service planning process, highlights detailed assumptions made during this process, and documents characteristic of the proposed service plan.

The focus of the implementation will be phased steps toward rationalizing corridor transit service. This phased implementation will transition from multiple providers to a uniform, branded, premium service running between southern termini at the Braddock Road Metrorail Station and Potomac Yard Town Center, and northern termini at the Pentagon and Pentagon City. This memorandum discusses three phases of a corridor-wide transit implementation plan (immediate, short-term, and mid-term) but focuses on the mid-term (4 to 7 year) time frame, wherein a uniform branded service is assumed to extend the length of the study corridor.

2.0 EXISTING CONDITIONS

2.1 Existing Transit Service in the Potomac Yard area

The Crystal City/Potomac Yard corridor is currently served by six Metrobus routes and one Arlington Transit (ART) route, described below. For a map of the "existing transit routes" in the study area, see Figure 1.

ART 90 (Crystal City Rush Hour Loop) serves as a rush hour loop through Crystal City. It serves the Arlington portion of the corridor, but does not serve the Pentagon or Pentagon City. The service operates every 10 minutes during the a.m. weekday and p.m. peak periods.

Metrobus Route 9A (Huntington-Pentagon Line) travels between the Huntington Metrorail Station and the Pentagon via Old Town Alexandria and Route 1. These routes do not penetrate the heart of Crystal City or Pentagon City. Route 9A operates at 30-minute headways on weekdays and Saturdays and at slightly longer headways on Sundays.

Metrobus Route 9E (Huntington-Pentagon Line) travels between the Del Ray section of Alexandria and the Pentagon via Route 1. It operates 5 trips southbound in the morning peak and 6 trips northbound in the evening peak period, at intervals of between 5 and 30 minutes.

Metrobus Route 9B (Hunting Towers-Potomac Yard-Crystal City Line) travels between Hunting Towers and Crystal City via Old Town Alexandria and Route 1. It loops through Crystal City and the Potomac Yard shopping center, but does not serve the Pentagon or Pentagon City. Route 9B operates at 35-minute headways on weekdays. It does not operate after 8 p.m. and does not provide service on weekends.

Figure 1: Existing Transit Routes in the Crystal City/Potomac Yard Corridor

Metrobus Route 10P (Mount Vernon Avenue-Potomac Yard-Crystal City Line) begins at the Braddock Road Metrorail Station, travels north along Mount Vernon Avenue, east on South Glebe Road, and loops through the Potomac Yard shopping center and Crystal City before terminating. It does not provide access to the Pentagon or Pentagon City. Route 10P operates at 35-minute headways on weekdays. It does not operate after 9 p.m. and does not provide service on weekends.

Metrobus Routes 13F and G (National Airport-Pentagon-Washington Line) operate in a loop linking National Airport, the Pentagon, and employment centers in Washington, D.C. These routes operate only on weekend mornings, providing service every 30 minutes on Saturdays and every 40-60 minutes on Sundays.

Annual operating and maintenance (O&M) costs for the major existing Metrobus routes in the corridor are included in Table 1.

Table 1: Existing O&M Costs for 2004

Metrobus Route	Annual Cost
Route 10P	$553,204
Route 9A/E	$1,286,189
Route 9B	$693,094
Total	$2,632,488

The following routes provide limited service within the study area, but do not directly serve the corridor:

Alexandria Transit Company (DASH) Route 3 (Old Town-Parkfairfax-Pentagon Metro) provides connections between Old Town Alexandria, the Braddock Road Metrorail Station, and the Pentagon via Russell Road, West Glebe Road, and Shirley Highway. Service runs at 20 minute headways in the morning and evening peak periods.

DASH Route 3/4 (Old Town-Parkfairfax Loop) operates as a loop serving Old Town Alexandria, Braddock Road Metrorail Station, and Parkfairfax via Russell Road, West Glebe Road, Cameron Mills Drive, and Braddock Road. This route does not serve the Pentagon. Route 3/4 operates every 60 minutes during the mid-day and in the evenings on weekdays, between 8 a.m. and 8 p.m. on Saturdays, and between 9 a.m. and 7 p.m. on Sundays.

DASH Route 4 (Hunting Towers-Parkfairfax-Pentagon Metro) provides connections between Hunting Towers, Old Town Alexandria, Braddock Road Metrorail Station, and the Pentagon via Braddock Road, Cameron Mills Road, and Shirley Highway. Service runs at 15 minute average headways in the morning and evening peak periods.

Metrobus Route 10A (Hunting Towers-Pentagon Line) provides service between Hunting Towers and Pentagon City and the Pentagon via Old Town Alexandria along Mount Vernon Avenue. Route 10A runs at 30-minute headways throughout the day on weekdays and on Saturdays, with service every 60 minutes on Sundays.

Metrobus Route 10E (Hunting Towers-Pentagon Line) provides peak period service between Del Ray and Pentagon City and the Pentagon via Mount Vernon Avenue. 10E service operates 8 trips northbound in the morning peak period and 8 trips southbound in the evening peak period. Headways vary from 5 to 35 minutes.

Metrobus Route 10B (Hunting Towers-Ballston Line) provides service between Hunting Towers and the Ballston Metrorail Station via Mount Vernon Avenue. Weekday service runs every 30 minutes in the morning peak and mid-day, and every 25 minutes in the

afternoon and evenings. Weekend service runs every 30 minutes on Saturdays and every 60 minutes on Sundays.

Metrobus Route 13B (National Airport-Pentagon-Washington Line) generally operates in a loop serving the Pentagon and employment centers in Washington, D.C. However, it also provides one trip from National Airport to the Pentagon and Washington, D.C. on Saturday mornings.

Metrobus Routes 23A and C (McLean-Crystal City Line) provide service between Tyson's Corner and the Crystal City Metrorail Station via Ballston. Route 23A provides service every 30 minutes on weekdays and Saturdays, and service every 60 minutes on Sundays. Route 23C provides one trip a day in each direction on weekdays.

3.0 PLANNED IMPROVEMENTS – IMMEDIATE AND SHORT-TERM TIME FRAMES

3.1 Immediate Service Changes (1-2 Years)

Immediate service changes will be timed to coincide with the Environmental Protection Agency's (EPA) move to One Potomac Yard at the southern end of Crystal City. These service changes would take place in the spring of 2006 and are expected to remain in place for the next one to two years. The changes are outlined below.

3.1.1 Service

The service changes in the immediate time frame include modifications to Metrobus, Arlington Transit (ART) and Alexandria Transit (DASH) service. The changes will include the following elements:

Metrobus

- Implementation of new 6-minute peak service providing connections between One Potomac Yard (site of new EPA headquarters) and the Crystal City Metrorail and VRE stations. This service will have a unique brand identity, will be coordinated with the Metrorail schedule, and will initially operate Monday to Friday between 5:30 a.m. and 7:30 p.m. This service will be extended south to South Glebe Road (southernmost portion of the Arlington portion of Potomac Yard) in the summer of 2006.
- Elimination of Metrobus Routes 9B and 10P. The resources utilized to operate these routes will be used to run the new service within Crystal City.
- Metrobus Routes 9A and 9E will continue to serve the corridor.

ART

- Elimination of ART 90 service. This service will be replaced by the new Metrobus service described above.

DASH

- New Alexandria Transit service to cover areas of Alexandria previously served by Metrobus Routes 9B and 10P will be implemented. Preliminary service plans are currently being developed. The new service is anticipated to begin in March 2006, after Metrobus Routes 9B and 10P are eliminated.

Transitway, Stops, and Vehicles

Transitway, stops, and vehicles will have the following characteristics in the immediate time frame:

- Buses will run in mixed traffic.
- The new corridor Metrobus service (Crystal City/Potomac Yard Transit) will use new standard low-floor 40-foot Clean Natural Gas (CNG) buses based at the existing Metrobus Four Mile Run maintenance facility.
- All other corridor routes will continue to use standard Metrobus or DASH buses.
- Bus routes will utilize existing standard stops.

3.2 Short-Term (2-3 Years)

Short-term service changes will be initiated within two to three years after the implementation of the immediate term service changes described in Section 3.1. Services in Alexandria and Arlington will remain independent. A major implementation element during this time period will be the opening of the first segment of the Arlington transitway, between 26th Street South and the Arlington/Alexandria border at Four Mile Run. This segment is planned to open in winter 2006/spring 2007.

3.2.1 Service

Service elements of the short-term time frame include:

- Extension of Arlington's Crystal City/Potomac Yard service into the Alexandria portion of Potomac Yard, to the Potomac Yard Shopping Center.
- The Arlington Crystal City/Potomac Yard service will be expanded to operate Monday to Saturday, with 6-minute headways during weekday peak periods and 12-minute weekday off-peak and Saturday headways.
- Arlington Crystal City/Potomac Yard service will continue to be operated by WMATA.
- Service developed in the immediate time frame to cover portions of Alexandria previously served by Metrobus Routes 9B and 10P will remain. No decision has been made regarding whether this service will be operated by WMATA or DASH.

3.2.2 Transitway, Stops and Vehicles

Transitway, stop, and vehicle elements in the Short-term time frame will include the following elements:

- As noted, operation of the Metrobus Potomac Yard service along the first phase of the Arlington transitway (26th Street South to the Arlington/Alexandria border at Four Mile Run).
- Operation in mixed traffic in Alexandria and north of 26th Street South in Arlington.
- Installation of new stops along the first phase of the Arlington Transitway.
- Arlington's Crystal City/Potomac Yard service will continue to utilize low-floor 40-foot CNG buses operating out of the Metrobus Four Mile Run maintenance facility. Buses and designated stops will have a unique identity.
- All other corridor routes will use standard Metrobus or DASH buses.

4.0 PROPOSED SERVICE IMPROVEMENTS – MID-TERM (4 to 7 years)

Mid-term service changes will be implemented four to seven years after the immediate service changes described in Section 3.1. It is assumed that in this time frame, service between Alexandria and Arlington will be integrated into a single uniform service running from one end of the study corridor to the other, and will be operated by WMATA. It is

also assumed that buses providing the service will be operated from WMATA's Four Mile Run maintenance and storage facility. Outlined below is a description of each of the elements that together will comprise the proposed mid-term corridor transit improvements. These elements include:

- service plan routes
- running way
- stops
- bus run times
- service frequency and hours of service
- operations and maintenance costs
- operations facility

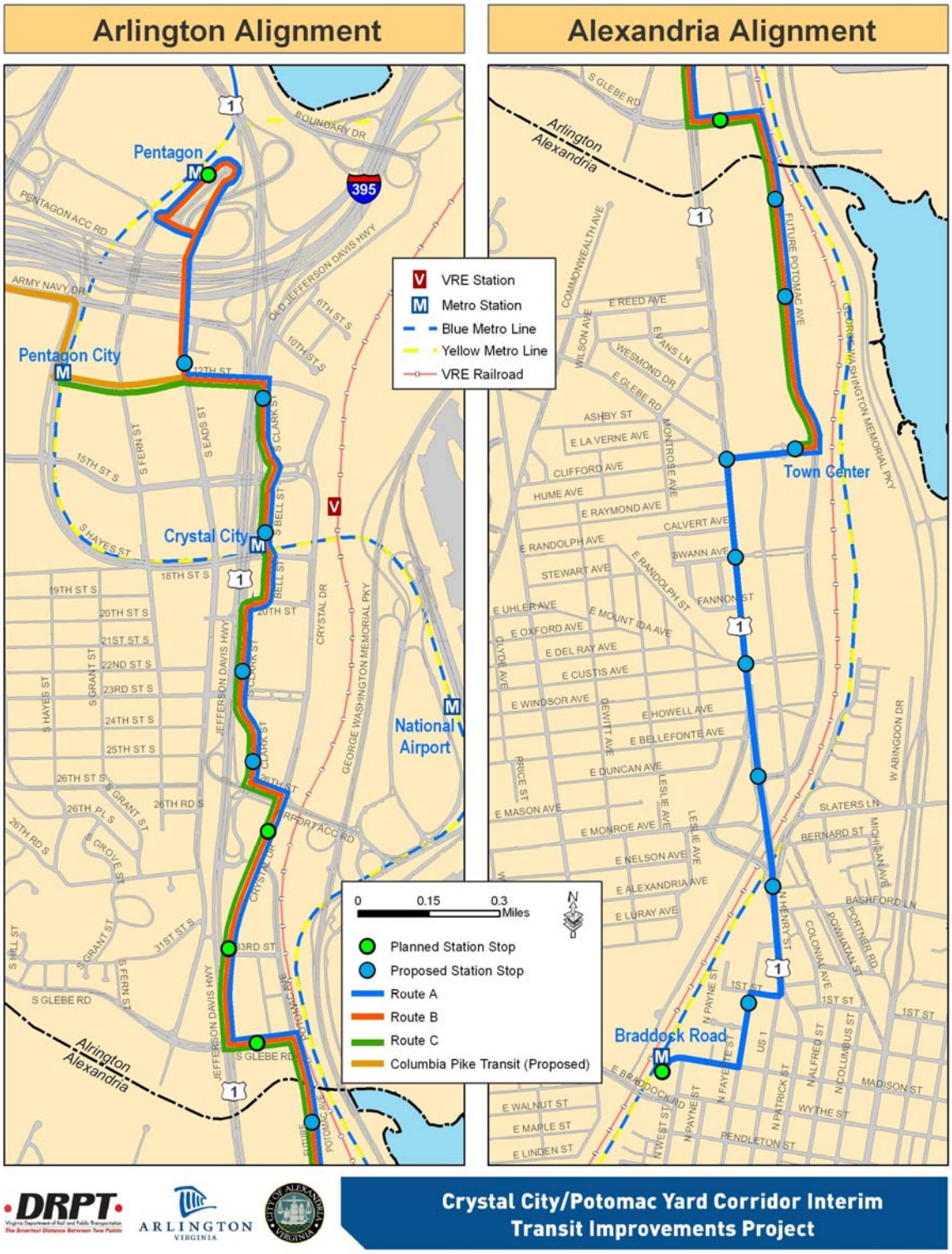
4.1 Mid-Term Service Plan Routes

In order to respond efficiently to growth in demand along the corridor, the proposed full-corridor Mid-Term service consists of three different routes operating between a series of northern and southern termini. An additional element of this service plan is that there are proposed implementation phases within the Mid-Term time period to correspond more closely with corridor development. Each of the routes as well as their proposed date of implementation is described below.

It should also be noted that during the four month service planning process, additional alternative alignments as well as vehicle options such as the use of articulated buses were analyzed but discarded in favor of the three-route approach described here. To provide a full understanding of the range of alternatives analyzed, including explanations of why they were dropped from further consideration, these alternatives and options are presented as Appendices to this Technical Memorandum.

The service plan presented in the body of the report consists of the three routes noted above, phased in over time as the corridor develops. A schematic showing the three routes and their northern and southern termini is shown in Figure 2. The first route, Route A, would have a northern terminus at the Pentagon and a southern terminus at the Braddock Road Metrorail Station. Route A would be implemented in 2010. The second route, Route B, would have a northern terminus at the Pentagon and a southern terminus at the Potomac Yard Town Center. Route B would also be implemented in 2010. The third route, Route C, would have a northern terminus at Pentagon City and a southern terminus at the Potomac Yard Town Center. Route C would be implemented in 2012. The street-by-street routings along each of these routes are discussed in greater detail below. The service characteristics associated with each of these routes are outlined in greater detail in Section 4.6.

Figure 2: Three Route Service Concept



Route A – Street-by-Street Routing

Route A would provide service between a northern terminus at the Pentagon and a southern terminus at the Braddock Road Metrorail Station, via the Potomac Yard Town Center. The routing for this service is described in detail below and shown in blue in Figure 2; the one-way and round-trip lengths for this route are 5.08 miles and 10.16 miles respectively.

Route A would depart the Pentagon, and would head southbound along South Eads Street to the intersection of 12th Street and Eads. From there it would follow Clark Street to the Crystal City Metrorail Station, then South Bell Street south to 20th Street South, and then turn west on 20th Street South, then south on South Clark Street. The route would follow South Clark Street to 26th Street South, where it would turn east before heading south on Crystal Drive. From Crystal Drive, it would head south briefly along Route 1 before turning east again on South Glebe Road, then south on Potomac Avenue to the Four Mile Run Bridge.

The route would then cross the Four Mile Run Bridge to enter Alexandria and the Potomac Yard shopping center, following Potomac Avenue south to the Potomac Yard Town Center station. The route would then continue along Potomac Avenue south to East Glebe Road. After turning west on East Glebe Road, the alignment would turn south from East Glebe onto Route 1. The route would then continue on Route 1 across the straightened Monroe Avenue Bridge to North Henry Street. The route would then turn west on 1st Street to Fayette Street, then would follow Fayette Street south to Madison Street and west to the Braddock Road Metrorail Station.

Route B- Street-by-Street Routing

Route B would provide service between a northern terminus at the Pentagon and a southern terminus at the Potomac Yard Town Center The street-by-street routing along this route is described in detail below and shown in orange in Figure 2; one-way and round trip route lengths are 3.26 miles and 6.52 miles respectively.

Route B would depart the Pentagon, and would head southbound along South Eads Street to the intersection of 12th Street and Eads. From there it would follow Clark Street to the Crystal City Metrorail Station and then follow South Bell Street south to 20th Street South, west on 20th Street South and south on South Clark Street. The route would follow South Clark Street to 26th Street South, where it would turn east before heading south on Crystal Drive. From Crystal Drive, it would head south briefly along Route 1 before turning east again on South Glebe Road, then south on Potomac Avenue to the Four Mile Run Bridge. Entering Alexandria, Route B would cross the Potomac Yard shopping center to its southern terminus at the Potomac Yard Town Center.

Route C – Street-by-Street Routing

Route C would provide service between a northern terminus at Pentagon City and a southern terminus at Potomac Town Center. The street-by-street routing along this alignment is described in detail below and shown in yellow in Figure 2; one-way and round-trip route lengths are 2.85 miles and 5.70 miles respectively.

Route C would leave Pentagon City Metrorail Station and follow 12th Street South east to South Clark Street, and then turn south on South Clark Street and continue south along South Bell Street to 20th Street South. The alignment would turn west on 20th Street South and south on South Clark Street to 26th Street South, where it would turn east

before heading south again on Crystal Drive. From Crystal Drive, it would head south briefly along Jefferson Davis Highway before turning east again on South Glebe Road, then south on Potomac Avenue to the Four Mile Run Bridge. Entering Alexandria, Route C would cross the Potomac Yard shopping center to its southern terminus at the Potomac Yard Town Center.

4.2 Three Route Concept - Impacts on Local Service

Outlined below is a brief summary of how local service would be configured in the corridor after implementation of the Mid-Term transit improvements.

- Metrobus Route 9B and Route 10P remain removed from service – originally removed in the one to two year time frame
- Metrobus Route 9A/E service will be maintained.

4.3 Running Way

Exclusive running way to increase bus speeds is an integral part of the mid-term service strategy. Potential segments of exclusive running way have been identified for implementation wherever deemed feasible by Arlington and Alexandria. The level of exclusive running way for each route in the proposed three-route service configuration is shown in Figure 3 and described in greater detail below:

- Route A (Pentagon to Braddock Road Metrorail Station) – service along Route A would run in mixed traffic between the Pentagon and the intersection of Army-Navy Drive and South Eads Street. South of this intersection service would run on exclusive transitway until it reaches the Four Mile Run Bridge. The service would then run in mixed traffic from this point until the point where it enters Route 1 at the intersection of Route 1 and East Glebe Road. The service would then run in exclusive transitway between East Glebe Road and a point south of East Bellefonte Avenue (dedicated transitway along Route 1 would be approximately 0.8 miles). Between this point and the Braddock Road Metro Station, the service would run in mixed traffic.
- Route B (Pentagon to Potomac Yard Town Center) – service along Route B would have the same exclusive transitway as Route A, as far south as Potomac Yard Town Center, where service along this route would terminate.
- Route C (Pentagon City to Potomac Yard Town Center) – service along this route would run in an exclusive transitway along South 12th Street between Hayes Street (at the Pentagon City Metrorail station) and the intersection of South 12th Street and South Eads Street. South of this intersection, the exclusive transitway would be the same as in Route A, as far south as Potomac Yard Town Center, where service along this route would terminate.

4.4 Stops

Stops for the proposed mid-term service would be spaced at intervals from ¼- to ½-mile. The stops associated with each route are listed in Table 2 and shown in Figure 3.

Figure 3: Level of Exclusive Right-of-Way

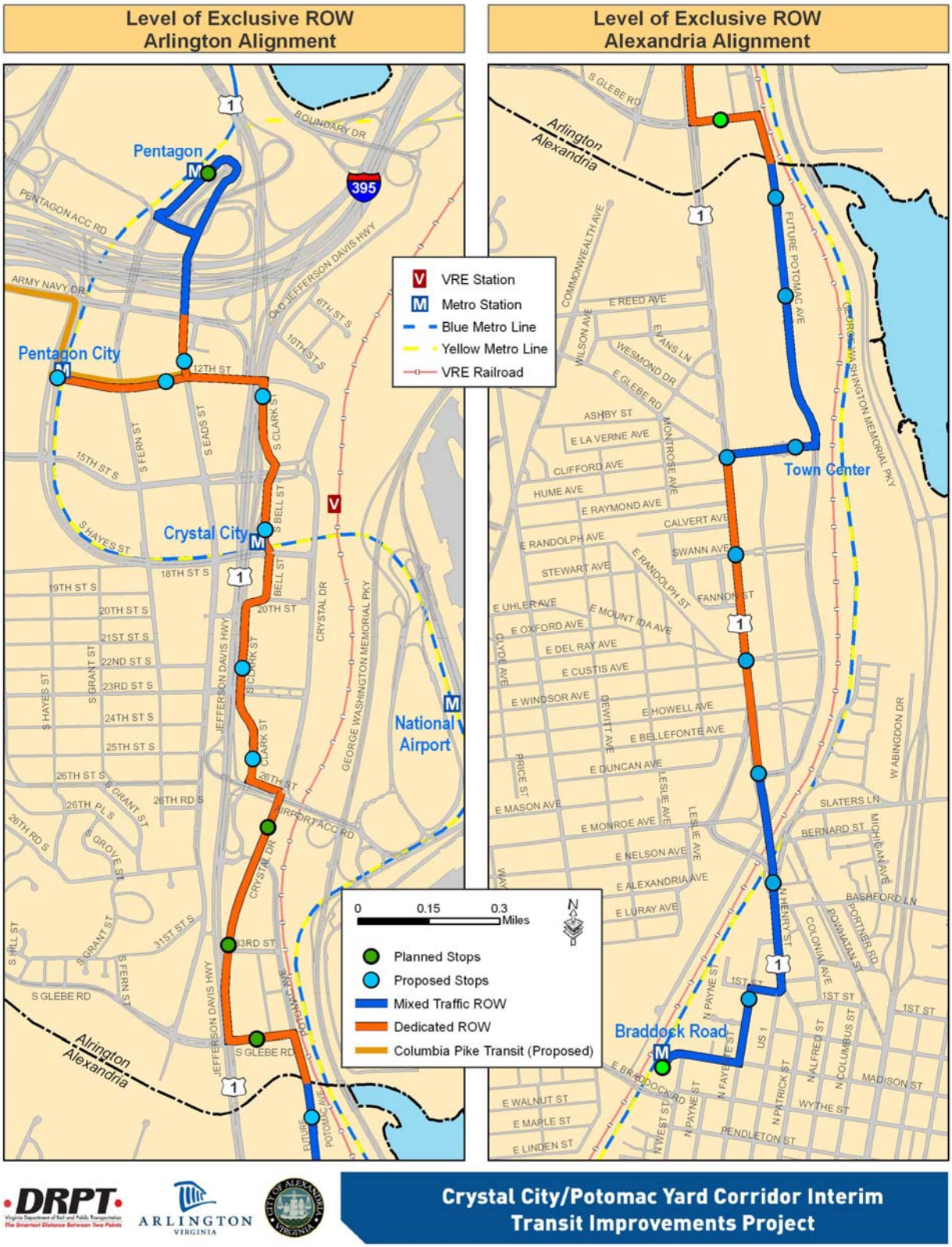


Table 2: Stop Locations

Route A	Route B	Route C
Pentagon to Braddock Road Metro Route Stops	**Pentagon to Potomac Yard Town Center Route Stops**	**Pentagon City to Potomac Yard Town Center Route Stops**
Pentagon	Pentagon	
12th Street and Eads Street	12th Street and Eads Street	
		Pentagon City
		12th Street & Fern/Eads Street
12th Street & Clark	12th Street & Clark	12th Street & Clark
Crystal City Metrorail Station	Crystal City Metrorail Station	Crystal City Metrorail Station
22nd Street	22nd Street	22nd Street
25th Street	25th Street	25th Street
26th Street	26th Street	26th Street
31st Street	31st Street	31st Street
South Glebe Road	South Glebe Road	South Glebe Road
Potomac Yard – North	Potomac Yard – North	Potomac Yard – North
Potomac Yard – Central	Potomac Yard – Central	Potomac Yard – Central
Potomac Yard Town Center	Potomac Yard Town Center	Potomac Yard Town Center
Hume Street		
Swann Avenue		
East Custis Avenue		
North of Monroe Avenue Bridge		
Bashford Lane		
1st Street		
Braddock Road Metrorail Station		

4.5 Run Times

As the first step in developing a service plan and estimating vehicle requirements and operations and maintenance costs, run times and round-trip cycle times were calculated for the three-routes described in Section 4.1. Calculation of these run times relied on inputs such as dwell times at stops, vehicle acceleration and deceleration rates, and roadway traffic conditions along the right-of-way (including level of right-of-way exclusivity). Table 3 shows the run times for each route based on level of dedicated right-of-way described in Section 4.3.[1]

Table 3: Run Time and Cycle Times

Alternative A	Round Trip Run Time (min)	Round Trip Cycle Time (includes layover)* (min)
Route A	59	69
Route B	40	50
Route C	40	50

** Layover time is assumed equal to 10 minutes*

[1] By way of comparison, travel times through the corridor for automobiles, as shown in the *Crystal City/Potomac Yard Transit Alternatives Analysis,* are 22 minutes for northbound and 18 minutes for southbound trips. Thus the automobile round trip would be approximately 40 minutes, assuming no layover time at either end.

4.6 Vehicles

The capacity of the vehicle to be used in the transit improvements is a key element in determining the number of vehicles that will be required to meet estimated demand. It was assumed that the mid-term service would operate using Orion VII 40-foot low-floor CNG buses operating out of WMATA's Four Mile Run maintenance facility. For comparison, service plans were also developed using the capacities of larger 60-foot articulated buses. This comparison can be found in the Appendix. Table 4 shows the vehicle capacity assumptions of the Orion VII vehicle, and Figure 4 shows a photograph of the vehicle.

Table 4: Vehicle Data*

Vehicle	Seats	Total Capacity (Seated and Standing)
Orion VII CNG (40-foot)	43	60

*Bus fleet data from WMATA

Figure 4: Orion VII 40-foot CNG Bus

4.7 Frequency and Hours of Service

The key elements in determining the final operating cost of the service plan proposed for the mid-term transit improvements are service frequency and hours of service, also known as span of service. Service frequency, in turn, can be set either based on policy (known as policy headway) or set based on the amount of capacity required to meet estimated passenger demand. The initial headway analysis originally considered both approaches. This analysis showed, however, that policy headways, which would have been set to match those of the Metrorail Blue Line, would not provide sufficient capacity to meet demand. Therefore the concept of policy headways for the mid-term service was dropped from further consideration.

To provide a more complete understanding of the policy headway analysis, the detailed results are provided in Appendix B. The demand based analysis is outlined below. All routes would operate weekday service from 5 a.m. to midnight. Weekend service would operate between 7 a.m. and midnight.

The service frequencies outlined in greater detail below show required headways during the peak period. Off-peak headways are assumed to be the same as off-peak Metrorail headways, 12 minutes. Outlined below are the time periods during the day when peak or off-peak service would be run. Saturday headways would be consistent, at 12 minutes, with weekday off-peak service frequencies. Sunday frequencies would be 15 minutes all day to correspond to Sunday Metrorail frequencies.

Weekday Service

- Off-peak early morning service between 5 and 6 a.m.

- AM peak service between 6 and 9 a.m.
- Off-peak late morning service between 9 and 11 a.m.
- Mid-day peak service between 11 a.m. and 2 p.m.
- Early afternoon off-peak service between 2 and 4 p.m.
- PM peak service between 4 and 7 p.m.
- Evening off-peak service from 7 to 12 a.m.

Weekend Service

- Saturday service between 7 a.m. and 10 p.m.
- Saturday late-night service between 10 p.m. and 12 a.m.
- Sunday service between 7 a.m. and 12 a.m.

To determine required service frequencies based on estimated demand, the demand estimates completed in the corridor Alternatives Analysis (AA) were utilized. As the first step in this analysis, a 2015 peak hour peak load point number of 1,900 from the Alternatives Analysis was calculated (ridership in 2015 was the earliest future year available from the AA). A 2010 (the first year of the mid-term service) ridership figure was scaled from the 2015 AA ridership estimate based on the proposed development schedule for Potomac Yard. For example, by 2010, development in Potomac Yard is expected to reach 62% of total build-out, thus the estimated peak load factor for 2010 was scaled down to 1,124 riders (this figure also includes scaling back based on an annual growth factor). For the year 2012 the peak load factor is estimated at 1,484 riders, and for 2014 the peak load factor is 1,886 (each of these figures is based on the anticipated percentage of full build-out and includes the annual growth factor).

Peak hour headway requirements were calculated by determining the number of trips in the peak hour that would be required to meet the estimated demand at the peak load point, utilizing an assumed vehicle capacity of 60. For 2010, 19 trips would be required to provide capacity to meet the peak load point demand of 1,124. 20 trips are actually proposed to allow for an even distribution of trips between Route A and B. This is shown in Table 5. Because there is less demand south of Potomac Yard Town Center, Route A, which runs all the way to the Braddock Road Metro Station, has less frequent service than Route B, which runs only to Potomac Yard Town Center. North of Town Center, where the greatest vehicle loadings occur, the two services provide for a combined peak hour headway of approximately 3 minutes in 2010.

Peak vehicle requirements, in turn, are calculated by dividing round trip cycle time (shown above in section 4.5) by peak hour headways. These peak hour vehicle requirements are also shown in Tables 5, 6, and 7.

To calculate the required number of spare vehicles, the typical WMATA fleet spare factor of 15.6 percent was applied to the number of total peak period buses in service. Table 5 shows the number of peak vehicles and the number of fleet vehicles required for all three routes.

As noted above, Table 5 shows the peak headways along each of the routes and the total peak hour vehicles required to operate enough service to meet the year 2010 peak load point demand of 1,124. Tables 6 and 7 show the peak trips and vehicles that would be needed for the 1012 demand of 1,484 and the 2014 demand of 1,886.

Table 5: 2010 Demand Based Peak Hour Vehicle Requirements with 40' CNG Bus

Route	Analysis Level Peak Hour Trips and Headway (min)	Peak Vehicles Required
Route A	8/7.5	10
Route B	12/5.5	10
Combined	**20/3.1**	**20**

Table 6: 2012 Demand Based Peak Hour Vehicle Requirements with 40' CNG Bus

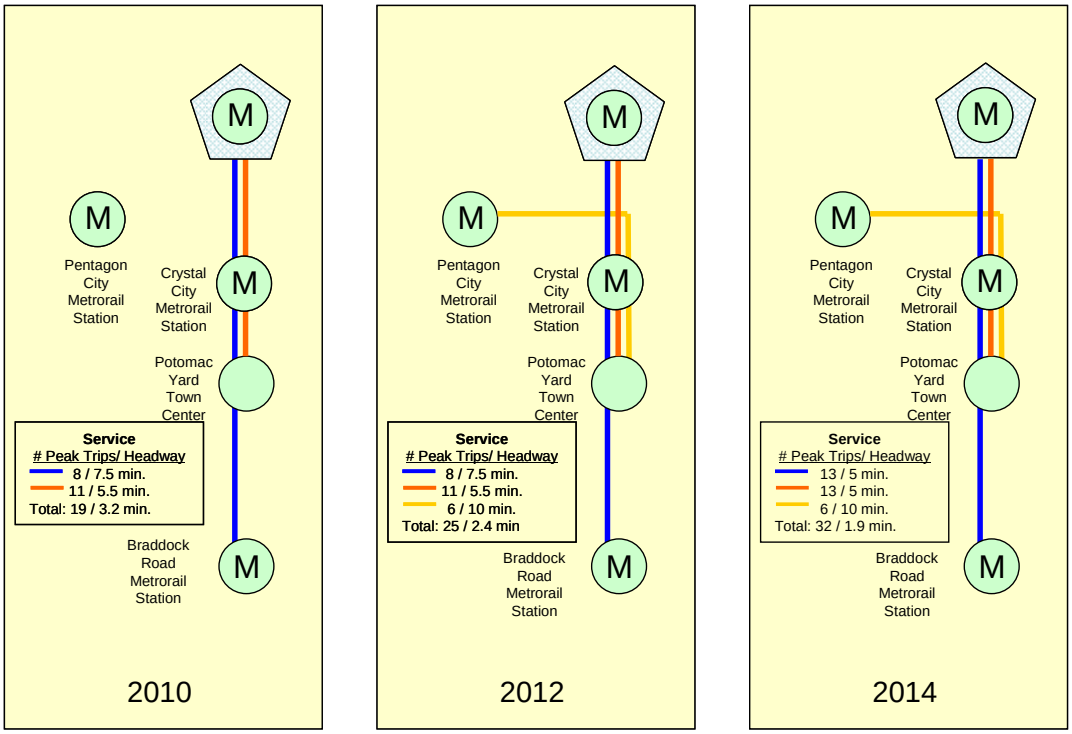
Route	Analysis Level Peak Hour Trips and Headway (min)	Peak Vehicles Required
Route A	8/7.5	10
Route B	12/5.5	10
Route C	6/10	5
Combined	**26/2.4**	**25**

Table 7: 2014 Demand Based Peak Hour Vehicle Requirements with 40' CNG Bus

Route	Analysis Level Peak Hour Trips and Headway (min)	Peak Vehicles Required
Route A	12/5.0	10
Route B	14/4.3	14
Route C	6/10	5
Combined	**32/1.9**	**30**

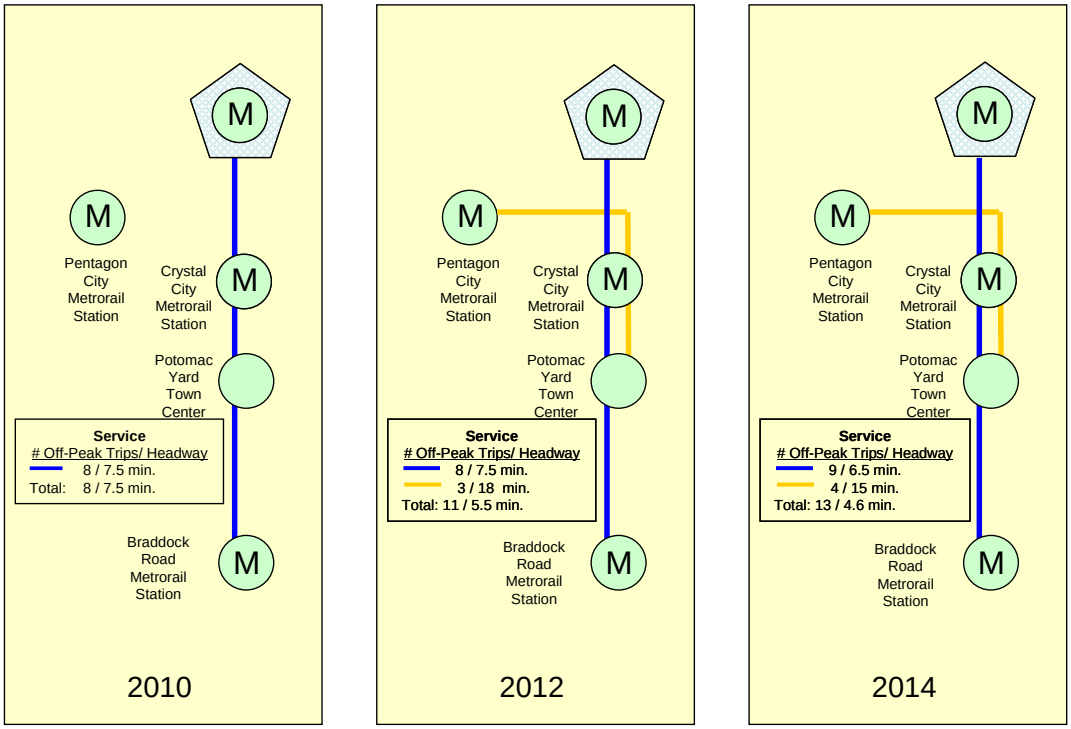
The phasing in of service routes based on demand and the headways for each route are shown in Figures 5A and 5B.

Figure 5A: Phasing of Routes / Peak and Off peak



Note: # of buses assumes a maximum vehicle capacity of 60 passengers

Figure 5B: Phasing of Routes / Peak and off peak



Note: # of buses assumes a maximum vehicle capacity of 60 passengers

Figure 6 shows how capacity increases would be phased to meet growing demand. Demand is expected to rise sharply in the mid-term due to the projected opening of a number of new office and residential buildings between now and 2014. Phased increases in capacity would enable the service to meet demand at the appropriate time and would avoid running buses at excess capacity. The capacities shown in Figure 7 assume demand-based headways and 40-foot CNG buses.

Figure 6: Mid-Term Service Capacity and Projected Growth in Demand (Peak Hour)

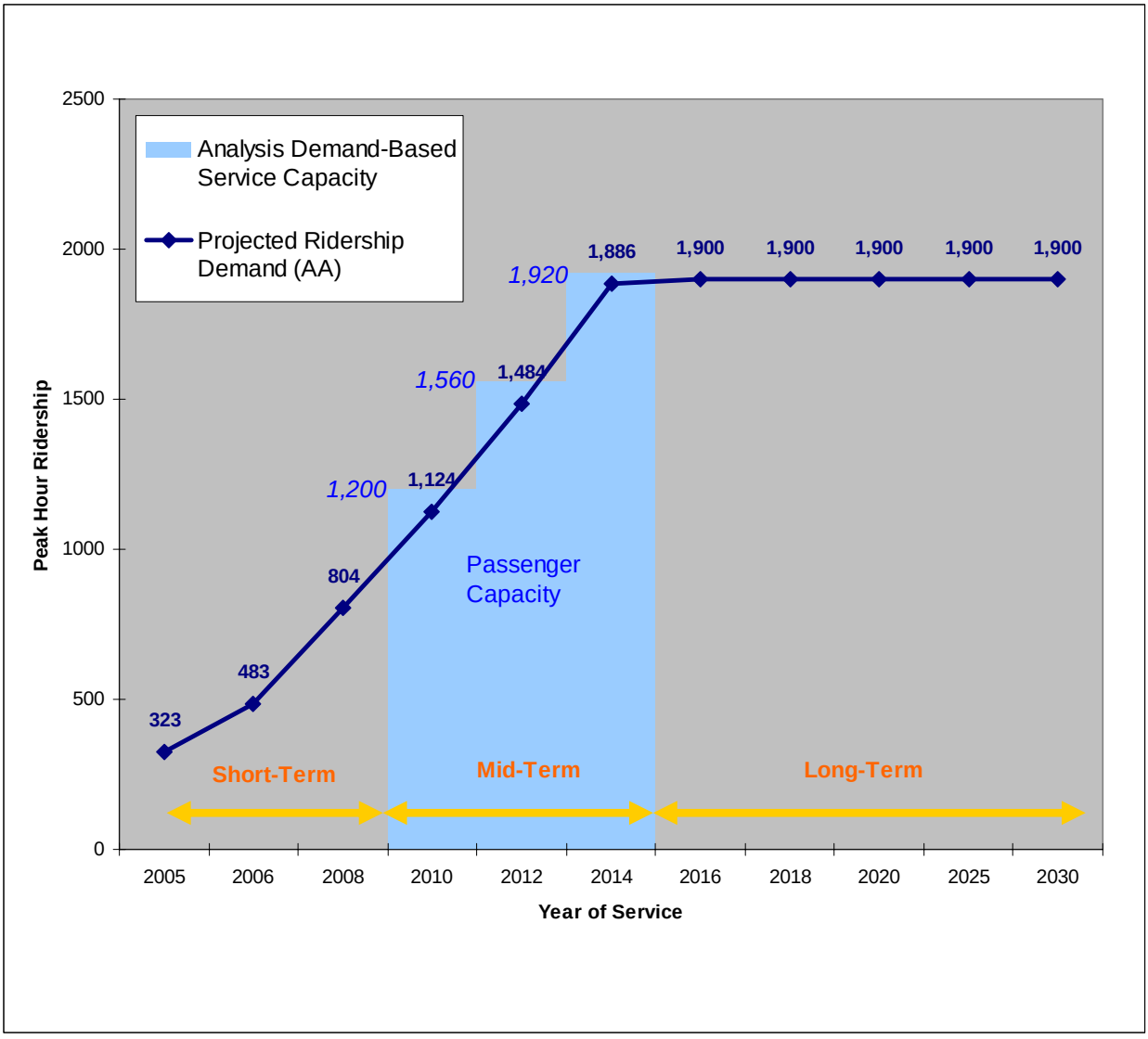


Table 8 presents a summary of all service in t16he corridor by year.

Table 8: Projected Ridership Growth and Demand-Based Transit Service

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Round Trip Run Time (min) Pentagon to Potomac Yard Town Center branch	40	40	40
Round Trip Run Time (min) Pentagon to Braddock Road Metro branch	59	59	59
Round Trip Run Time (min) Pentagon City to Potomac Yard Town Center	n.a.	40	40
Round Trip Cycle Time (min) Pentagon to Potomac Yard Town Center branch (includes layover)	50	50	50
Round Trip Cycle Time (min) Pentagon to Braddock Road Metro Station branch (includes layover)	69	69	69
Round Trip Cycle Time (min) Pentagon City to Potomac Yard Town Center	n.a.	50	50
40-foot CNG			
Peak Combined Headway	3.2	2.4	1.9
# Peak/Fleet Vehicles	20/24	25/30	30/35

4.8 Operations and Maintenance Costs

The estimated operations and maintenance costs for the different service alternatives outlined above were calculated based on estimated revenue vehicle hours multiplied by an average cost per revenue hour. The O&M costs per revenue hour used in Table 9 were calculated based on an average of operations and maintenance costs over all WMATA routes. This average cost per revenue vehicle hour is $94. No allowance for maintenance of dedicated transitway has been added to the estimates.

Table 9: Daily and Annual O&M Costs – Three-Route Service Configuration

Service Configuration and Year	Daily Revenue Hours	Cost/ Hour	Total Daily Cost	Total Annual Cost
2010 – All Routes				
	280	$94	$26,432	$7,771,008
2012 – All Routes				
	355	$94	$33,512	$9,852,528
2014 – All Routes				
	411	$94	$38,798	$11,406,730

Note: Annualization factor is 294

4.9 Operations and Maintenance Facility

The new service will utilize WMATA's Four Mile Run maintenance and storage facility. Additional details regarding any changes to the capacity of the Four Mile Run facility will be provided and evaluated as part of ongoing design of these interim transit improvements.

APPENDIX A: EXISTING BUS ROUTES

Route	Description	Start Time *northbound* southbound	End Time *northbound* southbound	Headway **am/mid/pm** (in minutes)	
				Weekday	**Weekend**
Arlington Transit (ART)					
ART 90	**Crystal City Rush Hour Loop.** Crystal Station to Gateway North via Crystal Drive and Clark Street **ONLY SERVES ARLINGTON PORTION OF POTOMAC YARD.**	*6:25 a.m.* 6:30 a.m.	*6:46 p.m.* 6:46 p.m.	10/--/10	No service
Alexandria Transit Company (DASH)					
DASH 3	**Old Town-Parkfairfax-Pentagon Metro.** Old Town Alexandria to Pentagon Metrorail Station via Braddock Road, Russell Road, West Glebe Road, and Shirley Highway.	*5:49 a.m./7:02 a.m.* [1] 6:19 a.m.	*6:10 p.m./7:12 p.m.* [1] 7:32 p.m.	20/--/20	No service
DASH 3/4	**Old Town-Parkfairfax Loop.** Loop serving Old Town Alexandria, Braddock Road Metrorail Station, and Parkfairfax.	*10:16 a.m.*	*10:07 p.m.*	--/60/60	60/60/60
DASH 4	**Hunting Towers-Parkfairfax-Pentagon.** Hunting Towers to the Pentagon via Old Town Alexandria, Braddock Road, Cameron Mills Road, and Shirley Highway.	*5:48 a.m.* 6:27 a.m.	*6:44 p.m.* 7:23 p.m.	20/--/20	No service
Metrobus					
9A	**Huntington-Pentagon Line.** Huntington Metrorail Station to Pentagon Metrorail Station via Huntington Avenue, Richmond Highway, Washington Street, and Route 1.	*4:30 a.m.* 5:06 a.m.	*1:54 a.m.* 1:37 a.m./ 4:01 a.m. [2]	30/30/30	Sat: 30/30/30 Sun: 60/40/40
9B	**Hunting Towers-Potomac Yard-Crystal City Line.** Hunting Towers to Crystal City via Washington Street and Route 1. Loops through Potomac Yard Shopping Center parking lot. Loops through Crystal City via Crystal Drive and Clark Street.	*6:32 a.m.* 7:06 a.m.	*8:23 p.m.* 8:18 p.m.	35/35/35	No service

Route	Description	Start Time *northbound* southbound	End Time *northbound* southbound	Headway **am/mid/pm** (in minutes)	
				Weekday	**Weekend**
9E	**Huntington-Pentagon Line.** Del Ray to Pentagon Metrorail Station via Route 1.	*4:16 p.m.* 6:40 a.m.	*6:21 p.m.* 8:01 a.m.	10-20/--/5-30	No service
10A	**Hunting Towers-Pentagon Line.** Hunting Towers to Pentagon Metrorail Station via Washington Street, Mount Vernon Avenue, and Pentagon City. **DOES NOT SERVE POTOMAC YARD.**	*4:54 a.m./ 6:38 a.m.*[3] 5:28 a.m.	*12:32 a.m.* 12:20 a.m./ 1:01 a.m.[3]/ 3:56 a.m. [2,3]	30/30/30 (60 min. after 8:30 p.m.)	Sat: 30/30/30 (60 min. after 8:00 p.m.) Sun: 60/60/60
10B	**Hunting Towers-Ballston Line.** Hunting Towers to Ballston Metrorail Station via Washington Street, Mount Vernon Avenue, Shirlington, Walter Reed Drive, and Glebe Road. **DOES NOT SERVE POTOMAC YARD.**	*5:10 a.m./ 5:32 a.m.*[3] 5:44 a.m./5:55 a.m.[4]	*12:24 a.m. / 2:16 a.m.* [2] 12:51 a.m./ 1:24 a.m. [3]/ 4:09 a.m. [2,3]	30/30/25 (60 min. after 10:00 p.m.)	Sat: 30/30/30 (60 min. after 9 p.m.) Sun: 60/60/60
10E	**Hunting Towers-Pentagon Line.** Del Ray to Pentagon Metrorail Station via Mount Vernon Avenue, Arlington Ridge Road, and Army Navy Drive. **DOES NOT SERVE POTOMAC YARD.**	*6:30 a.m.* 4:29 p.m.	*8:35 p.m.* 7:03 p.m.	10-20/--/5-35	No service
10P	**Mount Vernon Avenue-Potomac Yard-Crystal City Line.** Braddock Road Metrorail Station to Crystal City Metrorail Station via Mount Vernon Avenue, South Glebe Road, Potomac Yard Shopping Center, Crystal Drive, and Clark Street.	*6:46 a.m.* 6:48 a.m.	*8:27 p.m.* 9:03 p.m.	35/35/35	No service

Route	Description	Start Time *northbound* southbound	End Time *northbound* southbound	Headway **am/mid/pm** (in minutes)	
				Weekday	**Weekend**
13A	**National Airport-Pentagon-Washington Line.** Loop serving Pentagon Metrorail Station, Potomac Park, Federal Triangle, and Southwest employment area. **DOES NOT SERVE POTOMAC YARD.**	*5:09 a.m.*	*1:37 a.m.*	10-20/60/20-30 (60 min. after 7:00 p.m.)	60/60/60
13B	**National Airport-Pentagon-Washington Line.** Loop serving Pentagon Metrorail Station, Southwest employment area, Federal Triangle, and Potomac Park. **DOES NOT SERVE POTOMAC YARD.**	*5:42 a.m.*	*7:13 p.m.*	15-30/--/15	60/60/60
13F	**National Airport-Pentagon-Washington Line.** Loop serving National Airport, Crystal City, Pentagon Metrorail Station, Potomac Park, Federal Triangle, and Southwest employment area. **DOES NOT SERVE POTOMAC YARD.**	*5:18 a.m./ 6:22 a.m.* [5,6]	*8:15 a.m.* [6]	No service	Sat: 30/--/-- Sun: 60/--/--
13G	**National Airport-Pentagon-Washington Line.** Loop serving National Airport, Crystal City, Pentagon Metrorail Station, Southwest employment area, Federal Triangle, and Potomac Park. **DOES NOT SERVE POTOMAC YARD.**	*5:54 a.m./6:13 a.m.* [5,6]	*8:01 a.m./ 8:20 a.m.* [6,7]	No service	Sat: 30/--/-- Sun: 40/--/--
23A	**McLean-Crystal City Line.** Crystal City Metrorail Station to Tyson's Corner via Shirlington, Ballston, McLean, and Langley. **DOES NOT SERVE POTOMAC YARD.**	*5:31 a.m.* 5:43 a.m.	*12:04 a.m./12:46 a.m.* [8] 1:11 a.m./4:00 a.m.[2,9] .	30/30/30	Sat: 30/30/30 Sun: 60/60/60
23C	**McLean-Crystal City Line.** Crystal City Metrorail Station to Tyson's Corner via Shirlington, Ballston, McLean, and Langley. **DOES NOT SERVE POTOMAC YARD.**	*8:20 a.m.* [10] 6:56 a.m. [11]	*8:58 a.m.* [10] 8:07 a.m. [11]	One trip per day in each direction	No service

Note: Westbound service listed as northbound. Eastbound service listed as southbound.

Notes

1. Early morning and later evening service does not serve Old Town Alexandria
2. Later end time on Fridays only.
3. Early morning and late-night service does not serve Old Town Alexandria and Hunting Towers.
4. First bus leaves from Shirlington.
5. Early morning service does not serve National Airport and Crystal City.
6. Times given for Saturday service.
7. Last bus does not serve National Airport and Crystal City.
8. Last bus terminates at Ballston Metrorail station.
9. Last three buses originate at Ballston Metrorail station.
10. One westbound trip per day serving Crystal City. Terminates at Ballston Metrorail station.
11. One eastbound trip per day serving Crystal City. Originates at Langley.

APPENDIX B - Policy Headway Analysis

As noted in the body of the report, policy headways are not set by passenger demand but rather are determined by a set operator policy. In this case, headways along the trunk portion of the alignment would match the Metrorail Blue Line peak headways of 6 minutes weekday, 12 minutes for Saturday, and 15 minutes for Sunday. With 6 minute headways, 10 buses an hour would pass the peak load point (the point along the route where the vehicles have the greatest number of passengers on board). Further, with a capacity of sixty passengers per vehicle, the total hourly capacity at the peak load point would be 600 passengers. The excess demand under a policy headway service configuration is shown in Table B-1. In 2010, based on estimated demand, 524 passengers would not be able to board a bus because use of a policy headway would provide insufficient capacity. The excess demand is even greater in 2012 and beyond because of increased demand associated with increased corridor development.

Table B-1: Excess Peak Hour Demand Results – Policy Headway Operating Plan (At the Peak Load Point)

Orion VII CNG – 40'	Peak Hour Capacity	Excess Demand		
		2010	2012	2014
2010	600	524	884	1286

APPENDIX C: Prior Alternate Alignments and Projected Ridership Growth and Demand-Based Transit Service – Most Recent Alternatives Considered

The data presented above in the main body of this memorandum refer to a series of preferred routes through Arlington and Alexandria that makes use of dedicated right-of-way wherever possible. These routes have been agreed to by Arlington and Alexandria and reflect a general understanding of stop locations, street-by-street routing, and right-of-way. It should in no way, however, be inferred to be the final design.

Prior to agreement on the service configuration outlined in the body of the report, two other service alternatives were considered for implementation as part of the overall planning process. The first of these alternatives, Alternative A, would have had a single northern terminus at the Pentagon and two separate southern termini, one at the Potomac Yard Town Center and one at the Braddock Road Metrorail Station. The second alternative considered, Alternative B, would have had two northern termini, one at the Pentagon and the other at Pentagon City, and two southern termini, one at the Potomac Yard Town Center and one at the Braddock Road Metrorail Station. Each of these alternative alignments is discussed in greater detail below.

Alignment Alternative A

The Alternative A alignment would provide service along a trunk route between a single northern termini at the Pentagon and the Potomac Yard Town Center, with an additional branch continuing south to the Braddock Road Metrorail Station. The routes in this alternative are shown in Figure C1; one-way alignment lengths for each alignment are shown in Table C1.

Table C1: Alternative A One-Way Alignment Lengths

Pentagon to Town Center	Pentagon to Braddock Road Metro
3.26 miles	5.08 miles

Alignment Alternative B

This alignment would provide service along a trunk route between the intersection of 12th Street and Eads Street in Arlington and Potomac Yard Town Center, with the alignment branching to serve two northern terminus points at the Pentagon and Pentagon City, and two southern terminus points at the Braddock Road Metrorail station and the Potomac Yard Town Center. The Pentagon route would run between the Pentagon and the Potomac Yard Town Center, while the Pentagon City route would run between Pentagon City and the Braddock Road Metrorail Station. The routes in this alternative are shown in Figure C2; one-way alignment lengths for each route are shown in Table C2.

Table C2: Alternative B One-Way Alignment Lengths

Pentagon to Town Center	Pentagon City to Braddock Road Metro
3.26 miles	4.72 miles

Figure C1: Transit Alternative A

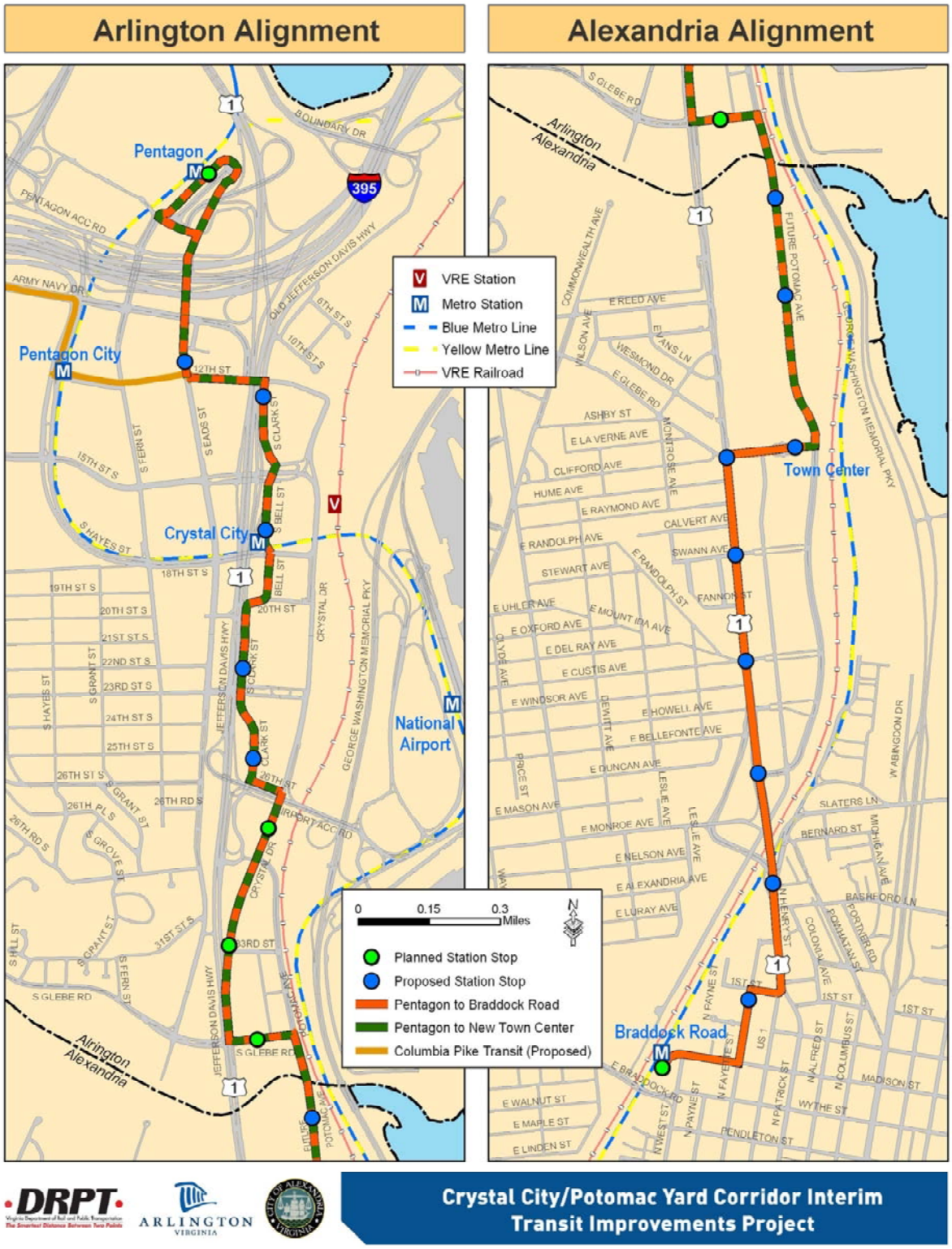
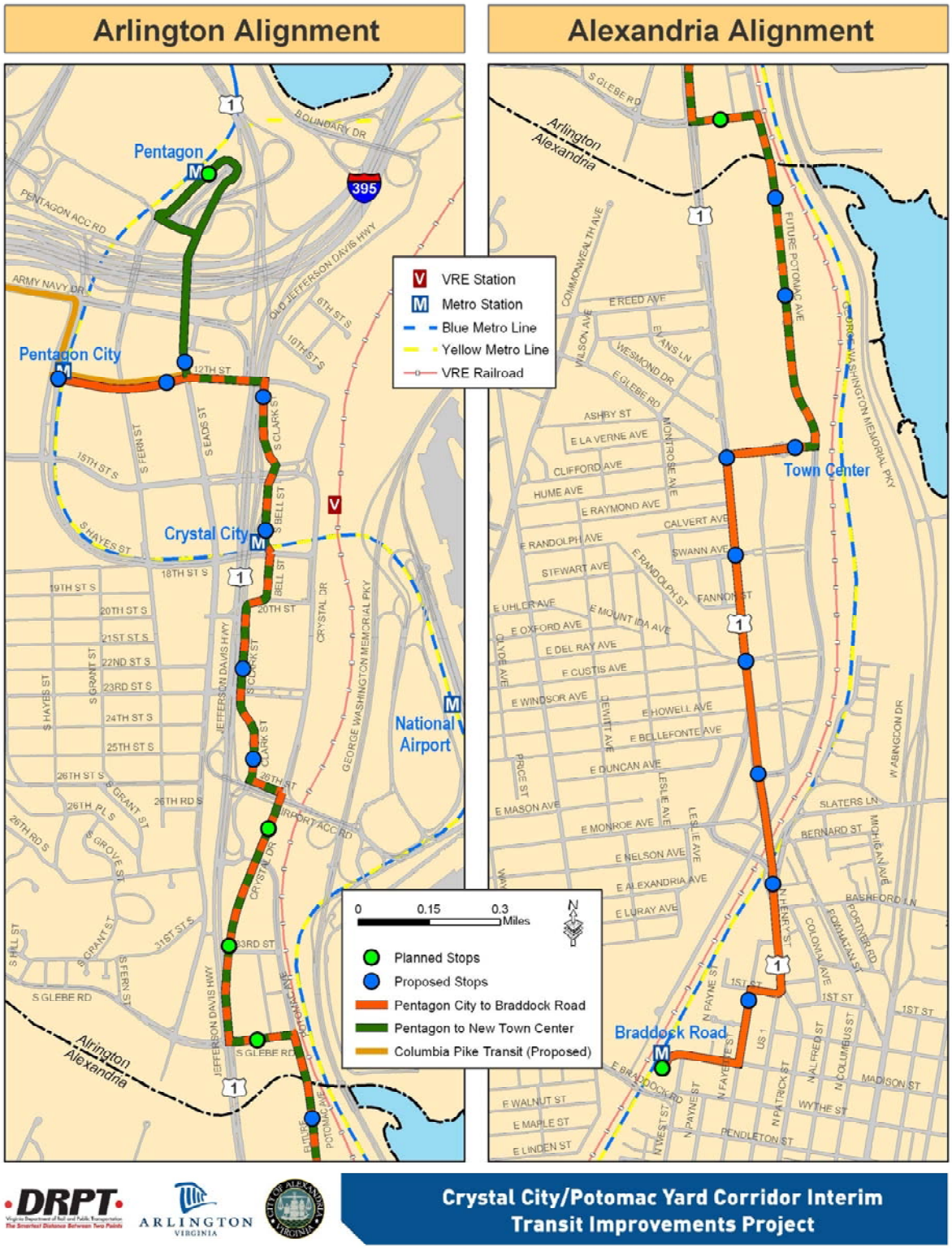


Figure C2: Transit Alternative B



Operating statistics and run times for the Alternative A and Alternative B are shown in Tables C3 and C4.

Table C3: Alternative A Daily and Annual O&M Costs

Alternative A	Revenue Hours	Cost/ Hour	Total Daily Cost	Total Annual Cost
Policy Headway	143	$94	$13,519	$3,974,593
2010 Demand				
40' CNG	188	$94	$17,790	$5,230,166
2012 Demand				
40' CNG	251	$94	$23,668	$6,958,383
2014 Demand				
40' CNG	332	$94	$31,309	$9,204,759

Note: Annualization factor is 294

Table C4: Alternative B Annual O&M Costs

Alternative B	Revenue Hours	Cost/Hour	Total Daily Cost	Total Annual Cost
Policy Headway	143	$94	$13,519	$3,974,593
2010 Demand				
40' CNG	185	$94	$17,509	$5,147,738
2012 Demand				
40' CNG	251	$94	$23,668	$6,958,383
2014 Demand				
40' CNG	225	$94	$31,309	$9,204,759

Note: Annualization factor is 294

APPENDIX D: Prior Alternate Alignments and Projected Ridership Growth and Demand-Based Transit Service – Initial Alternatives Considered

Prior to an agreement of the service alternatives presented in Appendix B, four other options were analyzed in the initial stages of the planning process. These scenarios were developed to represent the two theoretical extremes of dedicated right-of-way versus mixed traffic right-of-way. These additional options are shown in Figure D1 and detailed below. Two of the scenarios would operate along Route 1 and the other two would operate along a proposed Main Street route with Potomac Yard. Both the Route 1 and Main Street routes would include 50-50 split service to the Pentagon along Eads Street and to Pentagon City along Clark Street to 12th Street and both would have dedicated lane options along the right-of-way. In Alexandria, all of the alternatives would operate in mixed traffic south of the Monroe Street Bridge.

The first Route 1 scenario operates with maximum dedicated right-of-way along the Arlington alignment and operates in dedicated right-of-way along Route 1 in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road. The second Route 1 scenario operates with mixed traffic along the Arlington alignment and along Route 1 in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road.

The first Main Street scenario operates with maximum dedicated right-of-way along the Arlington alignment and operates along Main Street in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road. The second Main Street scenario operates with mixed traffic right-of-way along the Arlington alignment and operates along Main Street in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road. These scenarios are summarized in Table D1.

Table D1: Previous Scenarios and Alignment Options

	Arlington		Alexandria	
	Alignment	**ROW Type**	**Alignment**	**ROW Type**
Scenario 1	Clark/Eads	Dedicated lane	Route 1	Dedicated Lane
Scenario 2	Clark/Eads	Mixed Traffic	Route 1	Mixed Traffic
Scenario 3	Clark/Eads	Dedicated lane	Main Street	Mixed Traffic
Scenario 4	Clark/Eads	Mixed Traffic	Main Street	Mixed Traffic

Scenario 1, Route 1 – Maximum Dedicated ROW

The operating statistics and run times for this option are shown in Table D2. Characteristics of the alternative include:

- Dedicated guideway in northern Crystal City;
- Dedicated guideway through southern Crystal City (Arlington busway segments 1 and 2);
- Mixed traffic within Alexandria portion of Potomac Yard
- Dedicated guideway along Route 1 in Alexandria; and
- Mixed traffic south of the Route 1 bridge in Alexandria.

Figure D1: Prior Alternative Alignments (Arlington Maximum Exclusive)

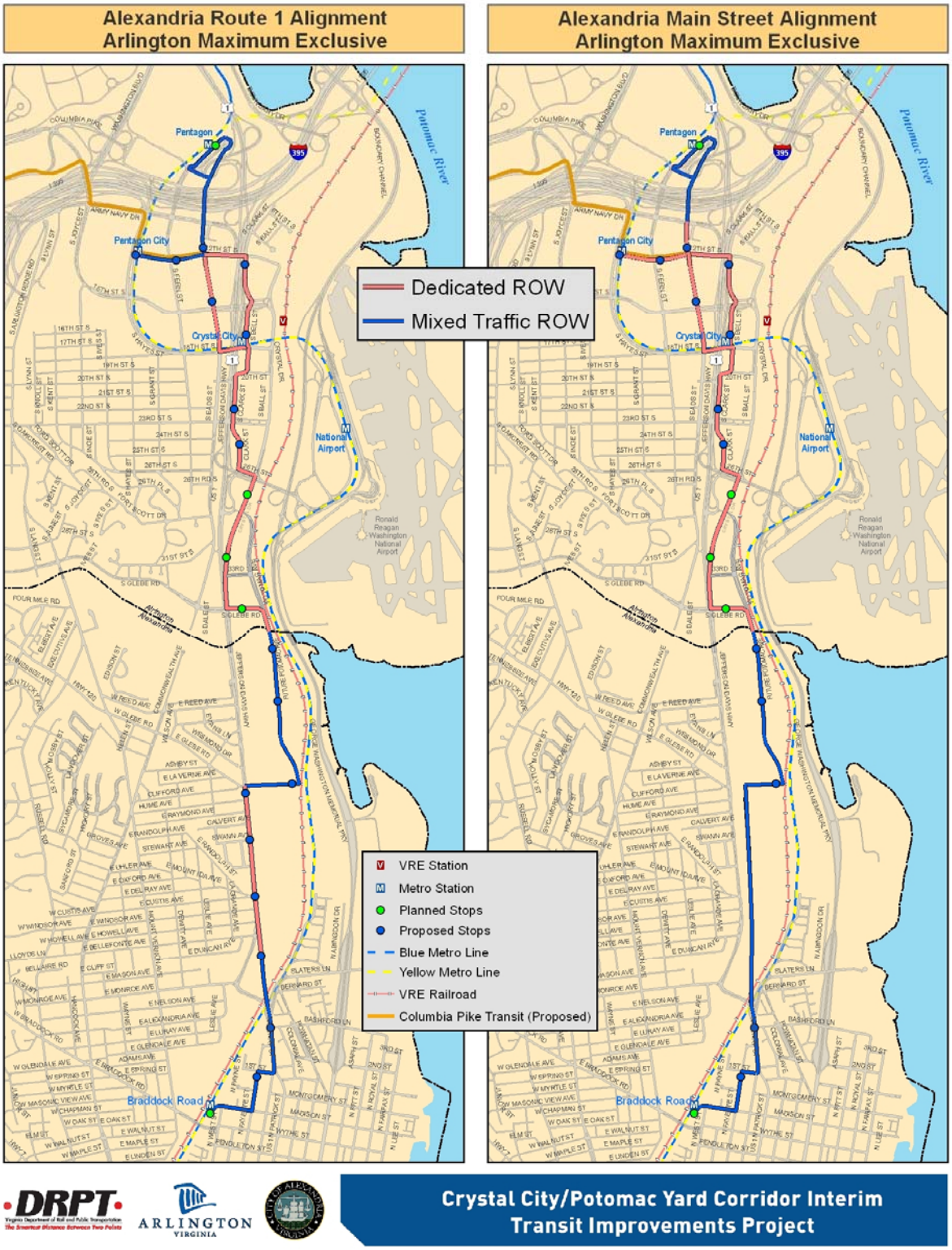


Figure D2: Prior Alternative Alignments (Arlington Partially Exclusive)

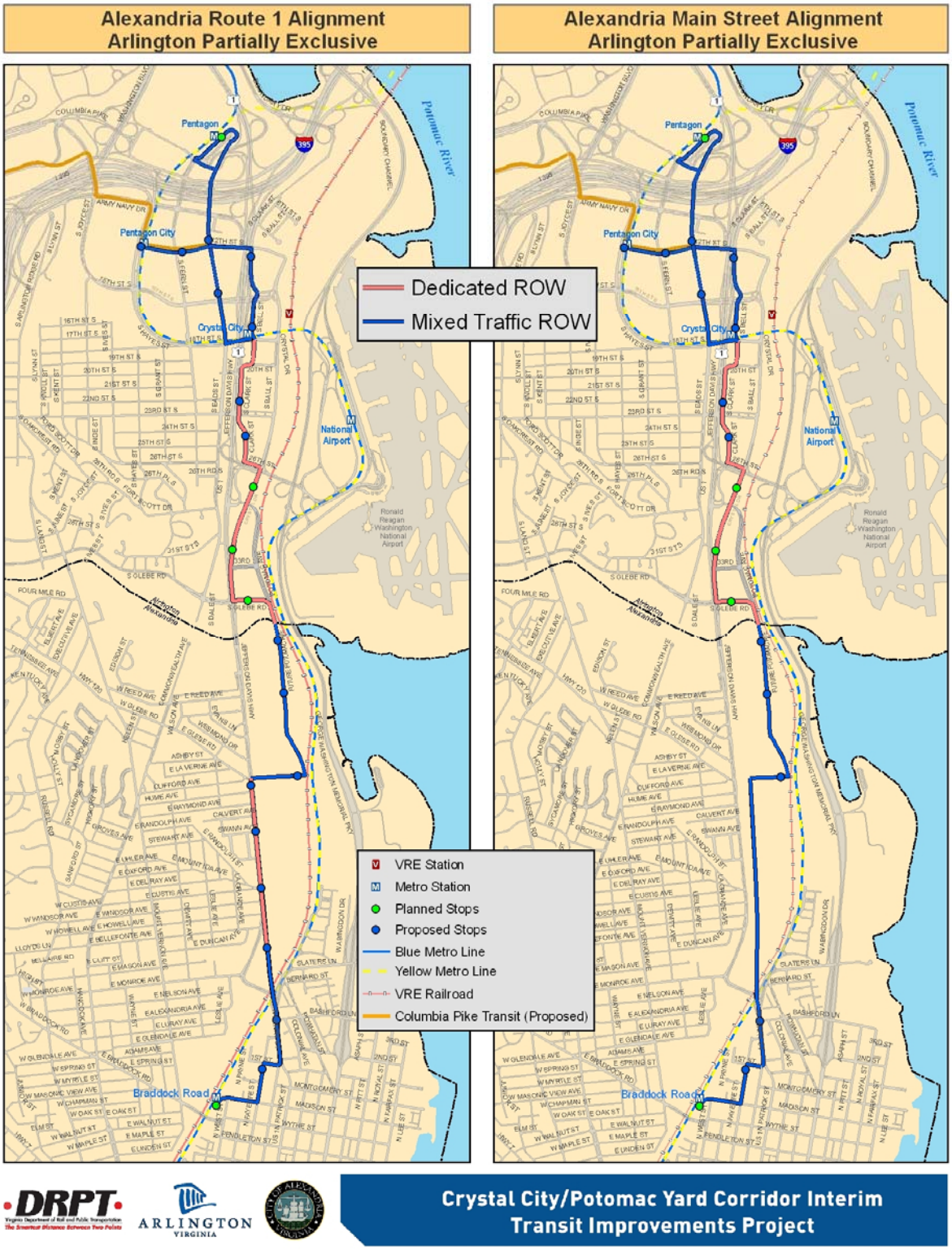


Table D2: Scenario 1, Route 1 Maximum Dedicated Traffic ROW

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	58	58	58
Run Time (min) Pentagon City branch	51	51	51
Cycle Time (min) Pentagon branch	68	68	68
Pentagon City branch	61	61	61
40-foot CNG			
Peak Combined Headway	4.0	3.0	2.3
# Peak/Fleet Vehicles	15/18	20/24	26/30
Daily Revenue Hours	209	277	364
Total Daily Cost	$19,682	$26,102	$34,314
Total Annual Cost	**$5,786,625**	**$7,673,870**	**$10,088,434**

Scenario 2, Route 1 – Mixed Traffic ROW

The operating statistics and run times for this option are shown in Table D3. Characteristics of the alternative include:

- Mixed traffic in northern Crystal City;
- Dedicated guideway through southern Crystal City (Arlington busway segments 1 and 2);
- Mixed traffic in Alexandria portion of Potomac Yard;
- Mixed traffic along Route 1 in Alexandria; and
- Mixed traffic south of the Route 1 bridge in Alexandria.

Table D3: Scenario 2, Route 1 Mixed Traffic ROW

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	58	58	58
Run Time (min) Pentagon City branch	51	51	51
Cycle Time (min) Pentagon branch	68	68	68
Pentagon City branch	61	61	61
40-foot CNG			
Peak Combined Headway	4.0	3.0	2.3
# Peak/Fleet Vehicles	17/20	22/25	29/34
Daily Revenue Hours	228	306	378
Total Daily Cost	$21,523	$28,839	$37,524
Total Annual Cost	**$6,327,821**	**$8,478,724**	**$11,032,056**

Scenario 3, Main Street – Mixed Traffic ROW

The operating statistics and run times for this option are shown in Table D4. Characteristics of the alternative include:

- Mixed traffic in northern Crystal City;
- Dedicated guideway through southern Crystal City (Arlington busway segments 1 and 2);
- Mixed traffic along a new two-way, two-lane Main Street in Alexandria with on-street parking; and
- Mixed traffic south of the Monroe Street Bridge in Alexandria.

Table D4: Scenario 3, Mixed Traffic ROW

	2010	**2012**	**2014**
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	69	69	69
Run Time (min) Pentagon City branch	66	66	66
Cycle Time (min) Pentagon branch	79	79	79
Pentagon City branch	76	76	76
40-foot CNG			
Peak Combined Headway	4.0	2.5	2.3
# Peak/Fleet Vehicles	20/23	29/34	35/41
Daily Revenue Hours	267	398	476
Total Daily Cost	$24,308	$25,204	$32,474
Total Annual Cost	**$7,410,211**	**$11,045,932**	**$13,196,836**

Scenario 4, Main Street – Maximum Dedicated ROW

The operating statistics and run times for this option are shown in Table D5. Characteristics of the alternative include:

- Dedicated guideway in northern Crystal City;
- Dedicated guideway through southern Crystal City (Arlington busway segments 1 and 2);
- Mixed traffic in Potomac Yard;
- Mixed traffic along a new two-way, two-lane Main Street in Alexandria with on-street parking; and
- Mixed traffic south of the Route 1 bridge in Alexandria

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Table D5: Scenario 4, Maximum Dedicated ROW

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	63	63	63
Run Time (min) Pentagon City branch	60	60	60
Cycle Time (min) Pentagon branch	73	73	73
Pentagon City branch	70	70	70
40-foot CNG			
Peak Combined Headway	4.0	2.6	2.3
# Peak/Fleet Vehicles	19/22	27/31	32/37
Daily Revenue Hours	253	364	437
Total Daily Cost	$23,836	$34,361	$41,206
Total Annual Cost	**$7,007,784**	**$10,102,310**	**$12,114,446**

APPENDIX E: ARTICULATED BUS DATA

The projected operating statistics and peak vehicle requirements presented in the body of the report and the previous appendices used the 40-ft CNG vehicle as the preferred vehicle choice. This choice was based on several factors:

- Operations issues involving articulated buses, including difficulty in making turns at tight radius intersections.
- The need to return the vehicles used in the interim service into the main fleet as the corridor transitions to a long-term rapid transit solution.
- Greater capital costs for the 60' vehicle

In addition to the 40-ft CNG vehicle, a 60-ft articulated vehicle, (see Figure E1), was also analyzed to provide decision makers with a full range of data on vehicle alternatives. Because of the issues noted above, the articulated bus is unlikely to be used in the corridor and therefore, the articulated bus information presented here is for reference and comparison purposes only.

Figure E1: Ikarus 60-foot Articulated Bus

The analysis for articulated buses was completed for the same four levels of transit exclusivity scenarios outlined in Appendix D. These scenarios are summarized below and in Table E1.

- The first Route 1 scenario operates with maximum dedicated right-of-way along the Arlington alignment and operates in exclusive right-of-way along Route 1 in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road.
- The second Route 1 scenario operates with mixed traffic along the Arlington alignment and in mixed traffic along Route 1 in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road.
- The first Main Street scenario operates with maximum dedicated right-of-way along the Arlington alignment and operates along Main Street, in mixed traffic, in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road.
- The second Main Street scenario operates with mixed traffic right-of-way along the Arlington alignment and operates along Main Street, in mixed traffic, in the Alexandria portion of the alignment north of the Monroe Street Bridge and south of East Glebe Road.

Table E1: Previous Scenarios and Alignment Options

	Arlington		Alexandria	
	Alignment	**ROW Type**	**Alignment**	**ROW Type**
Scenario 1	Clark/Eads	Dedicated lane	Route 1	Dedicated Lane
Scenario 2	Clark/Eads	Mixed Traffic	Route 1	Mixed Traffic
Scenario 3	Clark/Eads	Mixed Traffic	Main Street	Mixed Traffic
Scenario 4	Clark/Eads	Dedicated lane	Main Street	Mixed Traffic

Operating statistics for each scenario, utilizing a 60 foot vehicle, are summarized below.

Scenario 1, Route 1 – Maximum Dedicated ROW – 60 Foot Vehicle

Table E2: Scenario 1, Route 1 Maximum Dedicated Traffic ROW

	2010	**2012**	**2014**
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	58	58	58
Run Time (min) Pentagon City branch	51	51	51
Cycle Time (min) Pentagon branch	68	68	68
Pentagon City branch	61	61	61
60-foot Articulated			
Peak Headway	5.0	4.0	3.2
# Peak/Fleet Vehicles	13/16	15/18	19/22
Daily Revenue Hours	175	209	267
Total Daily Cost	$16,476	$21253	$25,158
Total Annual Cost	**$4,843,003**	**$6,327,821**	**$7,396,334**

Scenario 2, Route 1 – Mixed Traffic ROW – 60 Foot Vehicle

Table E3: Scenario 2, Route 1 Mixed Traffic ROW

	2010	**2012**	**2014**
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	58	58	58
Run Time (min) Pentagon City branch	51	51	51
Cycle Time (min) Pentagon branch	68	68	68
Pentagon City branch	61	61	61
60-foot Articulated			
Peak Headway	5.0	4.0	3.2
# Peak/Fleet Vehicles	14/16	17/20	21/24
Daily Revenue Hours	184	228	281
Total Daily Cost	$17,841	$19,682	$27,895
Total Annual Cost	**$5,245,430**	**$6,327,820**	**$8,201,188**

Scenario 3, Main Street – Mixed Traffic ROW – 60 Foot Vehicle

Table E4: Scenario 3, Main Street Mixed Traffic ROW

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	69	69	69
Run Time (min) Pentagon City branch	66	66	66
Cycle Time (min) Pentagon branch	79	79	79
Pentagon City branch	76	76	76
60-foot Articulated			
Peak Headway	5.0	4.0	3.2
# Peak/Fleet Vehicles	16/19	20/23	25/30
Daily Revenue Hours	223	267	344
Total Daily Cost	$21,051	$25,204	$32,474
Total Annual Cost	**$6,189,052**	**$7,410,211**	**$9,547,238**

Scenario 4, Main Street – Maximum Dedicated ROW – 60 Foot Vehicle

Table E5: Scenario 4, Maximum Dedicated ROW

	2010	2012	2014
Peak Load	1,124	1,484	1,886
Run Time (min) Pentagon branch	63	63	63
Run Time (min) Pentagon City branch	60	60	60
Cycle Time (min) Pentagon branch	73	73	73
Pentagon City branch	70	70	70
60-foot Articulated			
Peak Headway	5.0	4.0	2.5
# Peak/Fleet Vehicles	15/18	19/22	22/25
Daily Revenue Hours	204	267	315
Total Daily Cost	$19,210	$23,836	$29,736
Total Annual Cost	**$5,647,858**	**$7,410,211**	**$8,742,384**