

SOUTHERN MARYLAND RAPID TRANSIT STUDY

The Southern Maryland Rapid Transit Alternatives Report (2017)

Final Report

ALONG MD 5/US 301 BETWEEN THE BRANCH AVENUE METRORAIL
STATION AND THE WALDORF – WHITE PLAINS AREA



PRINCE GEORGE'S and CHARLES COUNTIES, MARYLAND

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EXECUTIVE SUMMARY

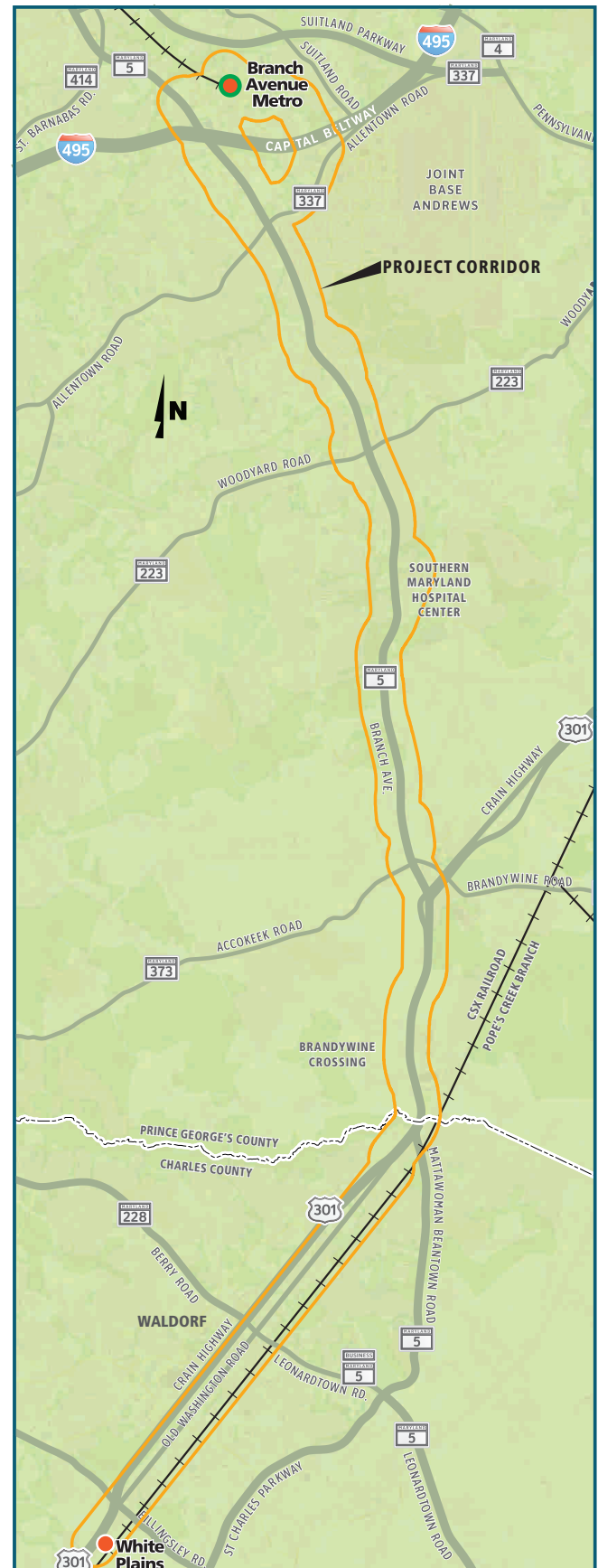
The Maryland Department of Transportation's (MDOT) Maryland Transit Administration (MTA) is working to further advance a rapid transit system along 18.7 miles of the MD 5 (Branch Avenue)/US 301 (Crain Highway) corridor, between Branch Avenue Metrorail Station in Prince George's County and the Waldorf-White Plains area in Charles County (see **Figure ES-1**). A statement representing the transit Vision for this corridor, referred to as the Southern Maryland Rapid Transit (SMRT) Project corridor, originated from MTA's 2016 Southern Maryland Rapid Transit Project Corridor Vision (Corridor Vision) document: **Providing safe, accessible, efficient and convenient high-capacity rapid transit during both the peak and off-peak hours in the SMRT Project corridor will overcome a number of transportation challenges that exist in the corridor.**

The Metropolitan Washington Council of Governments' (MWCOC) 2040 forecasts anticipate significant growth in employment, population and the number of households for Prince George's, Charles and St. Mary's counties, which supply regional traffic to the SMRT Project corridor. Most regional traffic flows northbound in the morning and southbound in the evening. Additionally, many private development projects along the SMRT Project corridor have been proposed, studied and thoroughly vetted, without yet being fully implemented. The SMRT Project could serve as the impetus to give many projects a greater incentive to develop to the highest and best use, by encouraging higher density transit-oriented development (TOD) in the urban activity centers.

The SMRT Project is an integral part of the on-going development of an interconnected regional transit system that will improve the quality of transit service in the Washington metropolitan region.

As travel demand along the SMRT Project corridor increases, there is limited ability to expand the transportation footprint, and few travel alternatives with reliable travel times are available. The current commuter bus system along MD 5/US 301 is nearing capacity, and further expansion is difficult, as bus storage capacity is scarce, and the streets of downtown Washington, D.C. are unable to handle ever-increasing numbers of commuter buses. Commuter buses are subject to the same travel delays on MD 5/US 301 that are experienced by general vehicular traffic. A separated high capacity transit system is needed to accommodate travel demand within the SMRT Project corridor, and support widespread job growth.

Figure ES-1: Project Location Map



Prince George's and Charles counties have ongoing planning efforts to integrate land uses and transportation alternatives to attract additional employment options through improved mobility.

Both counties are pursuing the creation of mixed-use centers with densities sufficient to support TOD, which are essential to creating a sustainable regional rapid transit system along the SMRT Project corridor. TOD will provide higher land use density/intensity, help increase transit ridership to maximize transit investment, encourage economic growth and job creation, reduce the jobs-to-housing imbalance along the MD 5/US 301 corridor, and promote alternative transportation modes (e.g., walking, biking, transit) to reduce or eliminate the need to commute via automobile.

Providing safe, accessible, efficient and convenient high-capacity rapid transit during both the peak and off-peak hours in the SMRT Project corridor will overcome a number of transportation challenges that exist in the corridor.

As a key step in realizing the transit Vision along the SMRT Project corridor, MTA completed a three-year, pre-National Environmental Policy Act (NEPA) planning study in collaboration with Prince George's County and Charles County (page MTA-39, CTP, 2014). This pre-NEPA study, also referred to as the SMRT Study, focuses on two transit modes—Bus Rapid Transit (BRT) and Light Rail Transit (LRT)—and marks a major milestone towards providing sustainable traffic congestion relief for commuters, residents, business owners and others along the SMRT Project corridor. The SMRT Study has been subject to oversight by a Steering Committee made up of two representatives each from MTA, Prince George's County and Charles County, and has included in-depth discussions with a Technical Advisory Working Group to assist in the evaluation of alignments and alternatives.

What is the Purpose of this Final SMRT Alternatives Report?

This Final Report presents a balanced summary of an array of BRT and LRT transit alternatives and options, engineering and environmental analyses, alternatives analyses, ridership forecasting, cost estimates, economic analysis, stakeholder coordination, public involvement and other technical studies and coordination efforts made to date.

As a result of this study, Prince George's County and Charles County planners will, after two decades, have a rapid transit alternative – the SMRT Recommended Alternative – to incorporate into various land use and transportation master plans, Geographic Information Systems (GIS) data sets and other resources available to the public.

What Prior Studies Were Conducted?

The possibility of rapid transit as a viable mode choice in Southern Maryland has been envisioned dating back to the 1996 Southern Maryland Mass Transportation Study. The following transportation studies conducted since 1996 have emphasized the need for transportation improvements in Southern Maryland, and some specify rapid transit along the MD 5/US 301 corridor:

- US 301/MD 5 Light Rail Feasibility Study (1997)
- MD 5/US 301 Transit Service Staging Plan (2004)
- Southern Maryland Transportation Needs Assessment (2008)
- Southern Maryland Commuter Rail Service Feasibility Study (2009)
- Southern Maryland Transit Corridor Preservation Study (2010)
- SMRT Corridor Vision (2016)* and
- SMRT Environmental Inventory (2016)*

* Part of this study

What Challenges Will Rapid Transit Address?

- The SMRT Project corridor does not have a balance between jobs and housing.
- The existing automobile-based transportation system is not adequate to support existing and planned development.
- Available options do not offer a reliable travel time from Waldorf to other parts of the Washington metropolitan region.
- There are few alternative travel options within the corridor.
- Transit-dependent populations have poor travel accessibility throughout the corridor.
- As travel demand increases, there is limited potential to expand the transportation footprint.
- Population in the Commute Shed is projected to grow by 26% and jobs are anticipated to increase by 51% within 25 years.

What Types of Rapid Transit Have Been Considered?

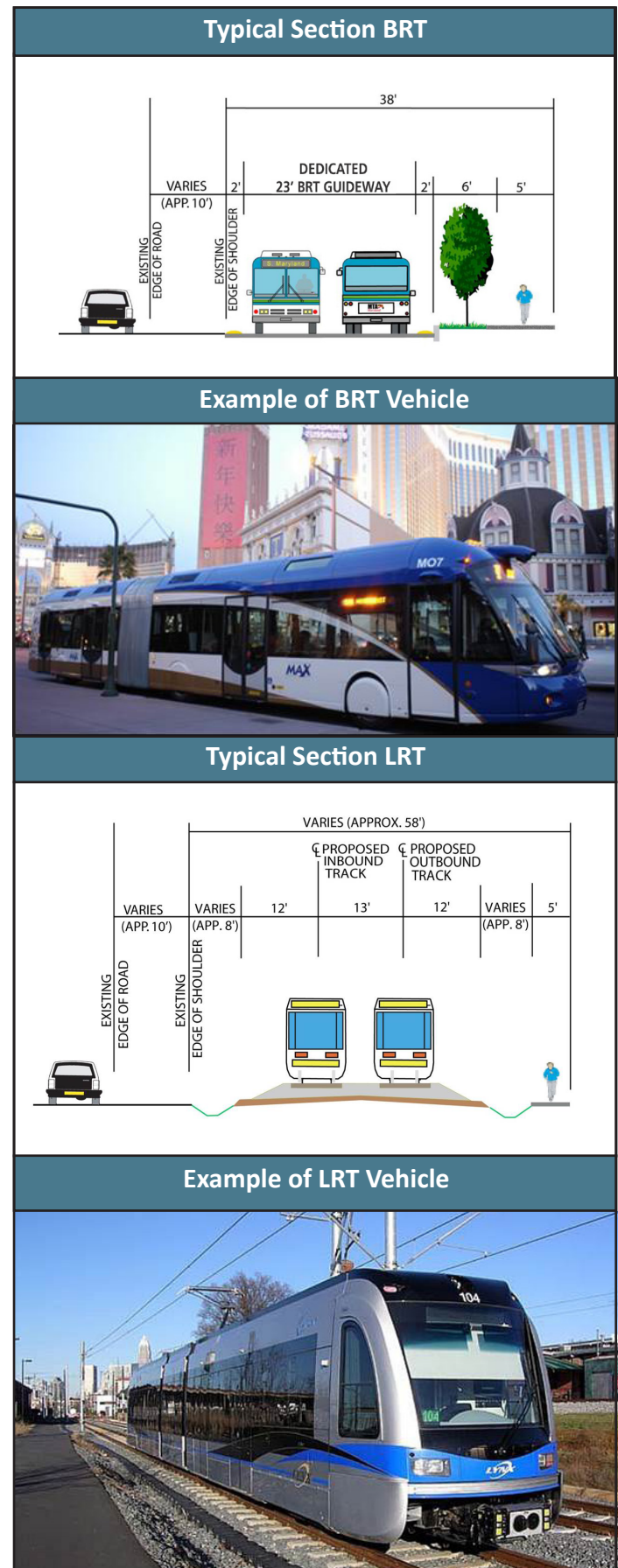
This study has included balanced consideration of BRT and LRT for the entire length of the SMRT Project corridor, with all of the studied alignments analyzed as both BRT and LRT (see typical sections in **Figure ES-2**). Both modes would include branded vehicles, off-vehicle fare collection, high-frequency all-day service, signal priority at traffic signals (or grade separation), and travel speeds which match or exceed the adjacent roadway (see **Table ES-1** for mode comparison). Some of the key differences between the two modes are as follows:

- LRT operates on rail, typically powered by overhead catenary wires; BRT operates on a roadway physically separated from the highway.
- LRT uses traditional steel-wheeled rail vehicles with a 150-passenger-per-car capacity. Two-car trains at 6-to-8-minute intervals will be needed for estimated 2040 ridership demands. This LRT configuration provides adequate capacity beyond 2040.
- BRT uses rubber tires, specially designed buses with a 90-passenger-per-bus capacity. A three-bus platoon at 6-minute intervals will be needed for estimated 2040 ridership demands.

Table ES-1: Comparison of BRT and LRT Features

Feature	BRT	LRT
Dedicated transitway for operations	●	●
Operates on roadway with no rail or overhead catenary	●	
Operates on rail, powered by electric overhead catenary wires		●
Off-vehicle fare purchase	●	●
Low-floor vehicles with level boarding	●	●
Traffic signal priority or pre-emption	●	●
Frequent service at substantial transit stations with full-service passenger amenities	●	●
Separately branded vehicles	●	●
Maximum cars per configuration	3	2
Maximum passengers per 3-bus platoon/2-car consist (train)	270	300
Travel Speed (mph)	55	55
Construction Cost (2016 \$billion)	1.1 to 1.5	1.6 to 2.0

Figure ES-2: Typical Sections and Examples of BRT and LRT



What are the Key Findings from the LRT vs. BRT Engineering Analysis?

- LRT is easily expandable, if needed to meet capacity needs beyond 2040, by adding an additional car to the train.
- This 3-bus platoon BRT configuration would not have capacity to handle passenger loads beyond 2040 and is not easily expandable. BRT would require guideway and station improvements to allow increased BRT capacity beyond 2040.
- Overall BRT costs are approximately \$0.5 billion less than LRT costs (\$1.1B to \$1.4B for BRT vs. \$1.6B to \$1.9B for LRT).
- Annual operating costs for LRT are approximately \$10 million lower for LRT than for BRT (\$25M per year for LRT vs. \$35M per year for BRT)

What are the Key Findings from the LRT vs. BRT Economic Impact Analysis?

Comparisons of BRT and LRT systems throughout the country reveal that, all things being equal, LRT generally results in greater public/private development interest, higher ridership and more economic growth than BRT. For this study, an Economic Rent Analysis compared potential TOD and economic impacts of LRT and BRT in the SMRT Project corridor, finding that as accessibility improves, so does the productivity and character of the economy.

Mixed-use centers with densities to support BRT/LRT transit service are essential to creating a regional rapid transit system.

Implementation of the SMRT Project (either a BRT or LRT rapid transit system) has the potential for increasing economic growth, with LRT providing 15% to 22% more economic stimulation than BRT. Both systems will increase regional employment, with the addition of approximately 250,000 to 300,000 person years of work, \$20 billion to income, and \$30 billion to property development and values. The increased employment and property values resulting from rapid transit are projected to expand the tax base by \$5 to \$6 billion, which in itself would cover the cost of the project.

What SMRT Mainline Alternatives Have Been Considered?

The Mainline Alternatives analyzed in this study were derived from, and remain similar to, those developed in MTA's 2010 Southern Maryland Transit Corridor Preservation Study. The Mainline Alternatives refer to the portion of the SMRT Project corridor from Allentown Road (MD 337) south.

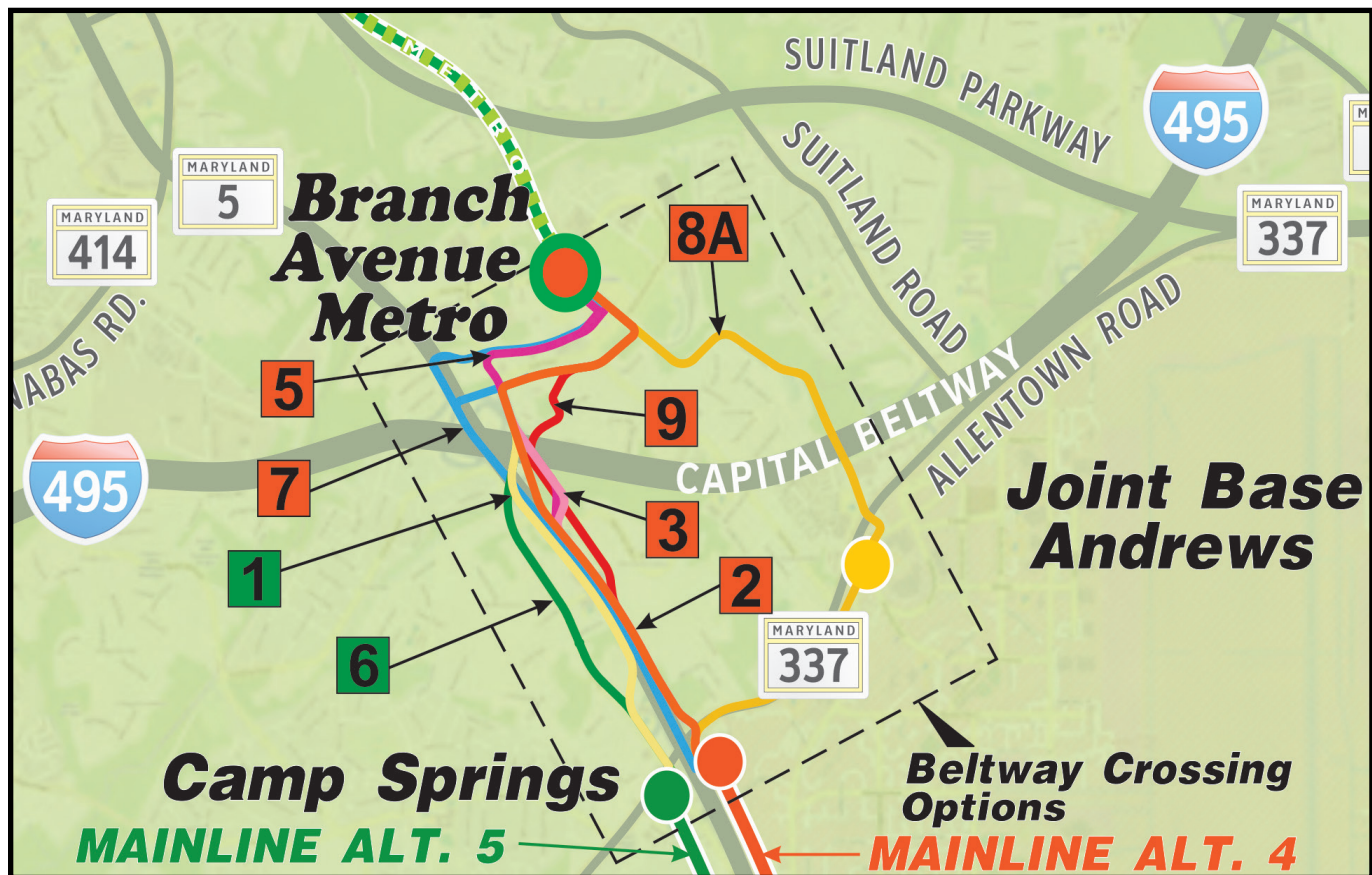
The 2010 Corridor Preservation Study developed five Mainline Alternatives and identified one – Alternative 4 – as preferred. This study evaluated the five Mainline Alternatives, and eliminated Alternatives 1, 2 and 3 from further consideration. Alternatives 4 and 5 remained under consideration.

Alternative 4 (preferred in the 2010 Study) is located on the east side of MD 5 for the entire length of the SMRT Project corridor. Alternative 5 is located on the west side of MD 5 from Allentown Road to south of Woodyard Road, where it crosses over to the east side of MD 5 and is the same as Alternative 4 from south of Woodyard Road to the project terminus at Demarr Road in Charles County. Alternatives 4 and 5, together with associated Beltway Crossing Options, are illustrated and described in **Figure ES-3** and **Figure ES-4** respectively.

What are the Key Findings from the Analysis of the Alternatives?

- Alternative 4 is located on the east side of MD 5/US 301 for the entire SMRT Project corridor, serving all of the key activity centers – Branch Avenue, Joint Base Andrews (JBA), Southern Maryland Hospital, Brandywine Crossing and the Waldorf Urban Redevelopment Corridor (WURC) – without crossing MD 5/US 301.
- Alternative 5 would displace between 14 and 22 more businesses than Alternative 4 – primarily along Old Branch Avenue between Old Alexandria Ferry Road and the beltway.
- Since the west side of MD 5 is more densely developed along the Alternative 5 alignment, at-grade roadway crossings (potentially causing traffic operations challenges) and impacts to potential hazardous materials sites are significantly greater for Alternative 5 than Alternative 4.
- There are 4 to 14 more residential property displacements with Alternative 4 than Alternative 5.
- Alternative 5 only connects to either Beltway Crossing Option 1 or Option 6 and therefore requires a tunnel to cross the beltway and MD 5.
- Since Alternative 5 requires a tunnel crossing, it is at least \$300 million more expensive than Alternative 4 with the Beltway Crossing Options that do not require a tunnel.
- If the areas along Alternative 5 where substantial business displacements would occur are able to redevelop, Alternative 5 may attract TOD more quickly, since dense development is already nearby.

Figure ES-3: Key Map of SMRT Beltway Crossing Options



What SMRT Beltway Crossings have been Considered?

This study took a fresh look at the six Beltway Crossing Options developed in the 2010 Corridor Preservation Study and developed additional options. (see **Figures 3-5, 3-6, 3-7 and 3-11**)

What are the Key Findings for the Beltway Crossing Options?

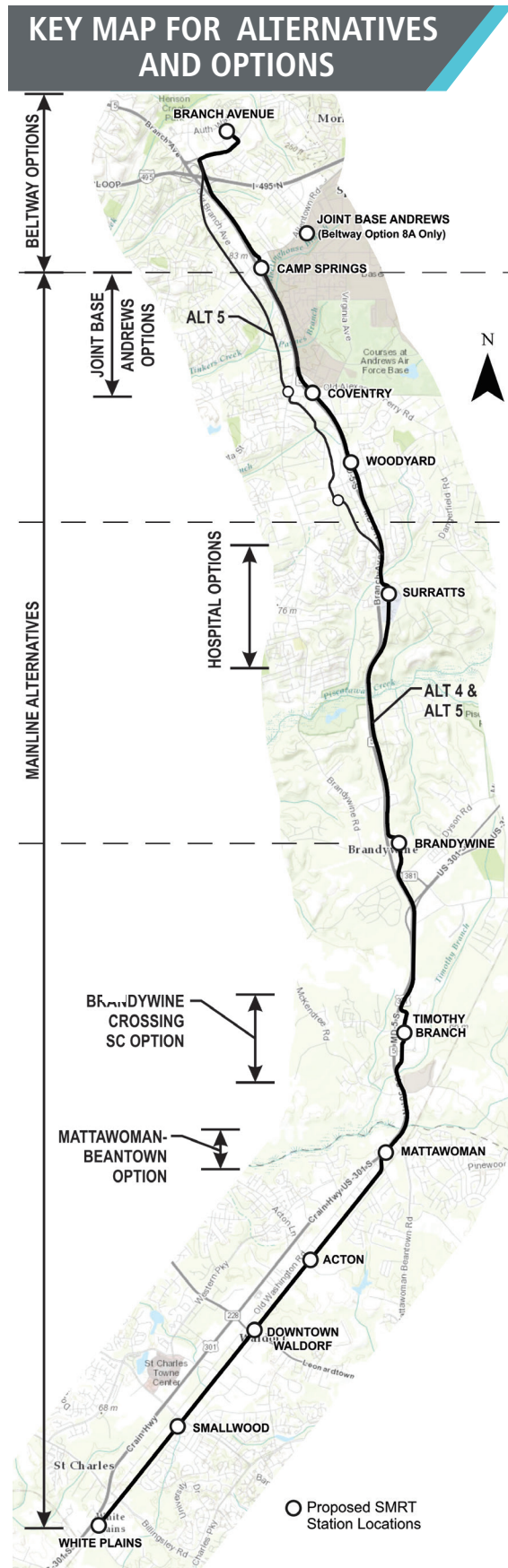
- Beltway Crossing Option 1 and Option 6 (Mainline Alternative 5) require a 1.2 to 1.3 mile tunnel to cross MD 5 and the beltway to reach the Branch Avenue Metrorail Station at a cost of at least \$300 million more than the Beltway Crossing Options that do not require a tunnel (Beltway Crossing Options 3, 5, 7, 8A and 9 with Mainline Alternative 4).
- Beltway Crossing Option 1 and Option 6 would result in 14 to 22 more business displacements than Beltway Crossing Options 3, 5, 7, 8A and 9.
- At-grade roadway crossings and impacts to potential hazardous materials sites are significantly greater for Beltway Crossing Option 1 and Option 6 than Beltway Crossing Options 3, 5, 7, 8A and 9.
- Residential property displacements are highest

with Beltway Crossing Option 3. In general, the residential displacements are 10% to 34% (4 to 14) higher with the Beltway Crossing Options associated with Alternative 4 than those with Alternative 5.

- Beltway Crossing Option 8A is the only option that includes a station directly serving JBA, near the main gate, closer to employment centers. The ridership increases in comparison to other Ridership Forecasting Model Run Scenarios, resulting from direct service to JBA are slightly outweighed by the ridership losses caused by the additional transit travel time with the 0.4-mile longer 8A alignment length. JBA has expressed a strong preference for Beltway Crossing Option 8A.x
- Beltway Crossing Option 8A has slightly higher natural environmental impacts (e.g., streams, wetlands, woodlands, etc.) than all other options (see **Table ES-2**).
- Beltway Crossing Option 7 and its suboptions, which are located in the median of MD 5 north of Coventry Way, are not able to accommodate a station at either Camp Springs or JBA; therefore, only indirect connections (via shuttle) would be possible to JBA.

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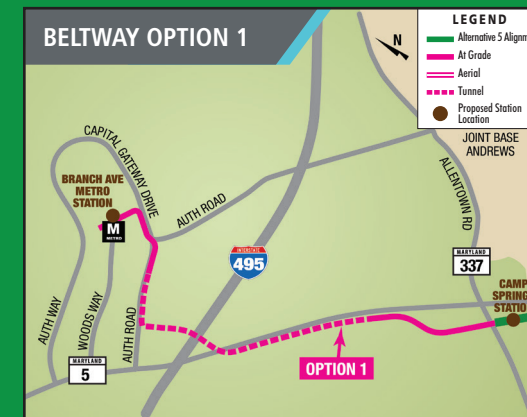
Figure ES-4: Mainline Alignment Alternatives and Beltway Crossing Options that Have Been Considered



BELTWAY CROSSING OPTIONS WITH MAINLINE ALTERNATIVE 5 (WEST OF MD 5)

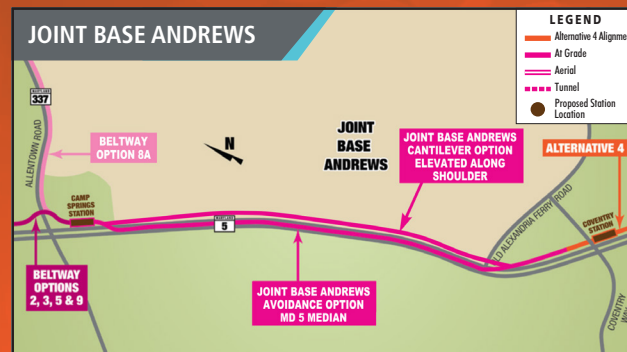
Alternative 5 runs west then east of MD 5: South of Allentown Road, the alignment runs east of Old Branch Avenue before returning to the west side of MD 5 near Kirby Road. The alignment then follows the existing ramps crossing Coventry Way and Woodyard Road interchanges at-grade. South of Woodyard Road, it follows the perimeter of the existing Park and Ride lot before returning adjacent to the west side of MD 5. South of the Park and Ride lot, crossing over MD 5 on an aerial structure, it returns to the east side of MD 5 north of Surratts Road. Alternatives 4 and 5 are the same alignment beyond this location. Please see below for alignment information.

Alternative 5 can be extended across the Capital Beltway lanes using either Option 1 or Option 6 only.



Cantilever Option – Similar to Alt. 4 alignment, except LRT or BRT would be elevated over outside Northbound MD 5 shoulder.

Avoidance Option (MD 5 Median) – With Alt. 4, LRT or BRT would be elevated within MD 5 median.



ALTERNATIVES 4 AND 5 ARE THE SAME SOUTH OF WOODYARD ROAD

South of Woodyard Road, both alternatives are the same. The alignment runs adjacent to the ramps at the proposed Surratts Road and Burch Hill Road interchanges and veers slightly away from MD 5 to accommodate the proposed Brandywine interchange and Park and Ride lot. Continuing south on MD 5, Alternative 4/5 travels adjacent to the ramps at the proposed MD 373 and McKendree Road interchanges. Diverging from MD 5/US 301 north of Mattawoman-Beantown Road, the alignment crosses Substation Road at-grade before turning south parallel to the CSX rail line. The southern study limit is located in Charles County at DeMarr Road.

BELTWAY CROSSING OPTIONS WITH MAINLINE ALTERNATIVE 4 (EAST OF MD 5)

Alternative 4 runs on the east side of MD 5: South of Allentown Road, the alignment runs adjacent to the Allentown Road off-ramp and crosses Old Alexandria Ferry Road and Coventry Way at-grade. It then proceeds over Malcolm and Woodyard Roads on an aerial structure. Alternatives 4 and 5 are the same alignment south of Woodyard Road.

Alternative 4 can use Options 2, 3, 5, 7 (all), 8A or 9 to cross the Capital Beltway lanes.

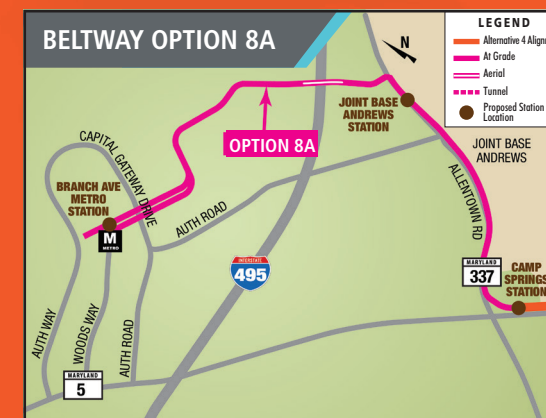
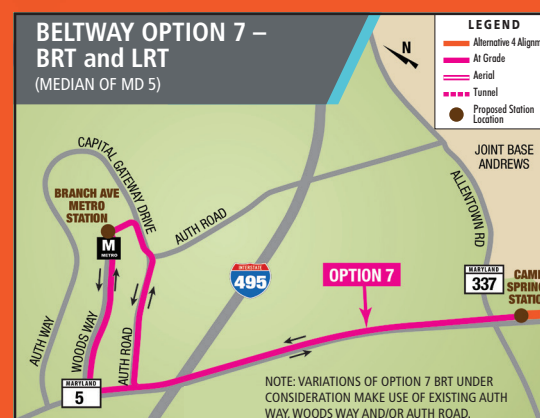


Table ES-2: Summary of Preliminary SMRT Corridor Transit Scenarios

SMRT Corridor Transit Scenario		RIDERSHIP					ENGINEERING			SOCIOECONOMIC/CULTURAL					NATURAL ENVIRONMENT				CAPITAL COSTS		O&M COSTS ⁷	
		Type of I-495 (Beltway) Crossing	Round 2 Daily Ridership - LRT	Round 2 Daily Ridership - BRT	Transit Run Time - LRT (Minutes) ⁸	Transit Run Time - BRT (Minutes) ⁸	Length of Alignment (Miles) ¹	Length of Structures (LF) - Tunnel (T), Aerial (A)	At-Grade Roadway Crossings	Residential Properties ²	Business/Commercial Properties ²	Churches, Schools, Cemeteries	Environmental Justice Areas	Historic Sites	Stream Crossings	Wetlands (Acres)	100-Year FEMA Floodplain (Acres) ³	Woodlands (Acres)	Bus Rapid Transit (BRT) - Costs (\$millions)	Light Rail Transit (LRT) - Costs (\$millions)	BRT - Annual Operating and Maintenance Costs (\$millions)	LRT - Annual Operating and Maintenance Costs (\$millions)
	Alternative 4 w/Options (East side of MD 5)⁹																					
1	Beltway Crossing Option 2 (Tunnel under I-495); Hosp. Option 1 ⁵	Tunnel	27,900	27,300	39	38	19.0	2,350 (A) 6,100 (T)	43	50	79	6	2	8	11	12.4	8.2	114.5	\$1,426	\$1,933	\$34.5	\$24.3
2	Beltway Crossing Option 3 (Aerial over I-495); Hosp. Option 1 ⁵	Aerial	27,900	27,300	39	38	19.0	4,580 (A)	39	55	78	6	2	8	11	12.5	8.4	117.7	\$1,103	\$1,617	\$34.5	\$24.3
3	Beltway Crossing Option 5 (Aerial over I-495); Hosp. Option 1 ⁵	Aerial	27,900	27,300	39	38	19.0	5,720 (A)	39	53	78	6	2	7	11	12.7	8.4	114.6	\$1,120	\$1,629	\$34.5	\$24.3
4	Beltway Crossing Option 7D (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	MD 5 At-Grade	N/A	24,800	N/A	41	19.0	10,840 (A)	42	45	72	6	2	10	11	10.4	7.4	104.7	\$1,119	N/A	\$35.6	N/A
5	Beltway Crossing Option 7E (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	MD 5 At-Grade	23,900	24,800	46	41	19.2	11,195 (A)	46	50	73	6	2	9	11	10.4	7.4	107.8	\$1,155	\$1,686	\$35.6	\$25.0
6	Beltway Crossing Option 8A (JBA Station & aerial over I-495); Hosp. Op. 1 ^{4 5}	Aerial	26,500	25,200	42	41	19.4	2,860 (A)	47	45	79	6	3	11	12	14.1	10.1	132.9	\$1,115	\$1,614	\$36.4	\$24.8
7	Beltway Crossing Option 9 (Aerial over I-495); Hosp. Option 1 ⁵	Aerial	27,900	27,300	39	38	18.9	3,700 (A)	38	51	78	6	2	8	11	12.7	8.4	121.0	\$1,081	\$1,585	\$34.5	\$24.3
8	JBA Cantilever Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Op. 1 ⁵	Aerial	27,900	27,300	39	38	18.9	10,215 (A)	37	51	78	6	2	8	11	12.0	8.0	118.2	\$1,141	\$1,658	\$34.5	\$24.3
9	JBA Avoidance Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Opt. 1 ⁵	Aerial	27,900	27,300	39	38	18.9	13,780 (A)	36	51	76	6	2	8	11	11.3	7.3	117.2	\$1,201	\$1,728	\$34.5	\$24.3
	Alternative 5 w/Options (West side of MD 5)⁹																					
10	Beltway Crossing Option 1 (Tunnel under I-495); Hosp. Option 1 ⁵	Tunnel	27,500	27,200	40	38	19.2	2,225 (A) 6,500 (T)	59	41	94	7	3	14	11	12.1	10.1	107.8	\$1,437	\$1,946	\$35.7	\$24.5
11	Option 6 (Tunnel under I-495); Hosp. Option 1 ⁵	Tunnel	27,500	27,200	40	38	19.2	2,225 (A) 6,900 (T)	56	41	93	7	3	17	11	12.0	10.0	106.7	\$1,432	\$1,942	\$35.7	\$24.5

Legend for Comparison of Alternatives: BETTER NEUTRAL WORSE

Notes:

¹ Length of Alignment as measured from Branch Avenue Metrorail Station to the proposed White Plains Station

² Property Impacts = potential displacements within Limits of Disturbance and assumed Station infrastructure envelope

³ The floodplain acreage includes county-designated floodplains present in the Wesson Drive area

⁴ Beltway Crossing Option 8A impacts are based on an at-grade crossing of Allentown Rd. If Aerial Option selected, add 1,500 LF to Length of Structure total and subtract 2 crossings from the Intersection Crossings total

⁵ Options include Brandywine Crossing Shopping Center Option and Mattawoman Beantown Option

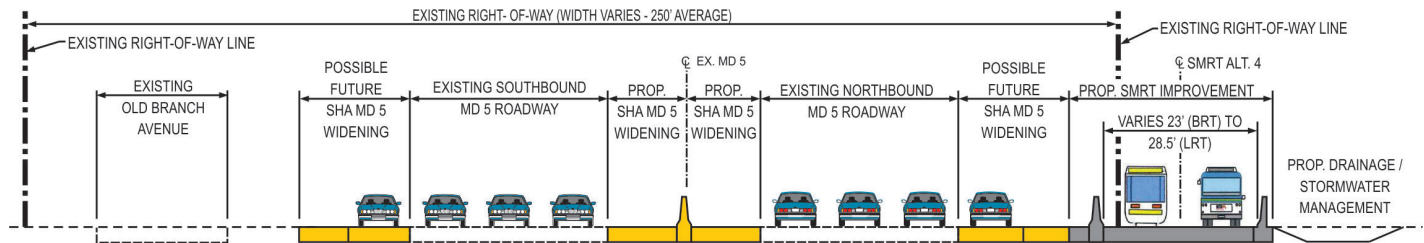
⁶ 2010 Corridor Preservation Study costs have been escalated to 2016 prices as a comparison

⁷ No BRT or LRT Vehicle Replacement Costs are included

⁸ White Plains to Branch Avenue at Auth Road: No-Build Average Highway Time = 59 Minutes; Max-Build Average Highway Time = 52 Minutes

⁹ All SMRT Corridor Transit Scenarios do not preclude widening of MD 5 one additional lane in each direction from I-95/I-495 to the US 301 split

Figure ES-5: Typical Section of SMRT (BRT or LRT) Mainline Alternative 4



What Other Specific Local Alignment Options were Considered and What are the Key Findings?

In addition to the Mainline and the Beltway Crossing, this study has identified four basic breakout areas:

JBA Options (See **Figures 3-9 and 3-10**):

Mainline Alternative 4 will require grading and/or drainage disturbance as much as 40 feet into JBA property, in an area with residential housing (see **Figure ES-5**). Given the potential challenges in obtaining right-of-way from, or constructing rapid transit infrastructure close to, JBA with Mainline Alternative 4, two options have been developed to minimize or avoid impacts to JBA. Both options connect to Mainline Alternative 4 only, since Alternative 5 avoids any impact to JBA property.

- *JBA Avoidance Option* places the transit alignment on elevated structure over the median of MD 5 from Old Alexandria Ferry Road to Allentown Road.
- *JBA Cantilever Option* places the transit alignment on elevated structure over the outside northbound MD 5 shoulder. This may not fully avoid grading or drainage within JBA property, but will reduce the impacts compared to Mainline Alternative 4.

MTA has met several times with representatives of JBA on the issues of alignment, property impacts, station location and future growth on JBA. Coordination will remain on-going with JBA on all of these issues, particularly as JBA coordinates with the contractor that manages the residential housing units within JBA along northbound MD 5.

MedStar Southern Maryland Hospital Center (MSMHC) Options (See **Figure 3-8**):

The MSMHC is located in the southeast quadrant of the MD 5/Surratts Road intersection and is considered a major employer in the region with high potential transit use, given its plans for continued expansion. The original Mainline Alternative 4/5 alignment and hospital station are located immediately adjacent to MD 5, making it difficult to access the hospital from the station on foot due to the elevation difference. The SMRT Study has developed several options to better serve the hospital. These options, described in **Figure 3-8**, have

been discussed with hospital representatives without any conclusion as to which, if any, they prefer. The differences between the options, in terms of cost, ridership, or environmental impact, are negligible.

Brandywine Crossing Shopping Center Option (See **Figure 3-12**):

The original Mainline Alternative 4/5 alignment and Brandywine Station are located immediately adjacent to MD 5/US 301, potentially causing traffic conflicts at the driveways and resulting in less than optimal station proximity to the many retail establishments. An optional alignment has been developed that includes a 500-foot easterly alignment shift into the middle of the shopping center parking area. This option has been reviewed favorably by one of the shopping center representatives, but further coordination is needed in future stages of project development.

Mattawoman-Beantown Road Option (See **Figure 3-12**):

The original Mainline Alternative 4/5 alignment and Mattawoman Station are located immediately adjacent to MD 5/US 301, primarily to limit the footprint of the Mattawoman Creek crossing. MDOT/State Highway Administration (SHA) has been planning for many years to improve the capacity of the MD 5/US 301/Mattawoman-Beantown Road intersection, possibly including a grade separation (flyover ramp for the southbound-to-eastbound movement). Combined with significant potential development and separately constructed county/developer roadway improvements (e.g., the extension of Western Parkway), there remain numerous uncertainties with regard to the ultimate roadway design/lane configurations at this intersection.

The Mattawoman-Beantown Road Option has the greatest compatibility with the range of MDOT/SHA roadway options under consideration, given its shift to the east (see **Figure 3-12**). While it requires a new structure crossing Mattawoman Creek, the crossing location could be placed adjacent to the CSX rail line crossing. The optional design has a higher cost than basic Alternative 4/5, due to the additional bridge over Mattawoman-Beantown Road, but likely provides better constructibility and traffic operations.

What Stations are Proposed?

Thirteen transit station locations — strategically spaced and placed at key activity and employment centers to maximize ridership — are being considered at the following locations: Branch Avenue Metrorail Station; Camp Springs, JBA (with Beltway Crossing Option 8A only), Coventry Way, Woodyard Road, Surratts Road/MSMHC, Brandywine, Timothy Branch, Mattawoman, Acton, Downtown Waldorf, Smallwood and White Plains (see **Figure ES-3**). These locations are consistent with proposed land use and station location recommendations from a range of sources, including JBA and Prince George’s County Joint Land Use Study (JLUS), Prince George’s County’s Subregion 5 Master Plan, Central Branch Avenue Revitalization Sector Plan, Waldorf Urban Design Study (WUDS), and WURC Phase 1 and 2 Development Plans for Waldorf Center.

What are the Key Findings of the Station Location Analysis?

A Station Typology was developed for each planned SMRT station based on two categories – access pattern and land use pattern. This typology will aid the counties and subsequent SMRT Project team in station area planning and design. Access pattern refers to the role that each station plays within the overall system. Land Use Pattern refers to the density, physical character and mix of uses within ½ mile of the station. A summary of the assumed land use and access patterns for each of the planned SMRT stations is shown in the chart below.

What are the Key Ridership Forecasting Findings?

Ridership and travel times were projected to the Year 2040 using a travel forecasting model based upon the Regional MCOG travel forecasting process, together with the recently created Washington Metropolitan Area Transit Authority (WMATA) post-processing model. The number

of combinations of Mainline Alternatives, Beltway Crossing Options and highway widening possibilities is too large for all of them to be modeled; therefore, the SMRT Project team analyzed 12 of the most representative scenarios (referred to herein as the Ridership Forecasting Model Run Scenarios, or Ridership Scenarios) that would contribute to the full range of potential ridership projections. The key results of the SMRT ridership modeling are as follows:

- The forecasted 2040 SMRT ridership ranges from 24,000 to 28,000 daily riders for the 12 Ridership Scenarios (16.7% variance from highest to lowest) with little variation between LRT and BRT. The Ridership Scenarios that eliminate the Camp Spring Station have the lowest ridership. The Ridership Scenarios that extend the BRT outside the SMRT Project corridor have the highest ridership, but by a small amount.
- Travel times and mode are the primary drivers of ridership in the SMRT Project corridor.
- Ridership is very directional in the peak direction (northbound in AM) and strong during the peak period.
- The Branch Avenue Metrorail Station shows the highest daily boardings of all stations, as it accommodates transfers from the Metrorail system. Other stations with high daily boardings include Mattawoman, Smallwood and Downtown Waldorf.
- Highway widening, which reduces highway traffic congestion, results in only a 1% decrease in total ridership.

Transit travel time ranges from 37 to 42 minutes for the entire SMRT Project corridor length and is as much as 24 minutes, or 39%, faster than the highway time.

Table ES-3: Land Use and Access Patterns at SMRT Stations

Access Patterns	Land Use Patterns			
	Town Center/ Mixed Use: Dense, mixed use	Special Anchor: Single institutional attractor	Residential: Serves Residential Neighborhood	Rural/Isolated: Low intensity
Intermodal: Provides connections to regional transit	Branch Avenue Mattawoman			
Mid-Line Local: Serves local destinations	Woodyard Timothy Branch Acton Downtown Waldorf	Joint Base Andrews Surratts	Camp Springs Coventry Smallwood	
Regional Collector: Access to transit from broad Commute Shed				Brandywine White Plains

What Public Outreach Efforts Were Conducted?

MTA maintained numerous channels of communication with communities, businesses, and institutions in the SMRT Project corridor, as well as regional stakeholders throughout the project period. MTA developed a project website (<http://mta.maryland.gov/smrt/>) allowing visitors to contact the Project Manager, download newsletters and Open House materials, request a presentation, comment on SMRT Study reports, submit responses to the SMRT Project Survey, fill out a Comment Form, and join the Study's mailing list. Open Houses were conducted in both June 2014 (146 attendees) and Spring 2015 (163 attendees) in Clinton, Waldorf and Temple Hills. The June 2014 events provided information on alignments identified during the 2010 Corridor Preservation Study. The Spring 2015 events presented updated alignments and options under consideration; characteristics of BRT and LRT; and visions and challenges along the SMRT Project corridor. MTA identified potential Environmental Justice (EJ) populations (low-income and minority) and disadvantaged persons within the SMRT study area and ensured they were informed and afforded the opportunity to provide comments on the SMRT Study.

After publication of the Draft Alternatives Report, MTA conducted an Online Public Meeting on January 9, 2017. Eighty-seven participants registered and 62 attended the on-line webinar event. A total of 47 comments were received during the designated comment period. Additionally, Watch Parties were held in both Prince George's and Charles counties with local technical staff available on hand to address local questions and comments. Neighbors were also encouraged to have Watch Parties. The PowerPoint presentation used during the webinar and a meeting transcript including a question and answer section are located on the project website. (www.smrtmaryland.com/smrt/public-involvement/previous-meetings/january-2017-online-public-meeting)

How Will Environmental Effects be Handled?

The SMRT Environmental Inventory (2016) identified natural, socioeconomic and cultural resources potentially affected by the SMRT alternatives and options under consideration, which have been discussed with local, state and federal resource regulatory agencies. By identifying potential environmental concerns early in the planning process, avoidance, minimization and protection measures can be incorporated into the continuing design efforts. Compensatory mitigation for unavoidable impacts to natural environmental resources will be investigated as part of a future NEPA study.

What is the Recommended Alignment?

MTA recommends Alternative 4, along the east side of MD 5 and US 301 in Prince George's County, and along the west side of the Pope's Creek Railroad in Charles County. The recommended crossing of the Capital Beltway is Beltway Option 8A, which provides a station directly serving JBA near the main gate. The northern terminus of the alignment for the Recommended Alternative is the Branch Avenue Metrorail Station platform on what is currently the bus transfer side of the station. The alignment then proceeds southeasterly adjacent to the existing Metrorail maintenance yard and runs parallel to Wesson Drive, to cross over the beltway east of the Auth Road bridge over the beltway. The alignment then runs on the south side of Allentown Road, turning south, adjacent to the Allentown Road exit ramp from northbound MD 5, then across Old Alexandria Ferry Road and Coventry Road at-grade. It then proceeds over Malcolm Road and Woodyard Road on aerial structures.

South of Woodyard Road, the alignment runs adjacent to the location of the future ramps for the SHA-proposed Surratts Road and Burch Hill Road interchanges. The alignment then continues east of the Brandywine Interchange and Park and Ride lot, which are currently under construction. The alignment continues south into the central portion of the Brandywine Crossing Shopping Center parking lot. South of the shopping center, the alignment moves adjacent to MD 5/US 301, running parallel to the ramps at the SHA-proposed McKendree Road interchange. North of Mattawoman-Beantown Road, the alignment diverges from MD 5/US 301, running adjacent to the CSX rail line on a new structure crossing Mattawoman Creek (using the Mattawoman-Beantown Option alignment). The preferred alignment continues south over Mattawoman-Beantown Road parallel to the CSX rail line through the Waldorf area. The southern limit is near DeMarr Road in Charles County.

This route provides direct access along the east side of the MD 5/US 301 to all of the key activity centers/destinations including the JBA Pedestrian Gate, MSMHC, Brandywine Crossing Shopping Center and the Waldorf Urban Redevelopment Corridor. This route is, on average, the lowest-cost option of those considered and is preferred by both Prince George's and Charles counties, as well as JBA.

What Additional Refinements to the Alignment are Needed?

Throughout this study, the SMRT Project team has identified several challenging areas that need additional technical studies during subsequent phases of project development. These include:

- Minimizing and mitigating the environmental effects

- Addressing right-of-way impacts to JBA along Allentown Road and MD 5
- Integrating the SMRT alignment and stations into the MSMHC campus and into the Brandywine Crossing Shopping Center
- Crossing of the Mattawoman Creek
- Coordinating with CSX along its right-of-way in Charles County

What is the Recommended Technology?

MTA recommends BRT on a dedicated transitway as the most appropriate technology for SMRT, based upon several key factors:

- BRT and LRT are projected to have comparable ridership.
- BRT travel times are approximately one minute faster over the length of the corridor.
- BRT capital cost estimates are \$500M less than LRT.

Even though annual operating costs for BRT are higher, the difference is not sufficient to overcome the considerable difference in construction costs. As transit technologies evolve, it is conceivable that changes in light rail construction requirements or the emergence of automated vehicles could reduce the cost differential between BRT and LRT options or a hybrid technology may emerge. In any event, the development of a dedicated transitway would insulate the transit service from the projected traffic congestion of the adjacent highway facility.

What are the Next Steps in the Project?

Right-of-Way Preservation

The identification of a SMRT Recommended Alternative does not, in itself, preserve or secure essential right-of-way for a rapid transit system in the SMRT Project corridor. The longer it takes to secure project approvals and funding for right-of-way acquisition, the more difficult and expensive the necessary land will be to acquire.

A key goal of this study is to provide Prince George's and Charles counties a reference point for preserving right-of-way into the future, which may also help reduce impacts to future construction of buildings and facilities. Inclusion of a SMRT Recommended Alternative in county planning documents (e.g., land use and development plans) allows coordinated integration of highway improvement projects along the SMRT Project corridor (so short-term highway improvements do not preclude rapid transit implementation of a rapid transit system) and provides a reference for potential TOD investment.

Identify an owner/operator for the system

A key question left unresolved is the matter of ownership and operation of the SMRT facility and service. Resolving this question is key to progressing toward project development. By identifying the owner of the facility, it will be clear who is responsible for securing financing for construction and operation and how the governance of the system is addressed. There are a variety of models for this entity and a careful review of the legal, fiduciary and political issues associated with the service would enable the counties to select the most appropriate option. With the questions of governance and ownership addressed, the owner can then make critical decisions about procurement approach, options for public and private sector financing, and trade-offs between capital costs and operating costs.

Develop a funding strategy

Closely tied to the question of ownership and operation is the funding strategy for the capital and operating costs for the project. The availability of funding and the form of financing can have a tremendous impact on the design effort and associated studies. Some questions of the trade-off between capital cost and operating expenses are best answered by the owner. In addition, environmental commitments required during the NEPA process are best negotiated by the owner.

The development of a funding strategy is also key to including a project in the regional Constrained Long-Range Plan (CLRP). Once in the CLRP, the impacts of a project become part of the base future case for other projects located in the same area.

Complete NEPA and Preliminary Engineering Studies

It is recommended that the previous three steps be well underway prior to beginning the formal NEPA process and Preliminary Engineering. Since the use of federal funding is anticipated for at least some of the capital and operating costs for SMRT, the lead federal agency, probably the Federal Transit Administration (FTA), must approve the class of action for environmental analysis and compliance with NEPA regulations. Recently, the FTA has been unwilling to initiate those studies until funding commitments for some portion of the implementation are in place.

Securing a significant portion of the right-of-way, identifying the facility owner and developing a strategy for secure funding are fundamental to achieving the long-term goal of reliable rapid transit service in the MD 5/US 301 corridor.

1. INTRODUCTION

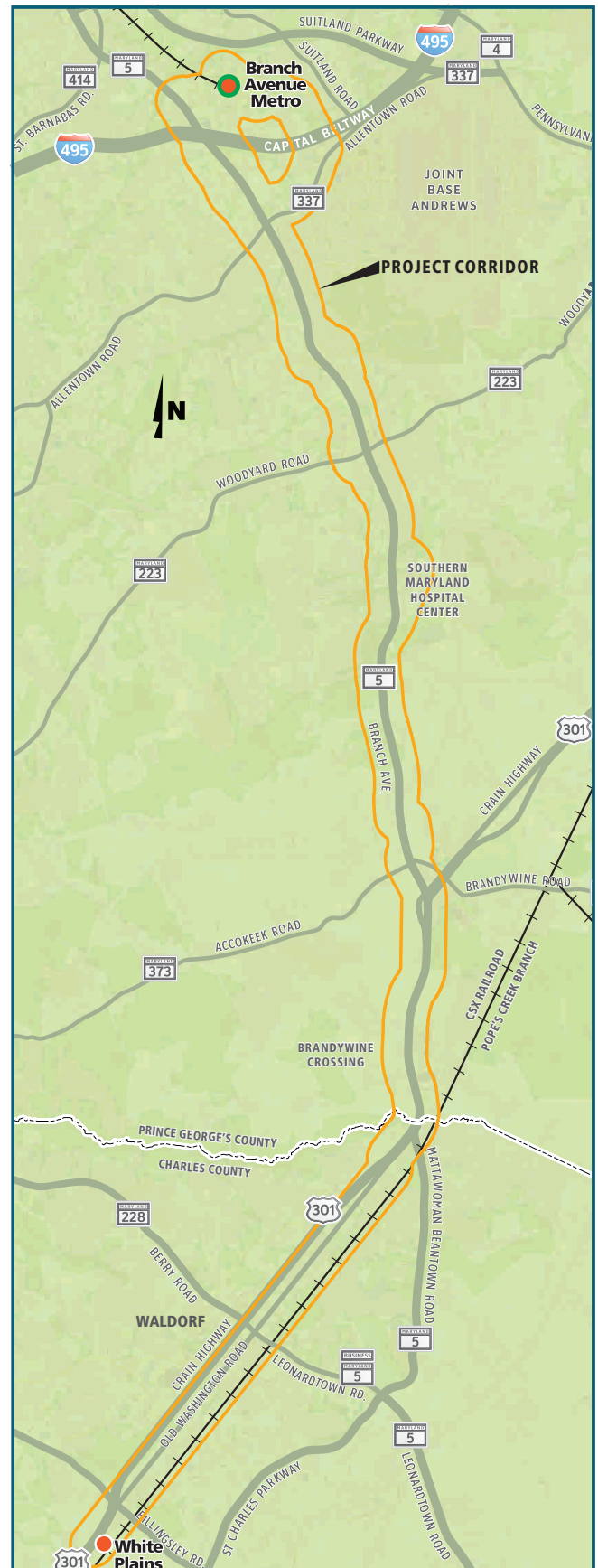
The Maryland Department of Transportation's (MDOT) Maryland Transit Administration (MTA) has completed this study in collaboration with Prince George's County and Charles County, as a key step in the overall implementation of the SMRT Project. The goal of the SMRT Project is to provide high-capacity transit improvements along 18.7 miles of the MD 5 (Branch Avenue)/US 301 (Crain Highway) corridor between the Branch Avenue Metrorail Station in Prince George's County and the Waldorf-White Plains area in Charles County (**Figure 1-1**). Approximately two-thirds of the SMRT Project corridor 12.8 miles, falls within Prince George's County, while the remaining third, 5.9 miles, lies in Charles County. Both MD 5 and US 301 are regionally significant roads that link Virginia and Southern Maryland to points north. The Project corridor carries a substantial amount of regional commuter traffic, in addition to being utilized for recreational and local travel.

This Final SMRT Alternatives Report summarizes the engineering and environmental analyses, alternatives analyses, ridership forecasting, cost estimates, economic analysis, stakeholder coordination, public involvement and other technical studies and coordination efforts that have taken place between November 2013 and November 2016. A balanced summary is provided of all the rapid transit alternatives and options developed – in both modes evaluated – Bus Rapid Transit (BRT) and Light Rail Transit (LRT).

Several directly related technical reports are referenced or summarized in this Final Report (see Appendices A - M). The following previously published works are directly related to this Final Report but do not appear as Appendices:

- Southern Maryland Transit Corridor Preservation Study, August 2010
- SMRT Corridor Vision, March 2016 and
- SMRT Environmental Inventory, May 2016

Figure 1-1: Project Location Map



2a. SMRT Project Corridor Characteristics and Regional Significance

The SMRT Project corridor is 18.7 miles in length along MD 5 and US 301. It begins at, and is integrated with, Washington Metropolitan Area Transit Authority's (WMATA) Green Line Branch Avenue Metrorail Station in Prince George's County and ends near the US 301/Demarr Road intersection in White Plains, just south of Waldorf in Charles County, Maryland (see **Figure 1-1**). Approximately two-thirds of this major north-south transportation corridor is within Prince George's County (12.8 miles), and the remaining one third is in Charles County (5.9 miles).

The SMRT Project is an integral part of the ongoing development of an interconnected regional transit system that will improve the quality of transit service in the Washington metropolitan region.

MD 5 and US 301 are regionally important roads that link Virginia and southern Maryland to points north. The southern Maryland region (Charles, Calvert and St. Mary's counties) accounts for the largest commuter bus ridership in the State of Maryland with 130,000 monthly passengers. Nine peak-hour bus routes serve Charles County with 196 daily trips into downtown Washington, D.C. There is no express transit service from southern Prince George's and Charles counties into WMATA's Green Line terminus at the Branch Avenue Metrorail Station.

The SMRT Project corridor connects six local and regional activity centers and includes commercial, residential, agricultural and forested land uses. The northern and southern portions of the corridor are designated as growth areas and Priority Funding Areas (PFAs), where commercial and residential land uses dominate the Project corridor (**Figure 2-1**).

The 2010 to 2040 forecasts from the Metropolitan Washington Council of Governments' (MWCOC, the region's Metropolitan Planning Organization), anticipate substantial growth in employment, population and the number of households for Prince George's County, Charles

County and St. Mary's County, which supplies regional traffic from the south. The middle of the corridor contains a portion of the Piscataway Creek Stream Valley Park along with larger residential lots and agricultural land uses, which are located outside of a PFA. JBA and MSMHC are the two largest employment centers along the corridor. In addition, there are highly-developed regional shopping centers, big box retailers and large undeveloped parcels throughout the corridor.

MAJOR STAKEHOLDERS

Brandywine Crossing Shopping Center
Charles County Government
Elected Officials
Joint Base Andrews (JBA)
Maryland Department of Transportation's (MDOT)
Maryland State Highway Administration (SHA)
Maryland-National Capital Park and
Planning Commission (M-NCPPC)
MedStar Southern Maryland Hospital Center (MSMHC)
Prince George's County Government
WMATA

JBA is a regionally important military base and major employer in Prince George's County. Land surrounding JBA has become mostly developed over time, with a variety of residential and commercial uses and densities, causing encroachment issues on base functions. Coordination with JBA is important to provide transportation access and support base land use and security concerns. The MSMHC and Brandywine Crossing are additional local activity centers along the SMRT Project corridor.

MD 5/US 301 highway infrastructure along the SMRT Project corridor features several overpasses, 5 interchanges, 22 signalized intersections, 25 unsignalized intersections and numerous driveways. Some highway segments are access-controlled while others are not. Roadway cross-sections vary from four-lane to nine-lane typical sections (including turn lanes), and the roadway is

divided throughout, with a median width that varies from 6 feet to 70 feet (excluding left turn lanes).

The MD 5/US 301 corridor is the only remaining corridor leading to the Capital Beltway with a large number of undeveloped parcels. There are also many privately-owned planned and proposed development projects (**Figure 2-2**). Prince George's and Charles counties have developed visions for the corridor that emphasize integrating land uses and transportation alternatives to attract additional employment options through improved mobility.

Many of the private development projects along the corridor have been proposed, studied and thoroughly vetted, but have yet to be fully implemented. The SMRT Project could serve as the impetus to give many projects a greater incentive to develop to the highest and best use, by encouraging higher density, transit-oriented development

(TOD) in the urban activity centers. The SMRT Project corridor would be the spine around which future growth would occur.

Planning for focused growth within existing or planned activity centers is central to achieving sustainable growth while promoting accessibility for a greater segment of the population and achieving county health and environmental quality goals. Planning for growth in the Waldorf Urban Redevelopment Corridor (WURC) is key to managing growth and increasing employment opportunities in Charles County.

The corridor's future is anchored by the SMRT vision and in the importance of mobility options, linkages between the activity centers and of all-day transit accessibility throughout the corridor.

2b. Related Master Plans and Transportation Projects within the SMRT Project Corridor

The SMRT Project supports, and is consistent with, numerous planning efforts such as the Prince George's County's Central Branch Avenue Sector Plan; Prince George's County Subregion 5 Master Plan; Charles County's Comprehensive Plan; Waldorf Urban Design and Waldorf Redevelopment Corridor Studies; and ongoing and planned transportation projects within the vicinity of the SMRT Project corridor.

MDOT/MTA began coordination with MDOT/SHA in November 2013, as it was recognized that MDOT/MTA's and MDOT/SHA's corridor planning efforts are closely related. **Table 2-1** describes the current status of seven related MDOT/SHA transportation studies and projects to improve capacity and safety including:

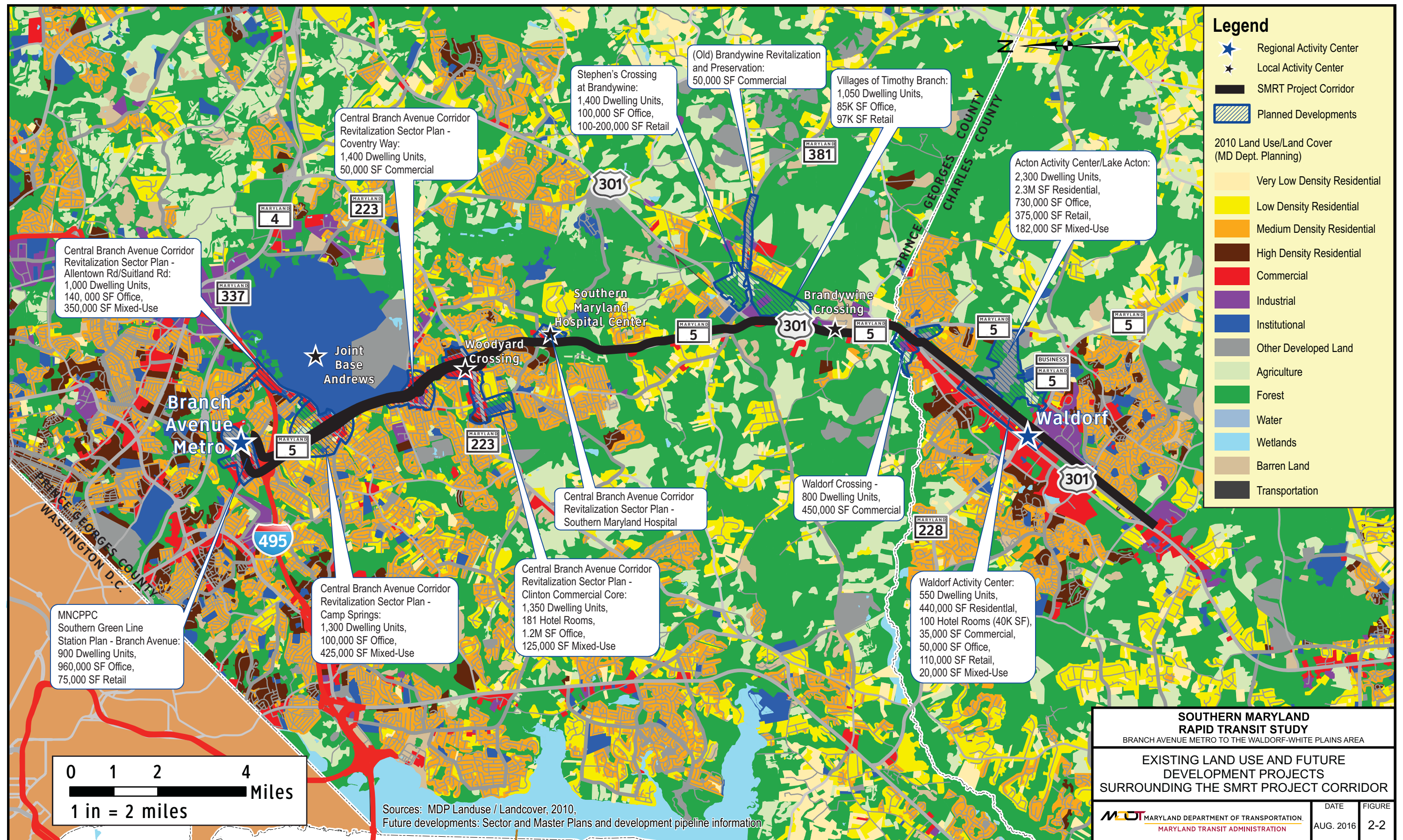
- Two feasibility studies
- One NEPA Project Planning Study
- Two Performance Based Practical Design studies and
- Two projects under construction

In addition to using Master Plans and Comprehensive Plans as guides, the SMRT Study builds on results of numerous prior transit and transportation studies that have taken place in southern Maryland, as described in **Table 2-2**.

As discussed in later Chapters, potential alignment alternatives and transit station locations for the current SMRT Study were initially derived from the 2010 Corridor Preservation Study, which identified station locations using various prior studies, 2005 State of Maryland Senate Bill 281 and the input of the SMRT Project team (Maryland Senate, 2005).

The proposed station locations support the counties' existing and future land uses by providing stations at key activity and employment centers throughout the corridor. In Prince George's County, the station locations proposed have relied heavily upon the Subregion 5 Master Plan and the Central Branch Avenue Revitalization Sector Plan station recommendations. In Charles County, the WURC Study proposes high density TOD and details a series of station locations that have been adopted into the SMRT Study.

Figure 2-2: Existing Land Use and Future Development Projects Surrounding the SMRT Project Corridor



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Table 2-1: Related Transportation Studies and Projects by MDOT/SHA within the SMRT Project Corridor

Project	Phase	Description	Status
Branch Avenue, MD 5, Corridor Transportation Study	Project Planning (NEPA)	Evaluate the potential for reducing congestion and improving safety in the MD 5 corridor from US 301 at T.B. to Auth Road (North of I-95/ I-495).	Environmental Assessment (EA) approved April 2012; Recommendations pending results of the SMRT Study.
Branch Avenue, MD 5, Metrorail Access Project	Construction	Construction of a new Metrorail Access Road as well as improvements to MD 5 north of the Capital Beltway, Auth Road, and Auth Way.	Under Construction
Woodyard Road MD 223 Corridor Planning Study	Project Planning (Feasibility Study)	A Corridor Planning Study to investigate transportation improvements to 7.7 miles of MD 223 (Woodyard Road/Piscataway Road) between MD 4 (Pennsylvania Avenue) and Steed Road. The study recommended types of improvements to carry forward into a NEPA study.	Completed 2015
MD 5 at Brandywine Road (MD 373/ MD 381) Interchange Project	Construction	Designs to replace two existing intersections with a grade-separated interchange: Branch Avenue (MD 5)/ Brandywine (MD 381) and Accokeek Road (MD 373) for congestion relief. The design considers the preferred alignment from the 2010 Corridor Preservation Study and would accommodate a station at the Park and Ride lot adjacent to the interchange.	Phase 1 - Completed Phase 2 - Under Construction
US 301 Waldorf Area Project	Project Planning (Feasibility Study)	Recommended safety improvements along the existing alignment of US 301 through Waldorf, north of the MD 5/US 301 Interchange at T.B. to Turkey Hill Road. This project is being taken through MDOT/SHA's Performance-Based Practical Design process	Draft Final Feasibility Study Report completed
US 301 at MD 228 and MD 5 Business Planning Study	Project Planning Study	Planning Study for traffic operation and the safety improvements at US 301/MD 228 (Berry Road) / MD 5 Business (Leonardtown Road) in Waldorf.	Planning Study in Progress
MD 5/US 301 Mattawoman-Beantown Road	Project Planning (Reevaluation Study)	Planning Study for capacity and safety improvements at MD 5/US 301 (Mattawoman-Beantown Road). This roadway is has become a bypass of the congested Waldorf area.	Planning Study in Progress

Table 2-2: Multi-Modal North-South Transportation Capacity Studies in Southern Maryland (1996 – 2010)

Study	Year	Support for SMRT
Southern Maryland Mass Transportation Alternatives Study (MDOT)	1996	- LRT Alternative would have the highest level of projected ridership and the strongest opportunity to reinforce local land use and economic development objectives of Charles and Prince George’s counties. - Short-term recommendations: » Provide more bus service in the MD 5/US 301 corridor » Begin right-of-way preservation for a future LRT
US 301/MD 5 Light Rail Feasibility Study (MDOT/MTA)	1997	- Recommended a “wider array of transportation options should be made available to residents and workers in the study area.” - Preserve and acquire right-of-way - Implement LRT after it can be supported by land use density - A follow up BRT or LRT planning study to identify locations for improvements such as bus priority lanes and signal pre-emption
Maryland Comprehensive Transit Plan, Vol. IV., Southern MD, 2001 (MDOT/MTA)	2001	- Recommended improvements to the existing bus networks; local county services and MDOT/MTA commuter bus. - Short-term: increasing the level of service on MDOT/MTA’s commuter bus service. - Long-term: a transitway or rail line along the MD 5/US 301 corridor from White Plains to the Branch Avenue Metrorail Station.
Maryland Strategic Framework for TOD in Prince George’s County (M-NCPPC)	2003	- A strategy for attracting TOD to Prince George’s County as a means of achieving General Plan development goals and objectives. - Opportunities, challenges, and policymaking issues to implement TOD in the County - Evaluation criteria for TOD at the County’s 15 Metrorail stations - Established 5 criteria used to evaluate potential for successful TOD; master plan and area plan consistency, access and parking, market opportunities, development constraints (obtaining right-of-way), proposed development is consistent with General Plan goals and TOD criteria
MD 5/US 301 Transit Service Staging Plan (MDOT/MTA)	2004	- Developed by MDOT/MTA to guide the expansion of transit service along the MD 5/US 301 corridor to the year 2025. - Two stages were developed and four alternatives for public transit were identified, including enhanced commuter bus, two levels of BRT (moderate and high level), and LRT. - The plan stated that the BRT or LRT service should be constructed and operational in 2025.

Study	Year	Support for SMRT
Southern Maryland Transportation Needs Assessment (MDOT and the Tri-County Council for Southern Maryland)	2008	- MDOT and the Tri-County Council for Southern Maryland evaluated the current transportation system and land use to update the 1998 Southern Maryland Regional Strategy – An Action Plan for Transportation. The update was spurred by increased population and suburbanization and commuter pattern changes. - Findings: 75% of all trips by personal vehicles - Commute times among highest in the nation - Commuter trips expected to increase 50% by 2028 to 2033 - Transit improvements, including LRT should be implemented as quickly as possible
Southern Maryland Commuter Rail Service Feasibility Study (MDOT/MTA)	2009	- Evaluated construction and operation of MARC commuter rail service on existing railroad right-of-way from Bowie to Southern Maryland. - Findings: costly and difficult to implement but possible. Upgrades to railroad would be needed for a safe and efficient passenger railway.
Southern Maryland Transit Corridor Preservation Study, Environmental Inventory Report (EIR) and a Land Use Analysis and Guidance Report (MDOT/MTA)	2010	- Study to define a high-capacity transit alignment along the MD 5/US 301 corridor from the Branch Avenue Metrorail Station in Prince George’s County to the Waldorf-White Plains area in Charles County. - Recommendations: a 18.7-mile long, 70-foot wide corridor alignment for use in county land use planning documents; with potential transit station locations, parking, and other facilities; and selected BRT and LRT as technologies to analyze further. - The companion EIR identified no fatal environmental flaws, deferring to NEPA for design to avoid and minimize impacts. - The companion land use report identified strategies, tools, and techniques to assist the counties in preserving, protecting, and enhancing the Project corridor in advance of the next phase of project development.

Source: The Wilson T. Ballard Company/Sabra, Wang & Associates, JV

2c. Corridor Vision

In order to establish a framework for developing, evaluating, and advancing SMRT Project alternatives, the following general Corridor Vision statement has been established:

Providing safe, accessible, efficient and convenient high-capacity rapid transit during both the peak and off-peak hours in the MD 5/US 301 corridor will overcome a number of transportation challenges that exist in the corridor.



More specifically, the SMRT Project is envisioned as ultimately being able to achieve the following:

- Link the SMRT Project corridor growth centers, and local and Regional Activity Centers with the Branch Avenue Metrorail Station;
- Support TOD, reinvestment and redevelopment, and the creation of new employment opportunities near Regional Activity Centers and planned development;
- Provide a catalyst for new investment, economic growth, and job creation;
- Enhance the tools available to local government to allow the transit corridor to be a spine around which future growth can occur as well as encourage transit-supportive development in the corridor;
- Improve accessibility to employment and services for transit-dependent populations;
- Expand commuting options, enhance local mobility, preserve highway capacity, and manage congestion throughout the Project corridor;
- Create a sustainable, multi-modal transportation strategy for this rapidly growing, automobile-dependent corridor; and
- Promote public health outcomes for residents along the Project corridor by offering alternative transportation options.

Source: SMRT Corridor Vision (March 2016)

2d. Challenges Addressed in the Project Corridor by SMRT*

Prince George's and Charles counties recognize a viable transit option is needed to efficiently move people in the corridor and are developing land use and development plans that prepare for the SMRT Project. The counties understand there needs to be an alternative to driving private vehicles. If the corridor is to continue functioning, people need an alternative way to travel in an efficient, timely manner.

Providing safe, accessible, efficient and convenient high-capacity rapid transit during both the peak and off-peak hours in the MD 5/US 301 corridor will overcome a number of transportation challenges that exist in the corridor.

The corridor does not have a balance between jobs and housing.

The current employment levels throughout the SMRT Project corridor are relatively low while the number of people living in the corridor is relatively high. This imbalance is demonstrated by the peak-hour directional travel. Most people are traveling north in the morning and south in the evening. Despite efforts to increase jobs in Charles and Prince George's counties, this uneven growth is forecast to continue. A transportation system needs to be developed that can accommodate travel demand and support widespread job growth (see **Tables 2-3A, 2-3B, 2-3C** and **Figure 2-3**).

The highway-based transportation system is not supportive of existing and planned development.

The MD 5/US 301 corridor is a major north/south commuting and shopping corridor and an example of a suburban, highway-centered land use pattern that is congested and has limited transportation alternatives. Population and employment growth is forecast to continue, and Prince George's and Charles counties have been encouraging development to occur in a new way – in a way that will enhance transit's attractiveness, encourage use of non-motorized travel methods and facilitate alternatives to the private automobile for personal travel.

SMRT is consistent with and supportive of the counties' master plans, sector plans, transportation studies and redevelopment activities, and recent planning efforts have suggested that SMRT will help encourage new developments to locate near existing and/or proposed transit facilities.

There are limited reliable travel options from the Waldorf Regional Activity Center to other parts of the Washington metropolitan region.

In the Waldorf area today, private vehicles are virtually the only option for traveling to most parts of the Washington metropolitan region. Along the SMRT Project corridor, there are no bicycle or pedestrian networks, few car-share and bike-share opportunities, and the local transit network is not very robust. The existing commuter bus service to downtown Washington, D.C. is heavily used. However, it does not provide off-peak service or connect to the Metrorail system to provide regional access. It provides little to no travel time advantages because it uses the same congested roadways as other travelers. SMRT would operate during peak- and off-peak hours, provide connections to the Branch Avenue Metrorail Station and be separated from the roadway in a dedicated transitway.

SMRT travel time ranges from 37 to 42 minutes for the entire corridor length and is as much as 24 minutes, or 39%, faster than the highway time.

There are few alternative transportation options within the MD 5/US 301 corridor.

Twenty-seven bus routes operate in the SMRT Project corridor. These routes are operated by MDOT/MTA, WMATA, and the local transit providers in Prince George's and Charles counties. However, none of these services provides express service to the Branch Avenue Metrorail Station. A small portion of commuters along the corridor use Prince George's County's TheBus system to access the Branch Avenue Metrorail Station using a local TheBus route (30) from the MSMHC or by transferring to this same route at the Clinton Park and Ride Lot from the Route 36 which operates from the MDOT/MTA Park and Ride lot, just north of Waldorf in Charles County.

While commuter buses run in the corridor they do not stop at the Branch Avenue Metrorail Station and they do not provide access along the entire MD 5/US 301 corridor. Providing an all-day, one-seat connection along MD 5/US 301 between Waldorf and White Plains, and the Branch Avenue Metrorail Station, will increase transportation options along the corridor.

* Section 2d. is taken from the SMRT Corridor Vision, 2016

Table 2-3A: Employment Growth Forecasts for the SMRT Commute Shed (2010 – 2040)

SMRT Commute Shed Subarea*	Area (sq. mi.)	2010 to 2015			2015 to 2030		2030 to 2040		2010 - 2040
		2010	2015	% Change	2030	% Change	2040	% Change	Total Number & % Change
Northern Prince George's County	105	112,713	102,454	-9.1	130,736	27.6	150,077	14.8	37,364 33.1%
Southern Prince George's County	129	9,516	8,378	-12.0	8,547	2.0	9,446	10.5	-70 -0.7%
Charles and St. Mary's Counties	217	54,437	59,940	10.1	67,894	13.3	72,645	7.0	18,208 33.4%
SMRT Commute Shed Subarea Total	451	176,666	170,772	-3.3	207,178	21.3	232,168	12.1	55,502 31.4%

*See Figure 2-3 for the SMRT Commute Shed subarea boundaries. Source: MWCOG Round 8.3 Cooperative Forecasts.

Table 2-3B: Population Growth Forecasts for the SMRT Commute Shed (2010 – 2040)

SMRT Commute Shed Subarea*	Area (sq. mi.)	2010 to 2015			2015 to 2030		2030 to 2040		2010 - 2040
		2010	2015	% Change	2030	% Change	2040	% Change	Total Number & % Change
Northern Prince George's County	105	275,494	267,923	-2.7	284,306	6.1	302,857	6.5	27,364 9.9%
Southern Prince George's County	129	42,341	43,596	3.0	53,312	22.3	57,000	6.9	14,659 34.6%
Charles and St. Mary's Counties	217	114,018	127,639	11.9	163,484	28.1	181,976	11.3	67,958 59.6%
SMRT Commute Shed Subarea Total	451	431,853	439,158	1.7	501,103	14.1	541,834	8.1	109,981 25.5%

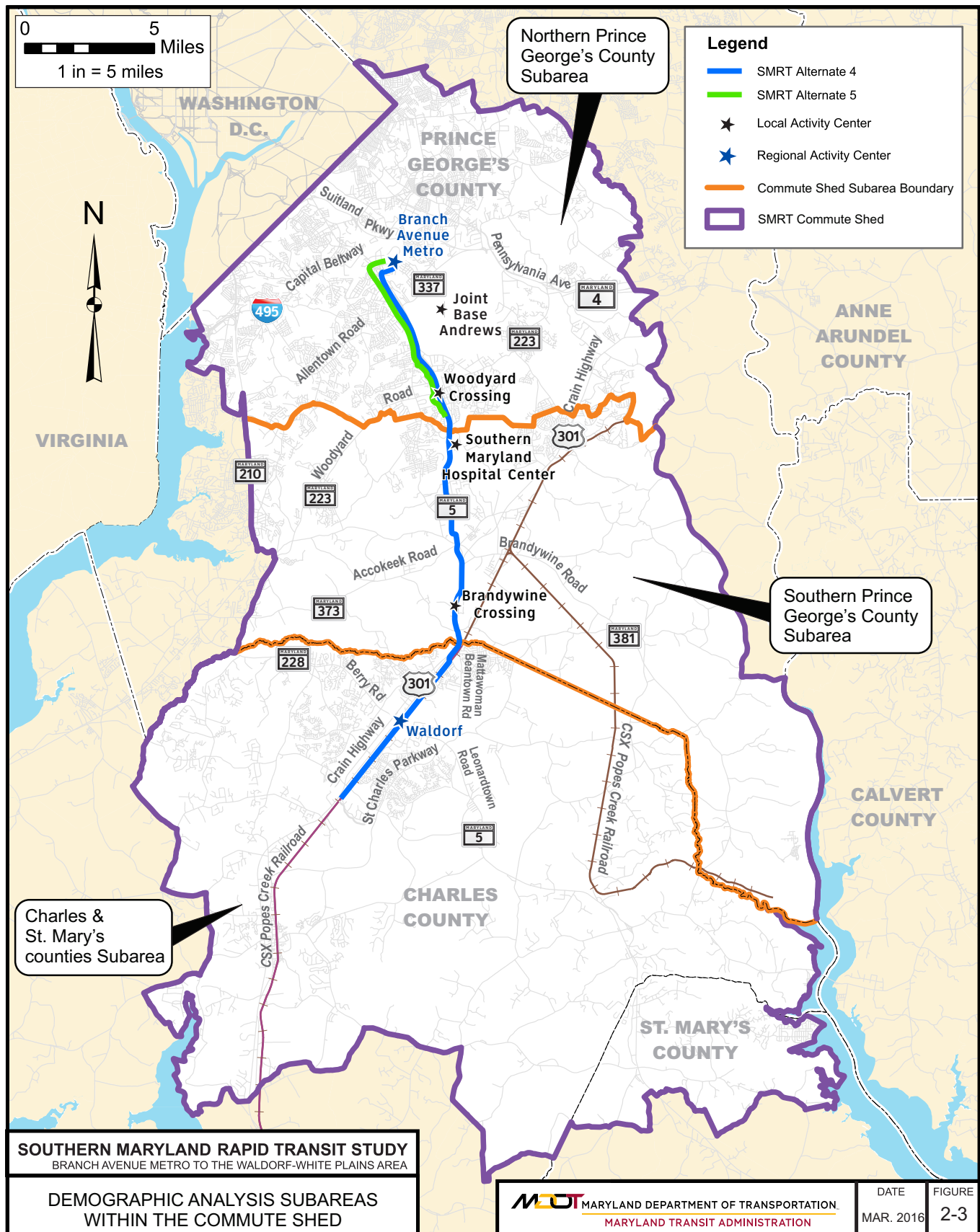
*See Figure 2-3 for the SMRT Commute Shed subarea boundaries. Source: MWCOG Round 8.3 Cooperative Forecasts.

Table 2-3C: Household Growth Forecasts for the SMRT Commute Shed (2010 – 2040)

SMRT Commute Shed Subarea*	Area (sq. mi.)	2010 to 2015			2015 to 2030		2030 to 2040		2010 - 2040
		2010	2015	% Change	2030	% Change	2040	% Change	Total Number & % Change
Northern Prince George's County	105	99,239	106,530	7.3	115,036	8.0	122,846	6.8	23,607 23.8%
Southern Prince George's County	129	15,239	16,456	8.0	21,472	30.5	22,987	7.1	7,748 50.8%
Charles and St. Mary's Counties	217	40,662	46,473	14.3	61,924	33.2	70,341	13.6	29,679 73.0%
SMRT Commute Shed Subarea Total	451	155,139	169,459	9.2	198,432	17.1	216,174	8.9	61,035 39.3%

*See Figure 2-3 for the SMRT Commute Shed subarea boundaries. Source: MWCOG Round 8.3 Cooperative Forecasts.

Figure 2-3: Demographic Analysis Subareas within the SMRT Commute Shed



Source: SMRT Corridor Vision (March 2016)

There is limited potential to attract new employment. Employment in the MD 5/US 301 corridor is primarily focused in the northern end. Only 4% of the overall commuting volume in the corridor travels from the north to the south. However, regional leaders expect that SMRT, combined with local master planned land use changes will reduce this imbalance by providing attractions and employment centers in the southern portion of the corridor. Employment growth in the southern portion of the SMRT Project corridor and efficient rapid transit to serve it, are seen as working together to achieve success. The SMRT Project can lead to employment growth in the southern portion of the SMRT Project corridor, and that employment growth can lead to the higher ridership on the SMRT transit system.

Accessibility for transit-dependent populations is poor. Lower income households generally have lower car ownership and typically depend on local transit service. Providing high-quality, direct transit service along the MD 5/US 301 corridor could improve economic opportunities for transit-dependent populations by providing increased access to healthcare, education and employment opportunities, by reducing travel times and commuting costs and by expanding reverse-commute options. While the SMRT study area taken as a whole has a smaller percentage of people living in poverty than in Prince George's or Charles counties, there are low-income populations in the northern and southern ends of the corridor that would benefit from improved accessibility.

As travel demand increases, there is limited availability to expand the transportation footprint. Regional travel demand models (that do not include SMRT) indicate that by 2040, the total number of commute trips from along the MD 5/US 301 corridor to the Washington, D.C. urban core (generally D.C. and adjacent northern VA counties) will increase by 40%—from 115,540 to 161,660 trips. However, while the number of transit riders is forecast to increase, the percentage of travelers using transit is forecast to decrease.

It is necessary to expand capacity within the MD 5/US 301 corridor or bottlenecks and increased congestion can be expected in numerous locations, especially along the portion of the corridor adjacent to JBA. However, the existing MD 5/US 301 corridor right-of-way is quite constrained making it difficult to increase capacity by providing more highway lanes. SMRT will substantially increase the corridor's people-moving capacity and help slow congestion growth without major roadway improvements or expansion of the highway because the transit will be in its own dedicated right-of-way.

The Current Transportation System Contributes to Substantially Higher-than-Average Rate of Personal Injuries in the Corridor and Unhealthy Lifestyles. Automobile-dependent land uses, increasing volumes of traffic and lack of facilities for non-motorized travel all play roles in the health levels of the corridor's residents. The health outcomes stem from three areas: vehicle crashes, limited opportunities for incidental exercise associated with walking or biking rather than driving to a destination and health problems associated with degraded air quality.

Making improvements at key intersections and increasing transit travel opportunities through SMRT and other projects, which will allow implementation of the bicycle, pedestrian and healthy community plans prepared by Prince George's and Charles counties, and can help improve health outcomes along the corridor.

Population and employment in the corridor are projected to grow. Tables 2-3A through 2-3C identify Employment, Population, and Household growth forecasts for the northern Prince George's County, southern Prince George's County, Charles/St. Mary's counties subareas, and for the overall SMRT Commute Shed. Table 2-3A shows that growth in employment from 2010 to 2040 will be roughly 31.4% in the SMRT Commute Shed, with the largest job growth expected in the northern and southern subareas. Table 2-3B shows that population growth between 2010 and 2040 in the SMRT Commute Shed will be roughly 25.5%. Population is forecasted to increase 34.6% and 59.6%, respectively, in the more rural southern Prince George's County and Charles/St. Mary's counties subareas, as compared to 9.9% in urbanized northern Prince George's County subarea. Employment demand in northern Prince George's County will need to be served to an even greater extent by Charles and St. Mary's counties, leading to continued increases in commuter travel volumes within the SMRT Commute Shed.

Following the trend in population growth, the number of households is expected to grow by 50.8% in the southern Prince George's County subarea and by 73.0% in the Charles/St. Mary's counties subarea between 2010 and 2040 (Table 2-3C). Household growth in the northern Prince George's County subarea is expected to increase by roughly 23.8% and the number of households is expected to increase by 39.3% within the SMRT Commute Shed in that period.

3. ALTERNATIVES

3a. Alternatives and Options Considered

The purpose of the alternatives evaluation phase of this study and this Final SMRT Alternatives Report is to document the development of all practicable alternatives and options that satisfy the established visions and objectives for the SMRT Project. Engineering and environmental analyses, stakeholder coordination and public involvement have been performed over a three-year time frame – from fall 2013 to early 2017 – to determine those alternatives and options to be eliminated, and those to retain for further study in subsequent stages of project development.

The primary starting point for establishing the range of transit alternatives and options for evaluation in this study was The Southern Maryland Transit Corridor Preservation Study (completed in August 2010). The 2010 Study developed, analyzed and presented five Mainline Alternatives, eight Localized Options (providing connections between the mainline alternatives) and six Beltway Crossing Options. The 2010 Study concluded with a Preferred Alternative, defined as Alternative 4 with Beltway Crossing Option 2, which will be described further below. Since the 2010 Study did not include any agency coordination or public involvement, this SMRT Study took a fresh look at all of the 2010 Study alternatives and options, and developed additional options.

The following sections provide a chronology of the alternatives and options developed in this study, with descriptions and current status in terms of being either dropped from consideration or retained for presentation at an upcoming online public meeting. Figures conceptually illustrating the alternatives and options that have been considered are included either in the body of this report, or in Appendices A and B of this report. Graphical representations of the alternatives and options and a chronology of all alternatives and options considered throughout the SMRT Study are included as 11x17 figures at the end of this chapter.

Preservation Study and presented at the 2014 SMRT Study Open House were as follows:

Mainline Alternatives at Study Initiation

The Mainline Alternatives define the transit alignment – either Bus Rapid Transit (BRT) or Light Rail Transit (LRT) – from south of Allentown Road to the southern limit of the study, in White Plains. North of Allentown Road, any of the Mainline Alternatives need to be combined with a Beltway Crossing Option to tie into the Branch Avenue Metrorail Station.

In establishing the alignment for the Mainline Alternatives, the SMRT Study has assumed all potential MD 5/US 301 widening and interchange improvements currently being considered by MDOT/SHA as part of various planning and design efforts (see **Table 2-1**) will be in place prior to any SMRT Project corridor improvements. Therefore, for most of the corridor, the SMRT Study alignments have been horizontally offset from the MD 5/US 301 roadway pavement a sufficient distance to allow for future widening and separated by a barrier to minimize potential property impacts as much as possible. In all cases, BRT and LRT follow the same alignment.

Proposed SMRT Typical Section

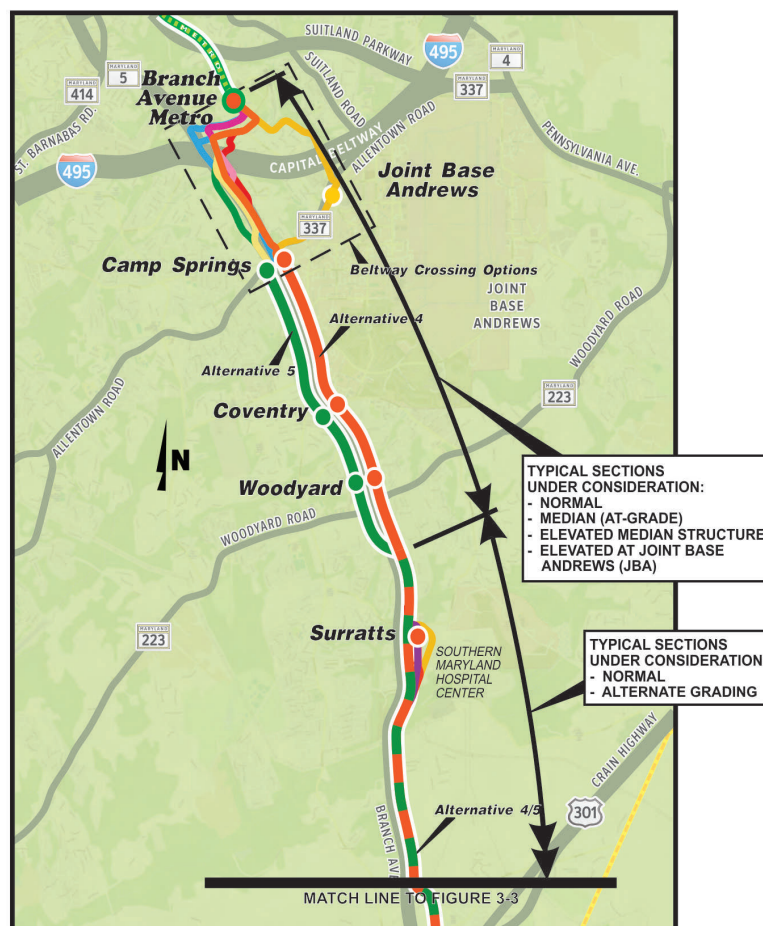
Figures 3-1 and 3-3 show the locations of typical sections considered in Prince George's and Charles counties. The study considered a variety of potential transit typical sections, for both LRT and BRT, to provide the best fit for each segment, in terms of compatibility with existing and future land use and minimization/avoidance of impacts to environmental features. As seen in the typical sections, the "footprint" of the LRT track bed (37 feet) is generally wider than that of the BRT transitway; however, the difference is negligible. Project cross-sections were created at 200-foot intervals to determine a potential Limit of Disturbance (LOD). Impacts were assessed within the LOD for both BRT and LRT.

Figure 3-1: Key Map of BRT and LRT Typical Sections Considered - Prince George's County

Transit Typical Sections

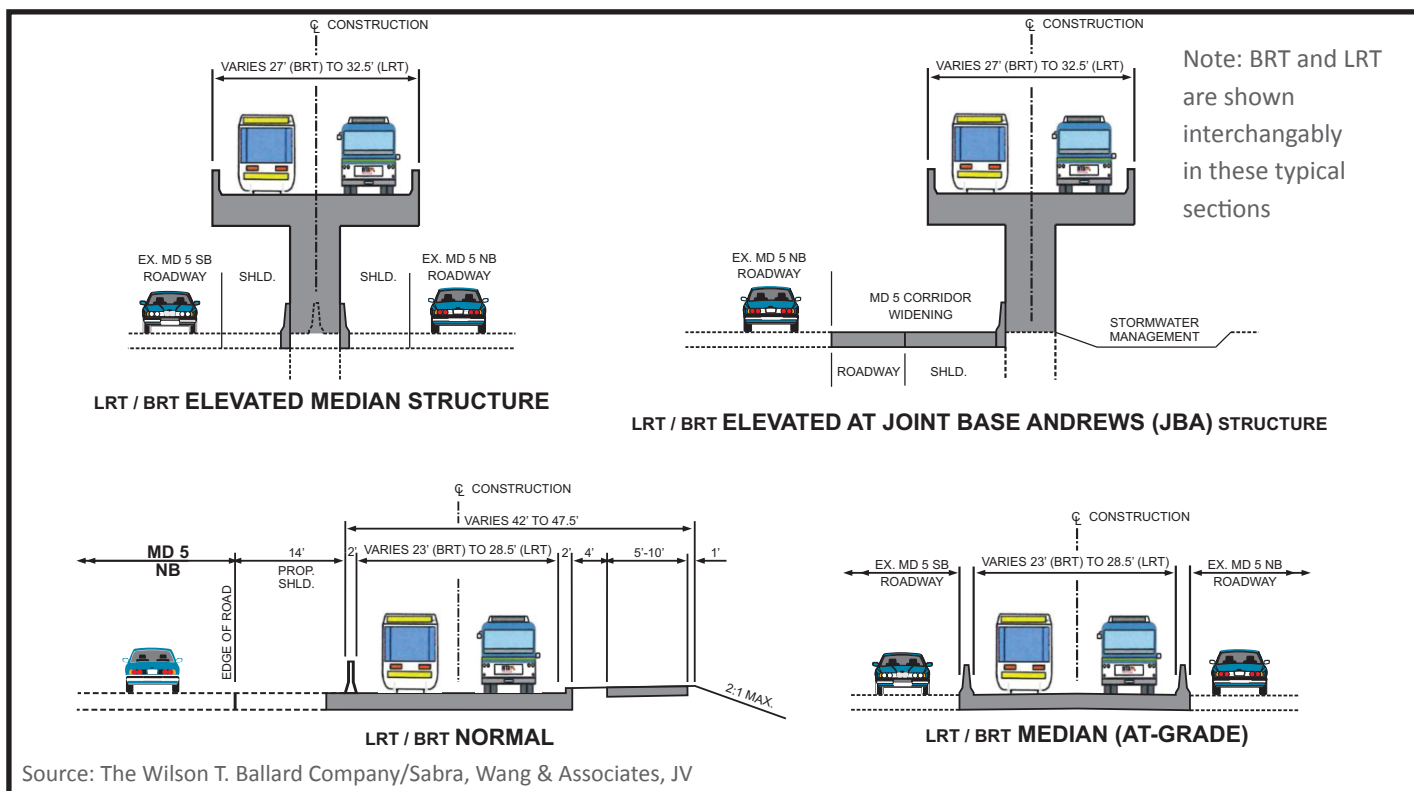
Prince George's County Segment

In the northern portion of the SMRT Project corridor, within Prince George's County where most of the existing land is developed and right-of-way is constrained, a closed section design, with concrete barrier separating the roadway from the transit transitway/track, was generally applied from Branch Avenue to south of Woodyard Road along MD 5. In the vicinity of JBA, median and outside shoulder elevated transitway/track structures have been considered as an option to minimize or avoid property impact to the base. From south of Woodyard Road to the Prince George's/Charles County line, where the existing right-of-way is more generous, open and closed section templates are applied, as appropriate, based on existing and future conditions. Throughout this segment, sidewalk is proposed in all station areas and elsewhere, as conditions allow. See **Figures 3-1** and **3-2** for specific typical sections considered in the Prince George's County segment of the corridor.



Source: The Wilson T. Ballard Company/Sabra, Wang & Associates, JV

Figure 3-2: BRT and LRT Typical Sections Considered - Prince George's County

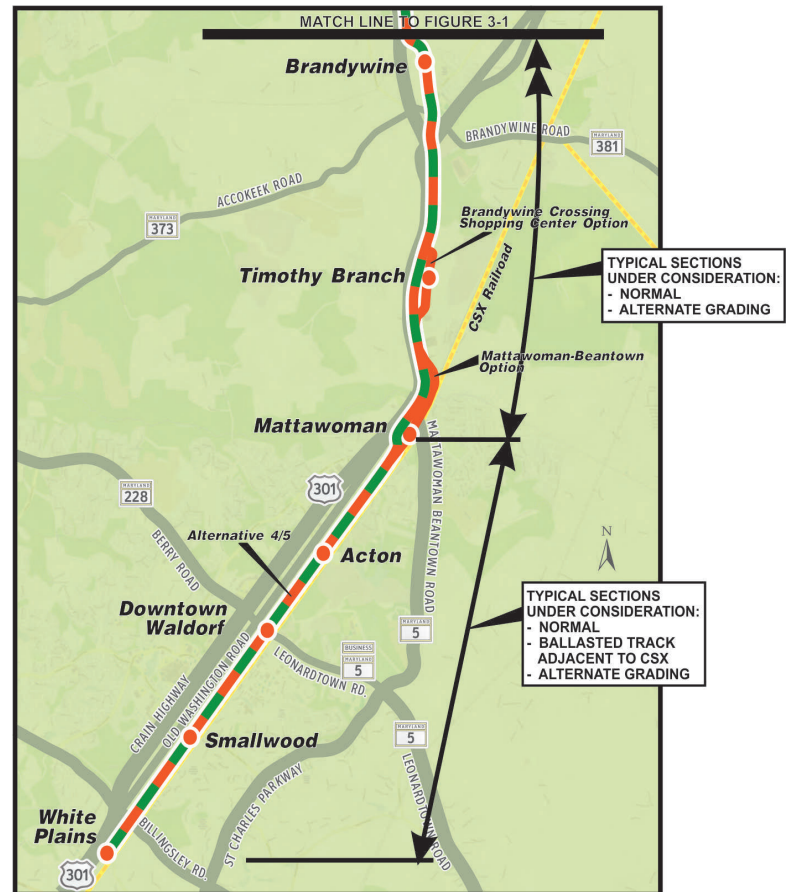


Source: The Wilson T. Ballard Company/Sabra, Wang & Associates, JV

Figure 3-3: Key Map of BRT and LRT Typical Sections Considered - Charles County

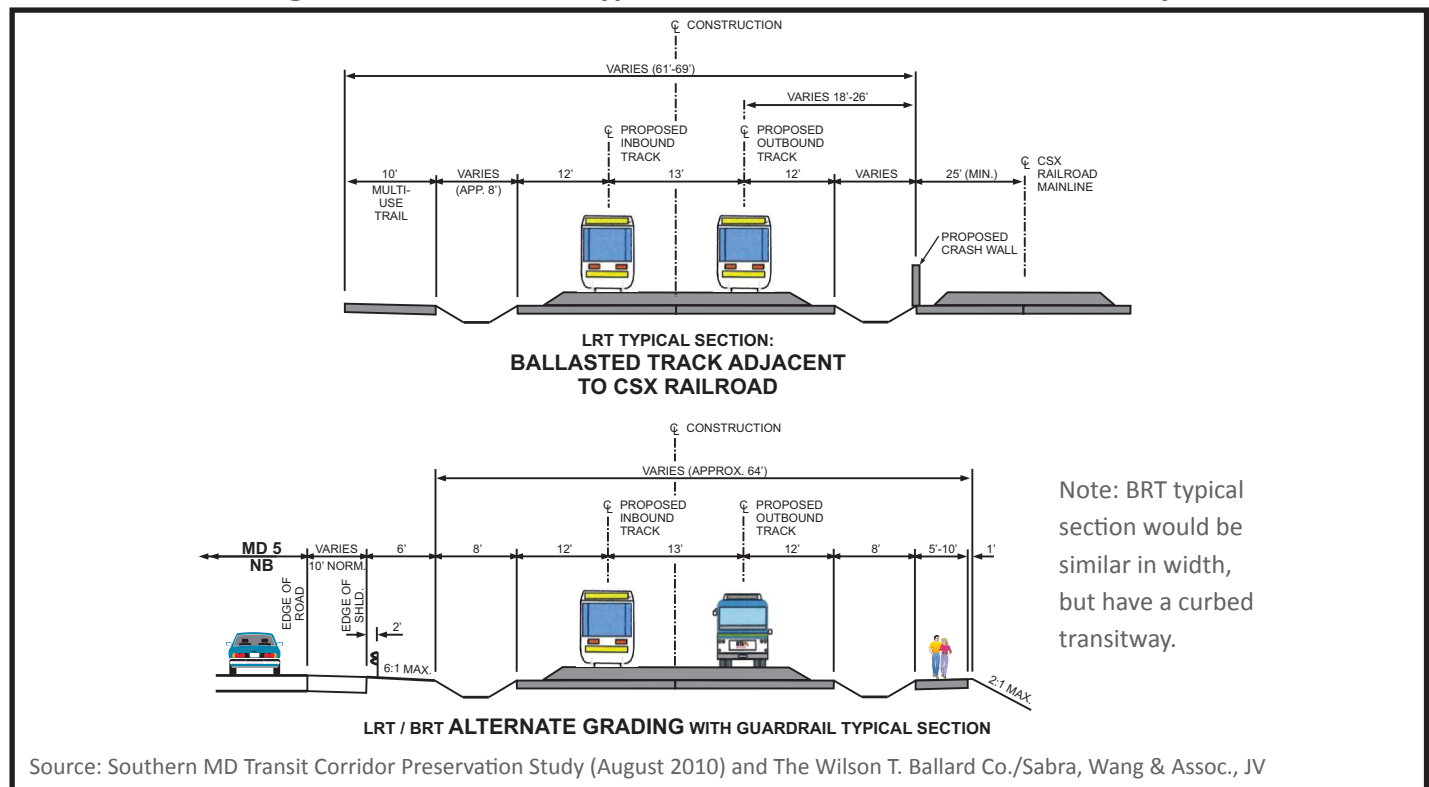
Transit Typical Sections Charles County Segment

In Charles County, where the study alignments are generally not adjacent to the highway, an open section template was applied outside of proposed station and bridge areas. The section includes a 10-foot-wide multi-use trail, drainage ditches and a crash wall to provide a safety barrier to separate the SMRT transit alignment from the parallel CSX rail line. Throughout this segment, sidewalk is proposed in all station areas and elsewhere, as conditions allow. The proposed 10-foot-wide multi-use trail would tie into an extension of the Indian Head Rail Trail. See **Figures 3-3** and **3-4** for specific typical sections considered in the Charles County segment of the corridor.



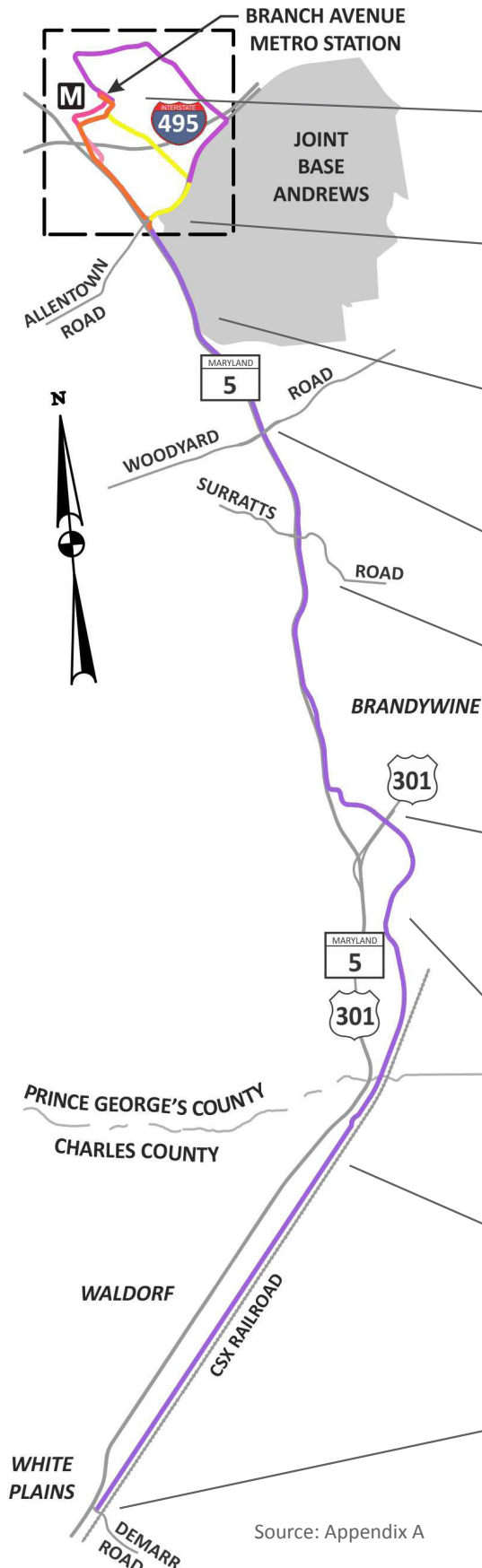
Source: The Wilson T. Ballard Company/Sabra, Wang & Associates, JV

Figure 3-4: BRT and LRT Typical Sections Considered - Charles County



Source: Southern MD Transit Corridor Preservation Study (August 2010) and The Wilson T. Ballard Co./Sabra, Wang & Assoc., JV

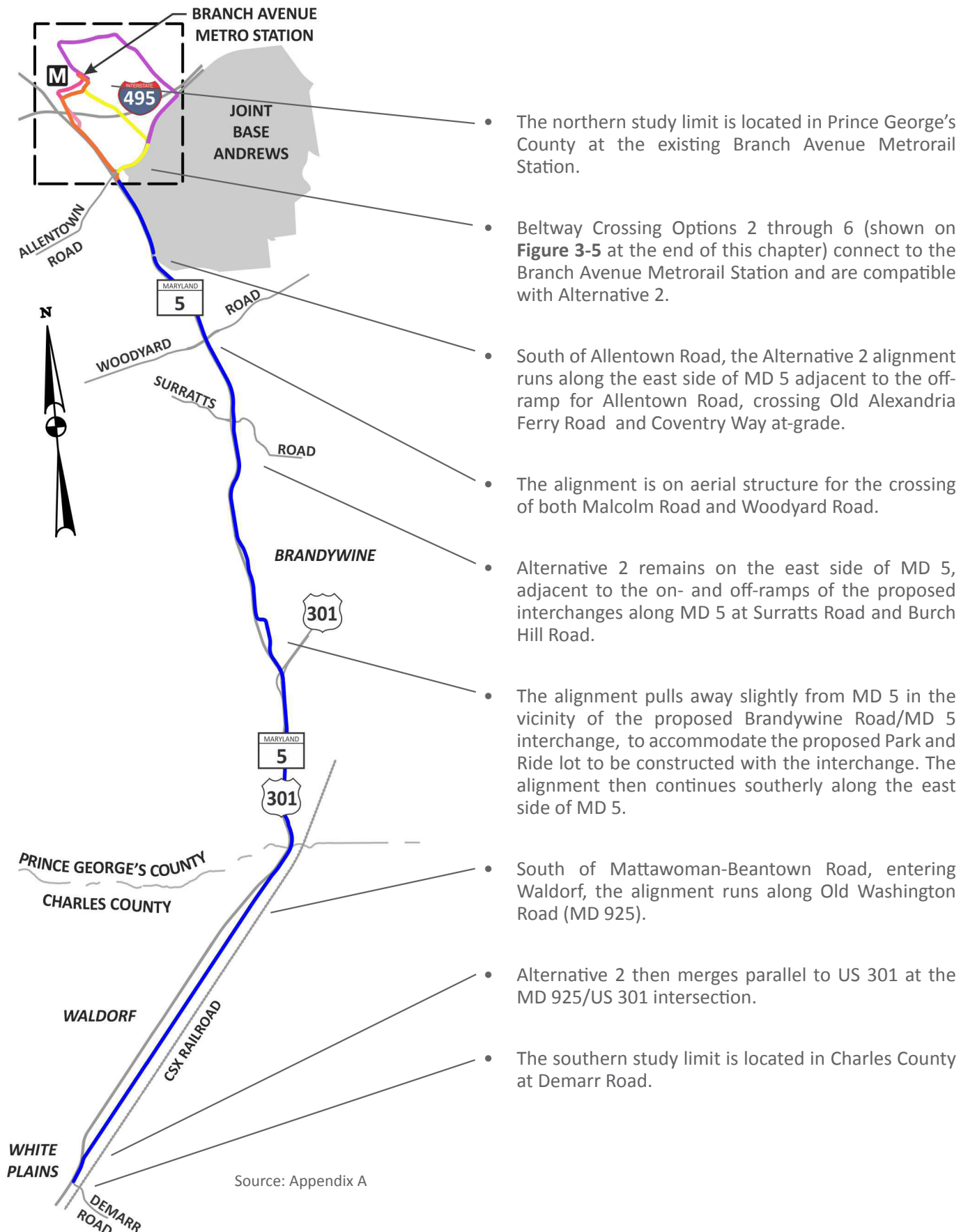
Mainline Alternatives Considered at Study Initiation - Alternative 1 Description and Key Map



Source: Appendix A

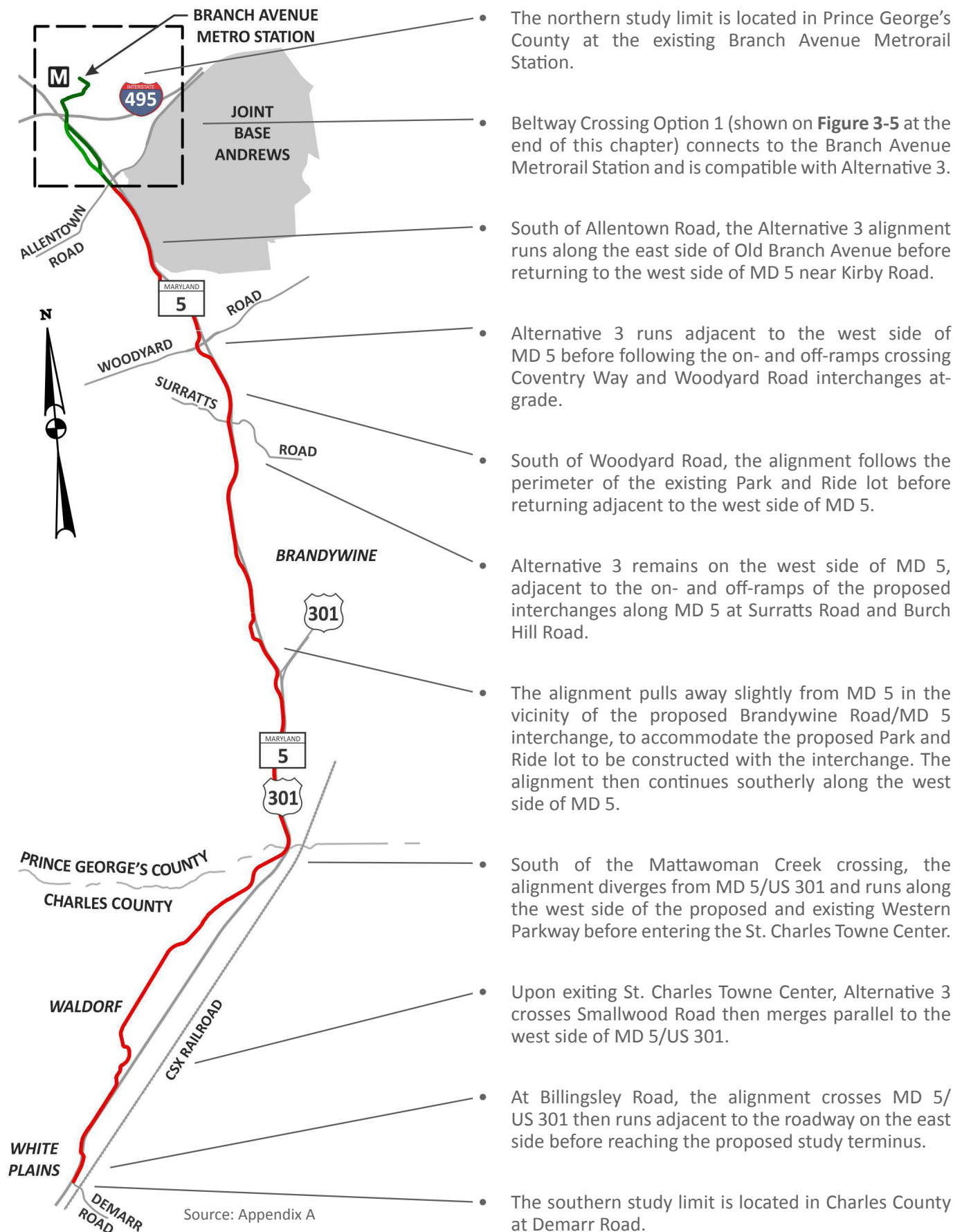
- The northern study limit is located in Prince George's County at the existing Branch Avenue Metrorail Station.
- Beltway Crossing Options 2 through 6 (shown on **Figure 3-5** at the end of this chapter) connect to the Branch Avenue Metrorail Station and are compatible with Alternative 1.
- South of Allentown Road, the Alternative 1 alignment runs along the east side of MD 5 adjacent to the off-ramp for Allentown Road, crossing Old Alexandria Ferry Road and Coventry Way at-grade.
- The alignment is on aerial structure for the crossing of both Malcolm Road and Woodyard Road.
- Alternative 1 remains on the east side of MD 5, adjacent to the on- and off-ramps of the proposed interchanges along MD 5 at Surratts Road and Burch Hill Road.
- The alignment diverges from MD 5 just north of the proposed Brandywine Road/MD 5 interchange continuing east of the proposed Park and Ride lot to be constructed with the interchange. The alignment then continues southeasterly along the master planned extension of Mattawoman Drive past Gwynn Park High School.
- Turning to the south, the alignment runs along Mattawoman Drive, crossing Timothy Branch and running along the alignment for proposed Spine Road.
- Alternative 1 merges parallel to the CSX rail line, just east of Cedarville Road, and follows the rail alignment into Waldorf.
- The southern study limit is located in Charles County at Demarr Road.

Mainline Alternatives Considered at Study Initiation - Alternative 2 Description and Key Map



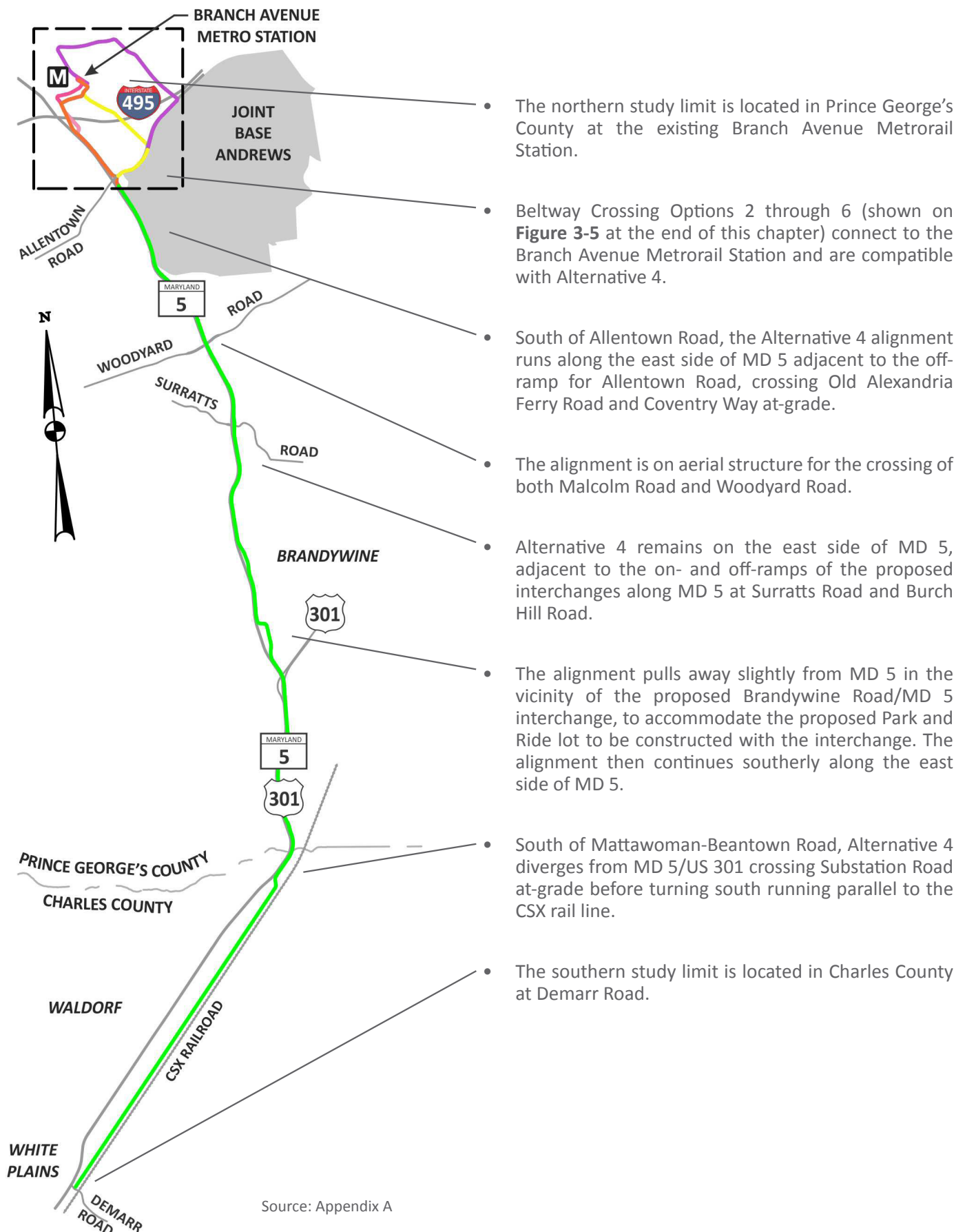
Mainline Alternatives Considered at Study Initiation -

Alternative 3 Description and Key Map



Mainline Alternatives Considered at Study Initiation -

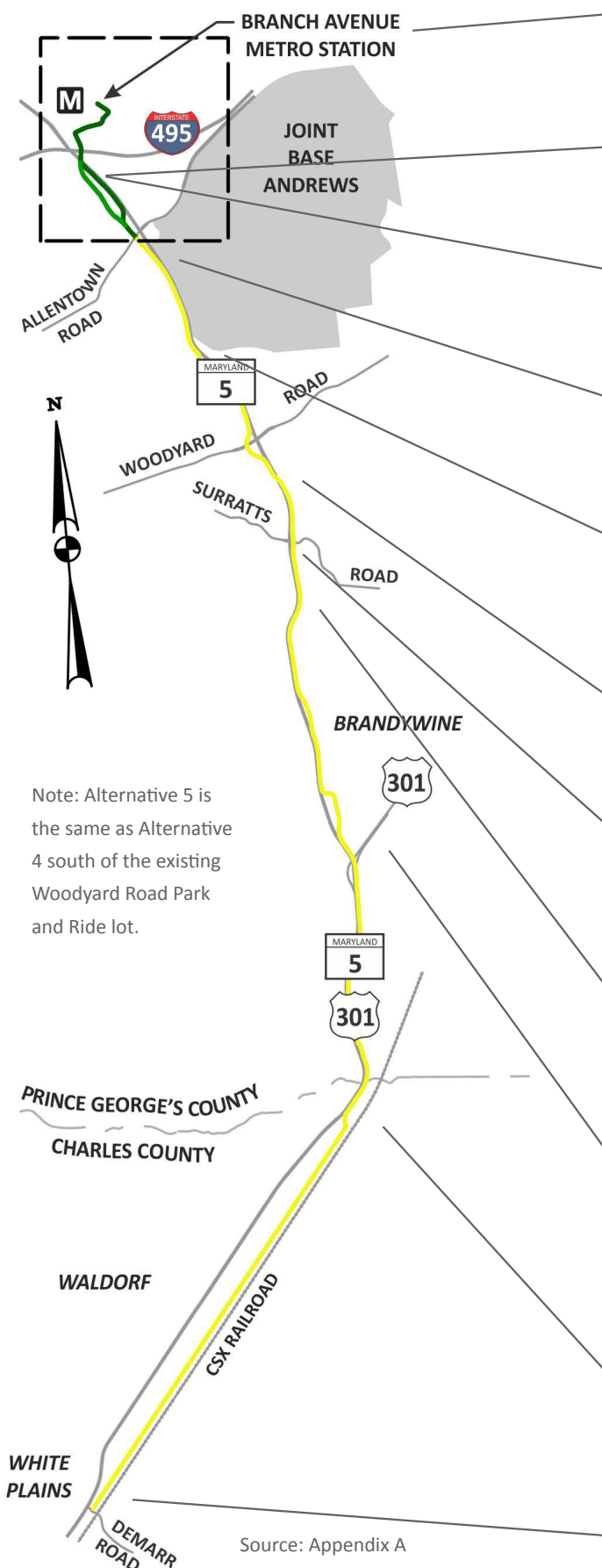
Alternative 4 Description and Key Map



- The northern study limit is located in Prince George's County at the existing Branch Avenue Metrorail Station.
- Beltway Crossing Options 2 through 6 (shown on **Figure 3-5** at the end of this chapter) connect to the Branch Avenue Metrorail Station and are compatible with Alternative 4.
- South of Allentown Road, the Alternative 4 alignment runs along the east side of MD 5 adjacent to the off-ramp for Allentown Road, crossing Old Alexandria Ferry Road and Coventry Way at-grade.
- The alignment is on aerial structure for the crossing of both Malcolm Road and Woodyard Road.
- Alternative 4 remains on the east side of MD 5, adjacent to the on- and off-ramps of the proposed interchanges along MD 5 at Surratts Road and Burch Hill Road.
- The alignment pulls away slightly from MD 5 in the vicinity of the proposed Brandywine Road/MD 5 interchange, to accommodate the proposed Park and Ride lot to be constructed with the interchange. The alignment then continues southerly along the east side of MD 5.
- South of Mattawoman-Beantown Road, Alternative 4 diverges from MD 5/US 301 crossing Substation Road at-grade before turning south running parallel to the CSX rail line.
- The southern study limit is located in Charles County at Demarr Road.

Mainline Alternatives Considered at Study Initiation -

Alternative 5 Description and Key Map



Note: Alternative 5 is the same as Alternative 4 south of the existing Woodyard Road Park and Ride lot.

Source: Appendix A

- The northern study limit is located in Prince George's County at the existing Branch Avenue Metrorail Station.
- Beltway Crossing Option 1 (shown on **Figure 3-5** at the end of this chapter) connects to the Branch Avenue Metrorail Station.
- Alternative 5 can be extended across the Capital Beltway lanes using either Beltway Crossing Option 1 or Option 6 only.
- South of Allentown Road, the Alternative 5 alignment runs along the east side of Old Branch Avenue before returning to the west side of MD 5 near Kirby Road.
- Alternative 5 runs adjacent to the west side of MD 5 before following the on- and off-ramps crossing Coventry Way and Woodyard Road interchanges at-grade.
- South of Woodyard Road, the alignment follows the perimeter of the existing Park and Ride lot before returning adjacent to the west side of MD 5.
- South of the existing Park and Ride lot, the alignment crosses over MD 5 (on aerial structure) returning parallel to the east side of the roadway, prior to Surratts Road.
- Alternative 5 remains on the east side of MD 5, adjacent to the on- and off-ramps of the proposed interchanges along MD 5 at Surratts Road and Burch Hill Road.
- The alignment pulls away slightly from MD 5 in the vicinity of the proposed Brandywine Road/MD 5 interchange, to accommodate the proposed Park and Ride lot to be constructed with the interchange. The alignment then continues southerly along the east side of MD 5.
- South of Mattawoman-Beantown Road, Alternative 5 diverges from MD 5/US 301 crossing Substation Road at-grade before turning south running parallel to the CSX rail line.
- The southern study limit is located in Charles County at Demarr Road.

Localized Options at Study Initiation to Connect Between Mainline Alignment Alternatives

(See Figures A-1 thru A-5 in Appendix A)

Option 1

Crossover from Alternative 1 to Alternative 2 just south of the intersection of Smallwood Drive and Old Washington Road.

Option 2

As an option for Alternative 3, the alignment extends from McKendree Road to the intersection of MD 5/US 301, running adjacent to proposed Spine Road on the west side.

Option 3

Turns off from MD 5/US 301 at Timothy Branch and runs behind the Brandywine Crossing development along Mattapeake Business Drive. Option 3 ties Alternatives 2, 4 and 5 to Alternative 1.

Option 4

Crossover from Alternatives 2, 4 and 5 to Alternative 1 begins near the intersection of MD 5/US 301 and Cedarville Road and follows proposed Spine Road on the east side.

Option 5

Deviates from MD 5 at Malcolm Road, and then follows Old Alexandria Ferry Road until the roadway ties back to MD 5 using the on-ramp. Option 5 provides a variation for Alternatives 1, 2 and 4.

Option 6

Runs adjacent to Old Branch Avenue from the intersection of Trueman Drive to north of Manchester Drive where it ties into Beltway Crossing Option 1.

Option 7

Crossover from Alternative 1 to Alternative 2 from the west side of CSX railroad to the east side of MD 5/US 301 in the vicinity of Substation Road. Option 7 has been incorporated into Alternatives 4 and 5.

Option 8

Crosses over from Old Washington Road to west side of CSX railroad at Substation Road to connect Alternative 2 with Alternative 1.

Option 9

Incorporated into Alternative 5, this option provides an aerial crossing from the east to west side of MD 5, beginning at Foxbranch Court and ending at Jordan Lane.

Beltway Crossing Options

As stated previously, north of Allentown Road, any of the Mainline Alternatives need to be combined with a Beltway Crossing Option to tie into the Branch Avenue Metrorail Station. The six Beltway Crossing Options developed as part of the 2010 Study and presented at the 2014 SMRT Open House are described and illustrated on **Figure 3-5** at the end of this chapter.

Tunnel Evaluation at the Capital Beltway Crossing

An important issue included in the scope of this study has been a more detailed analysis of tunneling under I-95/I-495, as included in several Beltway Crossing Options from the 2010 Study (including the Recommended Option), to provide the northern connection between the Mainline Alternatives and the Branch Avenue Metrorail Station. Beltway Crossing Options 1 and 2, and Mainline Connection Option 6 require tunnels. A summary of the findings of the tunnel options is contained in Chapter 6 of this report, and **Appendix C** contains the entire Tunnel Option Evaluation Report.

Alternatives Dropped after 2014 SMRT Open House

Mainline Alternatives Dropped from Consideration

Alternative 1 – Eliminated from further consideration because it is distant from most of the existing and proposed development along MD 5/US 301 in the Brandywine area. The addition of a new transitway between two schools raised concerns for the safety and security of students. Alternative 1 was estimated to have the largest wetland, forest and forest species habitat impact of the alternatives under consideration.

Alternative 2 - Eliminated from further study because of potential impact to the existing community. Analysis of the County's plan to reconstruct Old Washington Road/ MD 925 as an urban roadway, totaling an 84-foot typical section would likely displace 40% (66 of 163 structures) of the residential and commercial structures along MD 925 in the area from Demarr Road to Leonardtown Road. Additionally, for the overall length of the alignment, Alternative 2 would have the highest number of signalized intersection crossings and historic site impacts.

Alternative 3 - Eliminated because it was inconsistent with Charles County's master planned development and would not serve existing and proposed residential and commercial developments well. The alternative was also projected to have the lowest LRT and BRT average operating speeds

and the highest BRT travel time along the corridor from the Branch Avenue Metrorail Station to the southern terminus at Demarr Road. Environmentally, Alternative 3 was estimated to have the largest floodplain impact of the mainline alternatives.

Beltway Crossing Options Dropped from Consideration

Beltway Crossing Option 4 - Eliminated from further study because of the excessive impact to the existing neighborhoods adjacent to Auth Road, from Allentown Road to Capital Gateway Drive. Analysis shows the proposed LRT/BRT applied typical sections would likely displace approximately 42% (40 of 96 structures) of the residential and commercial structures along the roadway, mostly on the east side. The option would also have the highest amount of acreage impact to county park property and the number of historic sites impacted.

Localized Options Dropped from Consideration

Option 1 - This alignment is a crossover from Alternative 1 to Alternative 2 just south of the Smallwood Drive/MD 925 intersection. With both Alternatives eliminated from further consideration, this option has been removed from additional analysis.

Option 2 - The option provides a variation for Alternative 3 in Prince Georges County on the west side of MD 5/US 301. It has been eliminated because of the affiliation with the Alternative.

Option 3 - This option is a crossover from Alternatives 2, 4 and 5 to Alternative 1 in the Timothy Branch area. Because it is associated with Alternative 1, it was removed from further consideration.

Option 4 - Like Option 3, this alignment is a crossover from Alternatives 2, 4 and 5 to Alternative 1. Similarly, it was eliminated because of its connection with Alternative 1.

Option 8 - Located in the Substation Road area of Charles County, this option provides a connection from Alternative 2 to Alternative 1. It was removed from further study because of its connection with Alternatives 1 and 2.

In summary, the Alternatives, Beltway Crossing Options and Alignment Options that remained in the SMRT Study following the 2014 SMRT Open House consisted of:

- Mainline Alternatives 4 and 5
- Beltway Crossing Options 1, 2, 3, 5 and 6
- Localized Options 5, 6, 7 (in Mainline Alternatives 4 and 5), and 9 (in Mainline Alternative 5)

New Beltway Crossing Options and Localized Options added to the SMRT Study prior to the 2015 SMRT Open House

Beltway Crossing Options Added to Study

Following the 2014 SMRT Open House, the SMRT Project team explored additional Beltway Crossing Options that would not require tunneling under the Capital Beltway:

Beltway Median Options 7 BRT and 7 LRT (w/Suboptions) were developed to maximize the use of existing right-of-way along MD 5 near the beltway, to take advantage of the additional capacity provided by the elimination of a traffic signal at MD 5/Auth Road and partial grade separation provided at the MD 5/Metro Access Road intersection by Phase II of the MDOT/SHA MD 5 Branch Avenue Metro Access Project (currently under construction). These options combine with Mainline Alternative 4, please see **Figure 3-6** at the end of this chapter.

Beltway Crossing Option 8 was developed to minimize the amount of right-of-way acquisition from densely developed parcels in the vicinity of the Capital Beltway. Beltway Crossing Option 8 was recreated as Beltway Crossing Option 8A later in the study, because the transit alignment was shifted to avoid impacting proposed JBA facility expansion plans adjacent to Allentown Road. See **Figure 3-7** at the end of this chapter.

Beltway Crossing Option 9 was an additional aerial crossing of the beltway developed to minimize right-of-way acquisition from improved properties, based on changes to development which occurred subsequent to the 2010 Study. See **Figure 3-7** at the end of this chapter.

Localized Options Added to Study

Hospital Options 1, 2, 3, 4A and 4B were developed as localized options to provide more direct service to MSMHC than that provided by the Mainline Alternative 4/5 alignment, which is directly adjacent to MD 5 and requires transit riders to traverse a steep hill between the hospital and the proposed station location near Surratts Road. See **Figure 3-8** at the end of this chapter.

The JBA Avoidance Option was developed based on the potential concern that no right-of-way would be available adjacent to northbound MD 5 for a transit alignment, particularly if the MDOT/SHA MD 5 Corridor Planning Study selects an alternative that adds a lane to northbound MD 5. See **Figure 3-9** at the end of this chapter.

The JBA Cantilever Option was developed as another option to address the potential concern that no right-of-way would be available adjacent to northbound MD 5 for a transit alignment, particularly if the MDOT/SHA MD 5 Corridor Planning Study selects an alternative that adds a lane to northbound MD 5. See **Figure 3-10** at the end of this chapter.

Options Dropped after the December 4, 2014 Technical Advisory Committee Meeting and January 28, 2015 Ridership Workshop

Localized Options Dropped from Consideration

Hospital Option 4B - MDOT/SHA representatives informed the SMRT Project team that the proposed Surratts Road Interchange Option A, from the MD 5 Corridor Planning Study, had been identified as preferred. SMRT Hospital Option 4B was designed to be compatible with MDOT/SHA Surratts Road Interchange Option B and was dropped from further consideration.

Beltway Crossing Option 6 - Eliminated from further study because of the excessive socioeconomic impacts to the existing neighborhoods adjacent to Suitland Road, as well as high environmental impacts along Suitland Parkway in the vicinity of the Henson Creek Stream Valley Park. Additionally, the length of the alignment would likely create travel time deficiencies as compared to other remaining options. Analysis shows the proposed LRT/BRT applied typical sections would likely displace approximately 92% +/- (49 of 53 structures) of the residential and commercial structures along the east side of Suitland Road. The option would also have the highest amount of acreage impact to National Park Service property.

New Beltway Crossing Options and Localized Options Added to the SMRT Study after the 2015 SMRT Open House

Beltway Crossing Options Added to Study

Beltway Median BRT-only Options 7A, 7B, 7C, 7D and 7F and Beltway Median Option 7E (BRT and LRT) were developed as refinements of Beltway Median Options 7 BRT and 7 LRT. See **Figure 3-11** at the end of this chapter.

Localized Options Added to Study

The Brandywine Crossing Shopping Center Option was developed as an option to provide more direct transit service to the businesses in the shopping center and reduce conflicts with the high traffic commercial entrances off MD 5. See **Figure 3-12** at the end of this chapter.

The Mattawoman-Beantown Option was developed to reduce the number of grade crossing conflicts, allow a better vertical alignment for both the transit and potential interchange ramp designs and reduce the number of commercial property acquisitions near Mattawoman-Beantown Road. See **Figure 3-12** at the end of this chapter.

Beltway Crossing Options and Localized Options Dropped after August 26, 2015 and January 27, 2016 Technical Advisory Committee Meetings

Beltway Crossing Options Dropped from Consideration

Beltway Median BRT-only Options 7, 7A, 7B, 7C - These alignments were eliminated from further consideration because they were similar, but inferior, to Beltway Crossing Option 7D, which was selected for additional study because it is anticipated to have the highest likelihood of success. Options 7, 7A, 7B and 7C would have required major I-495 bridge reconstruction to accommodate dedicated BRT lanes, whereas Option 7D would require minimal, if any reconstruction. Operationally, potential safety issues arose for the MD 5/I-495 interchange ramp movements including weave length deficiencies and collector distributor road usage. Additionally, the options were anticipated to have higher costs and right-of-way impacts and Option 7C was anticipated to have a higher amount of environmental impacts (forest and water resources) compared with Beltway Crossing Option 7D.

Beltway Median LRT-only Option 7 (Tunnel Suboption) - This tunnel alignment was eliminated from further consideration because the existing median width may not be adequate for construction purposes without likely major disruption to MD 5 with the proposed portal occurring in the median just south of Manchester Drive. The option would require total reconstruction of the Manchester Drive overpass.

Additionally, a potential transit station at Camp Springs would not be possible because of the lack of available space for station infrastructure. The LRT At-Grade suboption was previously renamed as Beltway Crossing Option 7E and is proposed to be carried forward for further study for LRT and BRT.

Beltway Crossing Option 8 - The Beltway Crossing Option 8 alignment was shifted north because of the proposed JBA facility expansion plans adjacent to Allentown Road, and renamed Beltway Crossing Option 8A. The original Option 8 alignment would not be compatible with the planned JBA development, which assumed minimal impact to Allentown Road. The revised Beltway Crossing Option 8A alignment was moved approximately 30 feet +/- northward requiring widening of Allentown Road. The proposed Allentown Road reconstruction will generate new property impacts but no apparent displacements are anticipated.

Localized Option Dropped from Consideration

Option 5 - This alignment was created to provide a transit station with a direct connection to JBA. Internal discussions within JBA resulted in the opinion that Option 5 was not preferred, primarily because it was too distant and isolated from any employee traffic generators at the base. Beltway Crossing Option 8A, also with a direct connection to JBA, was chosen as the better option to serve the base. The SMRT Technical Committee agreed with the JBA assessment and the option was eliminated from further consideration.

New Beltway Crossing Option Added to the SMRT Study prior to the 2016 SMRT Open House

Beltway Crossing Option Added to Study

Beltway Crossing Option 8A (renamed), as discussed previously. See **Figure 3-7** at the end of this chapter.

Extended BRT Option Added to Study

For purposes of ridership sensitivity analysis, an option was developed to extend the BRT service out from the MD 5/US 301 corridor to Southern MD Blue Crabs Stadium, St. Charles Towne Mall, Mattawoman-Beantown, South Potomac Church and LaPlata.

The remaining Alternatives, Beltway Crossing Options and Mainline Alternative Connection Options to be presented at the 2017 Online Public Meeting* are as follows:

Mainline Alternatives

Alternative 4
Alternative 5

Beltway Crossing Options

Beltway Crossing Option 1
Beltway Crossing Option 2
Beltway Crossing Option 3
Beltway Crossing Option 5
Beltway Median Options 7D and 7F (BRT)
Beltway Median Option 7E (BRT and LRT)
Beltway Crossing Option 8A
Beltway Crossing Option 9
Option 6

Localized Options

Joint Base Andrews Avoidance Option
Joint Base Andrews Cantilever Option
Hospital Options 1, 2, 3 and 4A
Brandywine Crossing Shopping Center Option
Mattawoman-Beantown Option
Extended BRT Option

*See Figures B-1 through B-13 in Appendix B

ALTERNATIVES SUMMARY: In summary, the SMRT Study took the transit alignment alternatives and options developed as part of the 2010 Southern Maryland Corridor Preservation Study, presented them to the public and other stakeholders, performed more detailed analysis, and eliminated three of the Mainline Alternatives, two of the Beltway Crossing Options and five of the Localized Options. The SMRT Study has then refined the remaining options, developed some additional options at the beltway crossing to address other localized issues. The chronology of this progression of alternatives and options is summarized in **Figure 3-13** at the end of this chapter.

Figure 3-5: Beltway Crossing Options 1 - 6

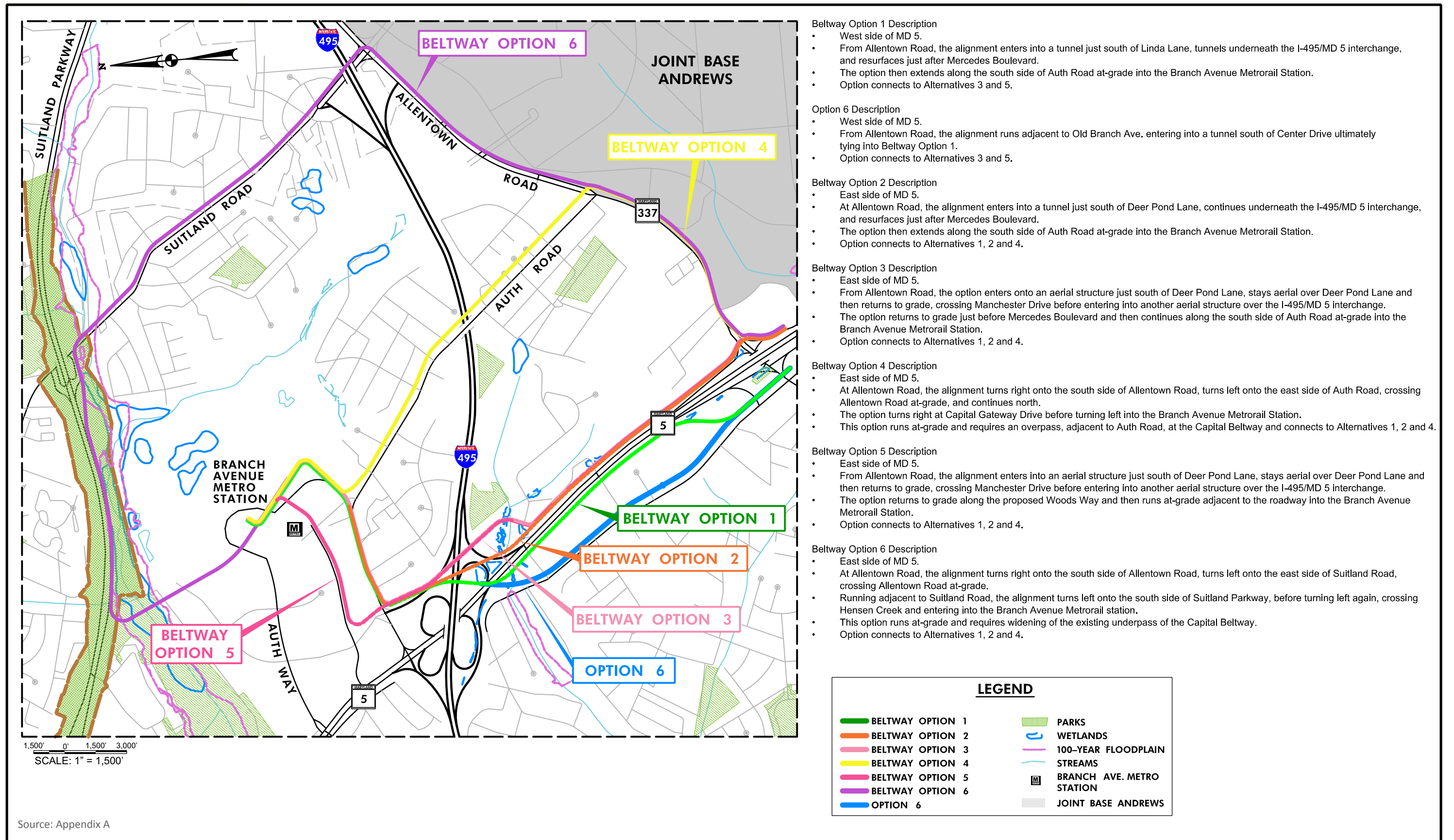


Figure 3-6: Alternative 4 Beltway Crossing Options 7A - F (MD 5 Median)

Beltway Option 7A (BRT) Description

- NB BRT transitions up to Woods Way bridge over the MD 5 NB lanes.
- NB BRT continues in dedicated lane on the south side of Woods Way into the Branch Avenue Metro Station.
- SB BRT from the Metro station runs in mixed-use traffic along the WB Woods Way and SB MD 5.
- SB BRT converges into the 2-lane dedicated BRT south of the I-495 Bridge over MD 5.
- Requires adding new lane on NB MD 5 between the existing bridge pier and abutment.

Beltway Option 7B (BRT) Description

- At the I-495 Bridge, the NB and SB BRT transition from a 2-lane dedicated to a 1-lane reversible BRT lane.
- The dedicated lane transitions up to Woods Way bridge over the MD 5 NB lanes.
- BRT continues in dedicated reversible lane in the median of Woods Way into the Branch Avenue Metro Station.
- Requires adding new lane on SB MD 5 between the existing bridge pier and abutment.

Beltway Option 7C (BRT) Description

- NB BRT transitions up to Woods Way bridge over the MD 5 NB lanes.
- NB BRT continues in dedicated lane on the south side of Woods Way into the Branch Avenue Metro Station.
- SB BRT from the Metro station runs in mixed-use traffic along the WB Woods Way and SB MD 5.
- SB BRT converges into the 2-lane dedicated BRT south of the I-495 Bridge over MD 5.
- Ramp movements from NB MD 5 to EB I-495, WB I-495 and EB Auth Road are directed onto a proposed collector-distributor road that runs between the existing bridge pier and abutment.

Beltway Option 7D (BRT) Description

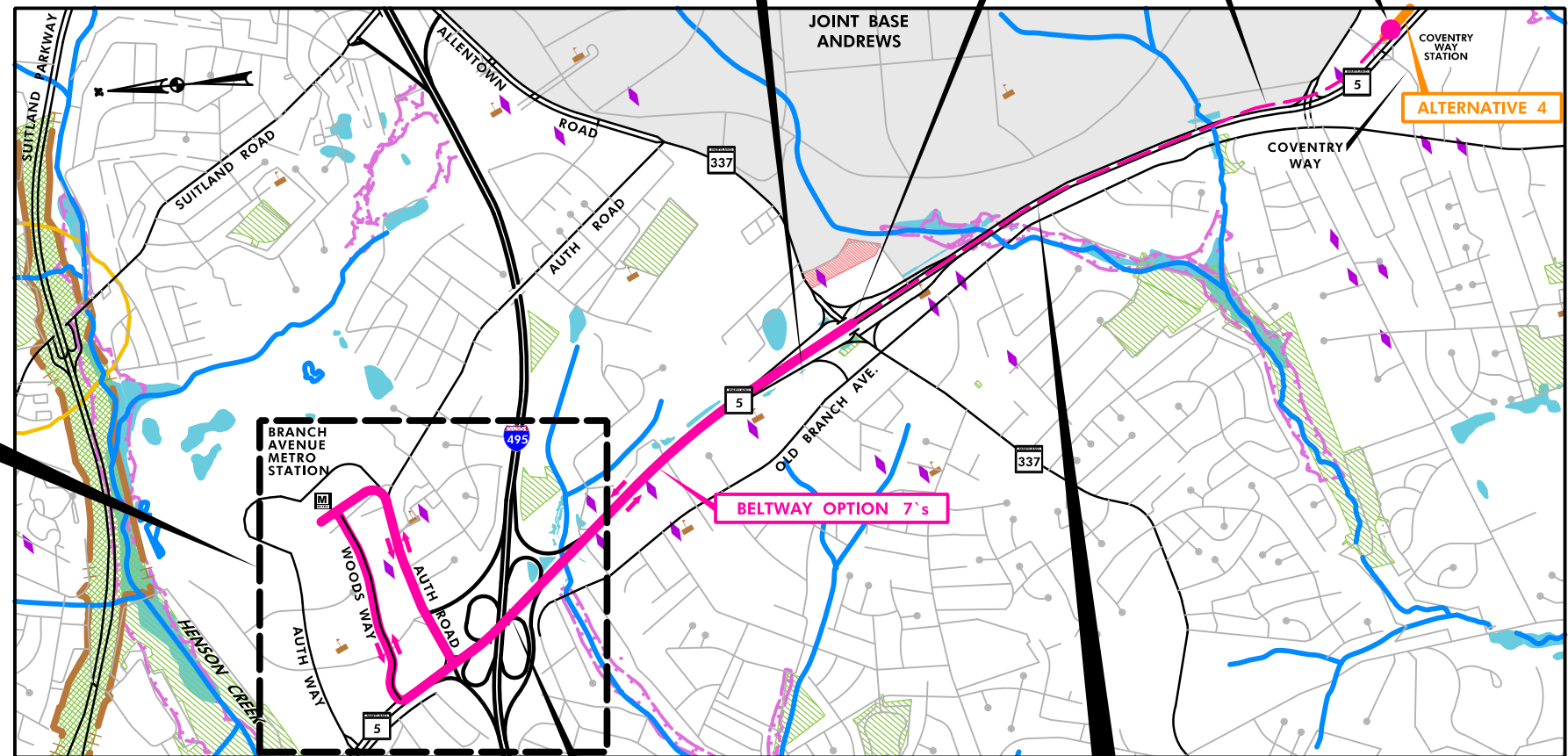
- NB BRT transitions up to Woods Way bridge over the MD 5 NB lanes.
- NB BRT continues in dedicated lane on the south side of Woods Way into the Branch Avenue Metro Station.
- SB BRT from the Metro station runs in mixed-use traffic along the WB Woods Way and SB MD 5.
- SB BRT converges into the 2-lane dedicated BRT south of the I-495 Bridge over MD 5.
- The NB MD 5 to WB I-495 loop ramp is removed for this option with traffic utilizing the existing Auth Road to WB I-495 ramp.

Beltway Option 7E (BRT & LRT) Description

- The alignment stays at-grade in the MD 5 median until crossing over NB MD 5 lanes onto the south side of Auth Road.
- Runs along Auth Road and Capital Gateway Drive at-grade before entering into the Branch Avenue Metro Station.
- Requires total bridge reconstruction of the I-495 Bridge over MD 5.
- Requires bridge lengthening at Manchester Drive and WB I-495 to SB MD 5 Ramp Bridge over MD 5.
- Requires widening of MD 5.

Beltway Option 7F (BRT) Description

- From the I-495 Bridge, the dedicated guideway transitions up to Woods Way bridge over the MD 5 NB lanes.
- BRT continues in dedicated guideway in the median of Woods Way into the Branch Avenue Metro Station.
- The NB MD 5 to WB I-495 loop ramp is removed for this option with traffic utilizing the existing Auth Road to WB I-495 ramp.
- Requires adding new lane on SB MD 5 between the existing bridge pier and abutment.



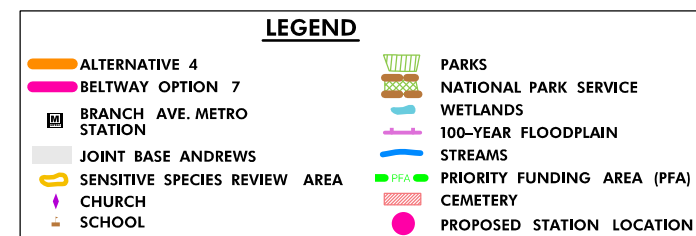
SEE DESCRIPTIONS

- The alignment stays at-grade in the MD 5 median until the I-495 bridge pier.

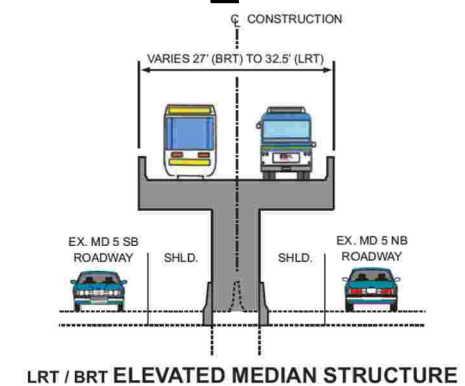
- Runs in the MD 5 median on structure until descending to the MD 5 grade at the Allentown Road overpass.

- 2-lane alignment transitions from Alternative 4 on the east side of MD 5 to median on aerial structure just south of Old Alexandria Ferry Road.

- The proposed Coventry Way Station is on aerial structure.

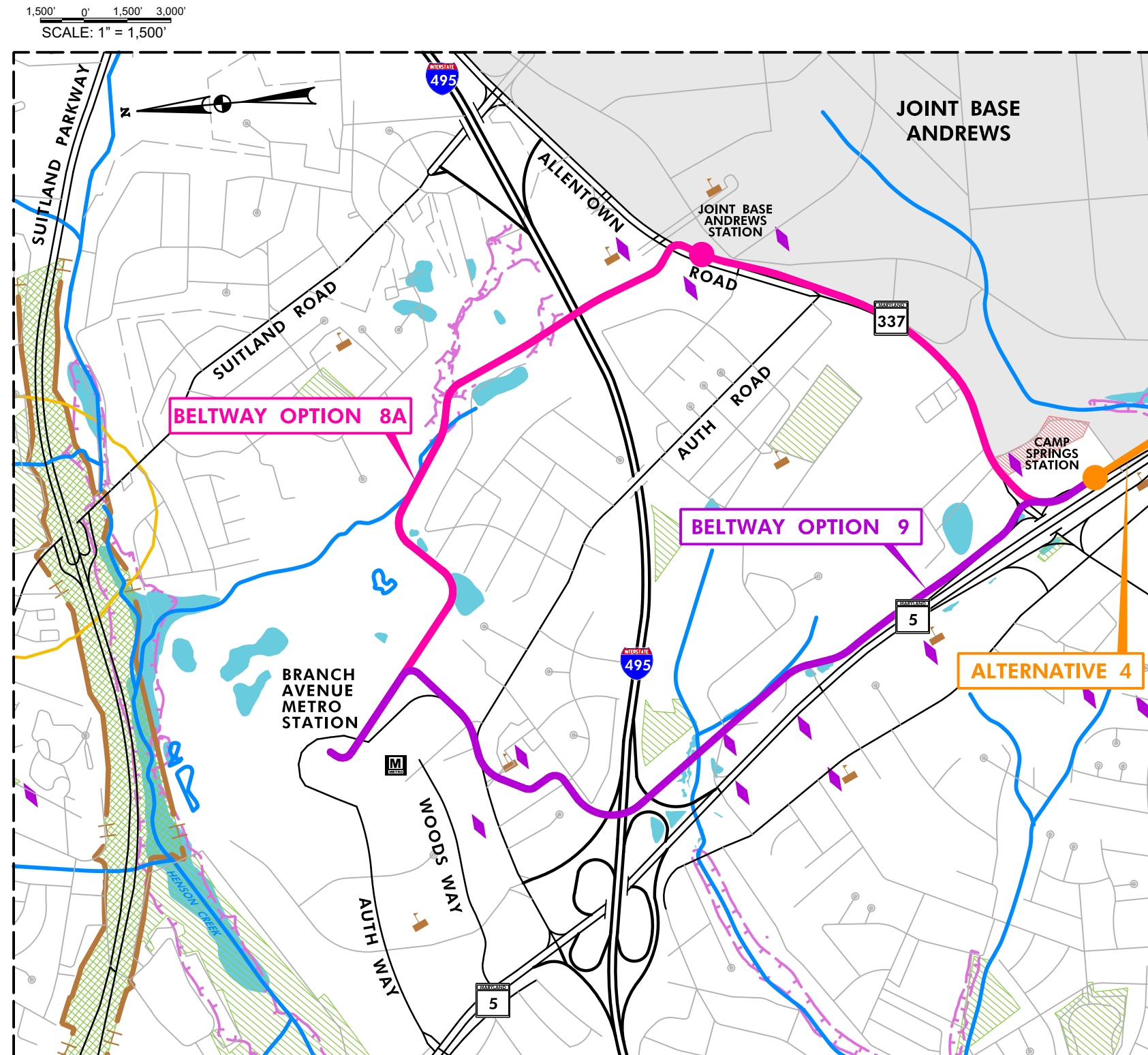


Source: Appendix A



2,400' 0' 2,400' 4,800'
SCALE: 1" = 2,400'

Figure 3-7: Beltway Crossing Options 8A and 9

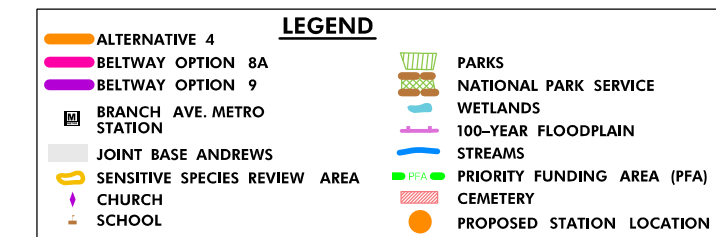


Beltway Option 8A Description

- East side of MD 5.
- Runs along the south side of Allentown Road to serve Joint Base Andrews pedestrian entrances.
- Requires widening of Allentown Road.
- Turns north, crosses Allentown Road at-grade and traverses through an existing parking lot prior to an aerial structure over I-495.
- Continues north through existing environmental area running parallel to Bridgeport Drive and Wesson Drive.
- Crosses the Metro line on aerial structure (LRT only) and Capital Gateway Drive at-grade before tying into the Branch Avenue Metro Station.
- Ties to Alternative 4, Joint Base Andrews Avoidance or Cantilever Options.
- Previously Beltway Option 8.

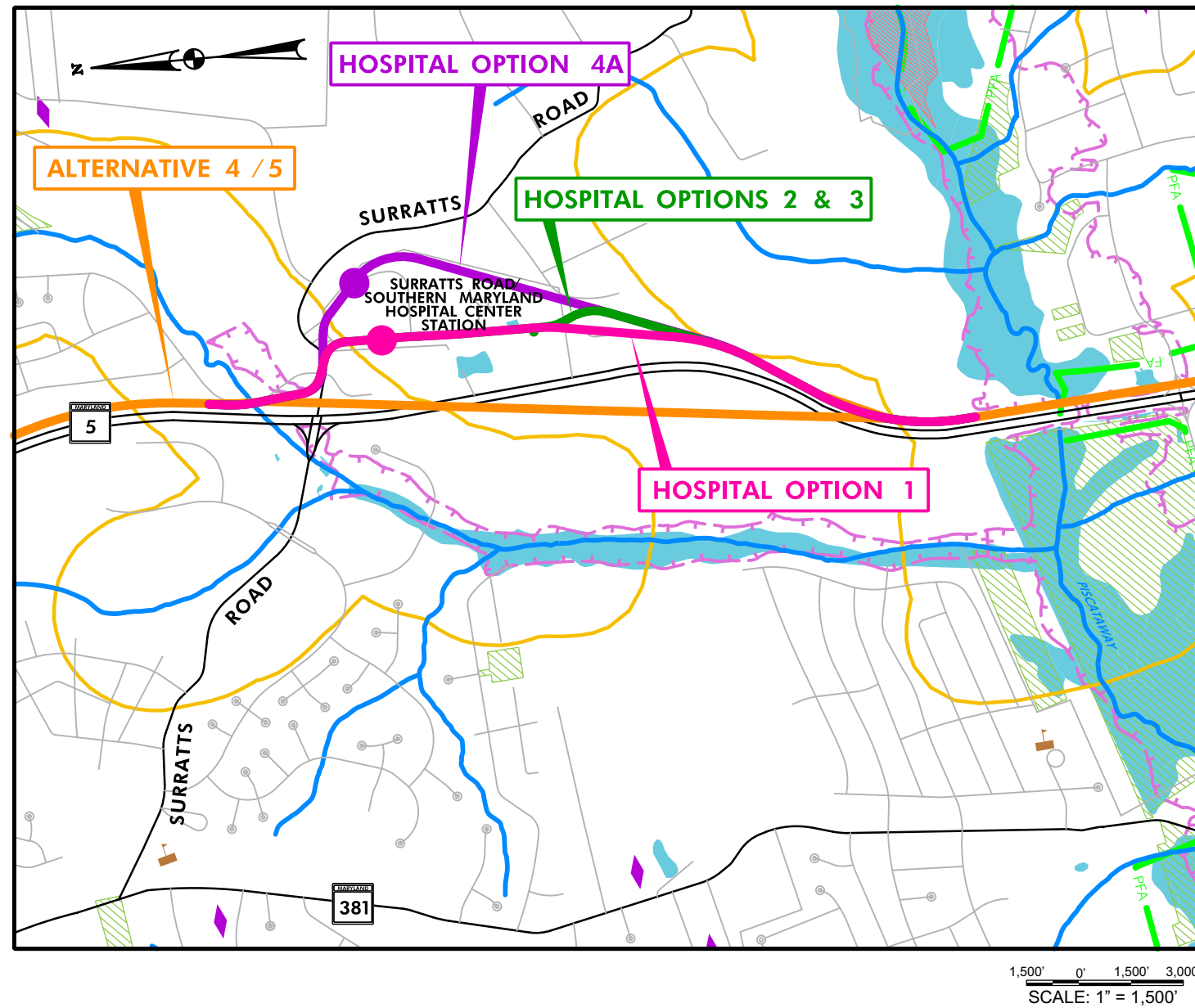
Beltway Option 9 Description

- East side of MD 5.
- From Allentown Road, the alignment diverges from MD 5 south of Deer Pond Lane turning northeast and crossing Deer Pond Lane at-grade.
- The alignment continues along the east side of Deer Pond Lane crossing Manchester Drive at-grade.
- The option transitions over the Capital Beltway on aerial structure.
- Returning to at-grade on the north side of Henderson Way, the alignment turns north, then east along the south side of Auth Road before accessing the Branch Avenue Metro Station.
- Option connects to Alternative 4.



Source: Appendix A

Figure 3-8: Hospital Options



Hospital Option 1 Description

- East side of MD 5.
- Alignment diverges from Alternative 4/5 and enters hospital property south of Surratts Road.
- Ties into privately owned Hospital Drive.
- Integrated LRT/BRT typical section with existing Hospital Drive roadway.
- Runs along westbound side of Surratts Road.
- Assumes SHA-proposed Surratts Road interchange as built.
- North of Surratts Road, the alignment runs between MD 5 and Fox Run Drive and ties into Alternative 4/5.

Hospital Option 2 Description

- East side of MD 5.
- Alignment diverges from Alternative 4/5 and enters hospital property south of Surratts Road.
- Ties into privately owned Hospital Drive.
- Integrated LRT/BRT typical section with existing Hospital Drive roadway.
- Runs along eastbound side of Surratts Road.
- Assumes SHA-proposed Surratts Road interchange as built.
- North of Surratts Road, the alignment runs between MD 5 and Fox Run Drive and ties into Alternative 4/5.

Hospital Option 3 Description

- East side of MD 5.
- Alignment diverges from Alternative 4/5 and enters hospital property south of Surratts Road.
- Runs adjacent to privately owned Hospital Drive.
- LRT/BRT typical section separated from existing Hospital Drive roadway.
- Runs along westbound side of Surratts Road.
- Assumes SHA-proposed Surratts Road interchange as built.
- North of Surratts Road, the alignment runs between MD 5 and Fox Run Drive and ties into Alternative 4/5.

Hospital Option 4A Description

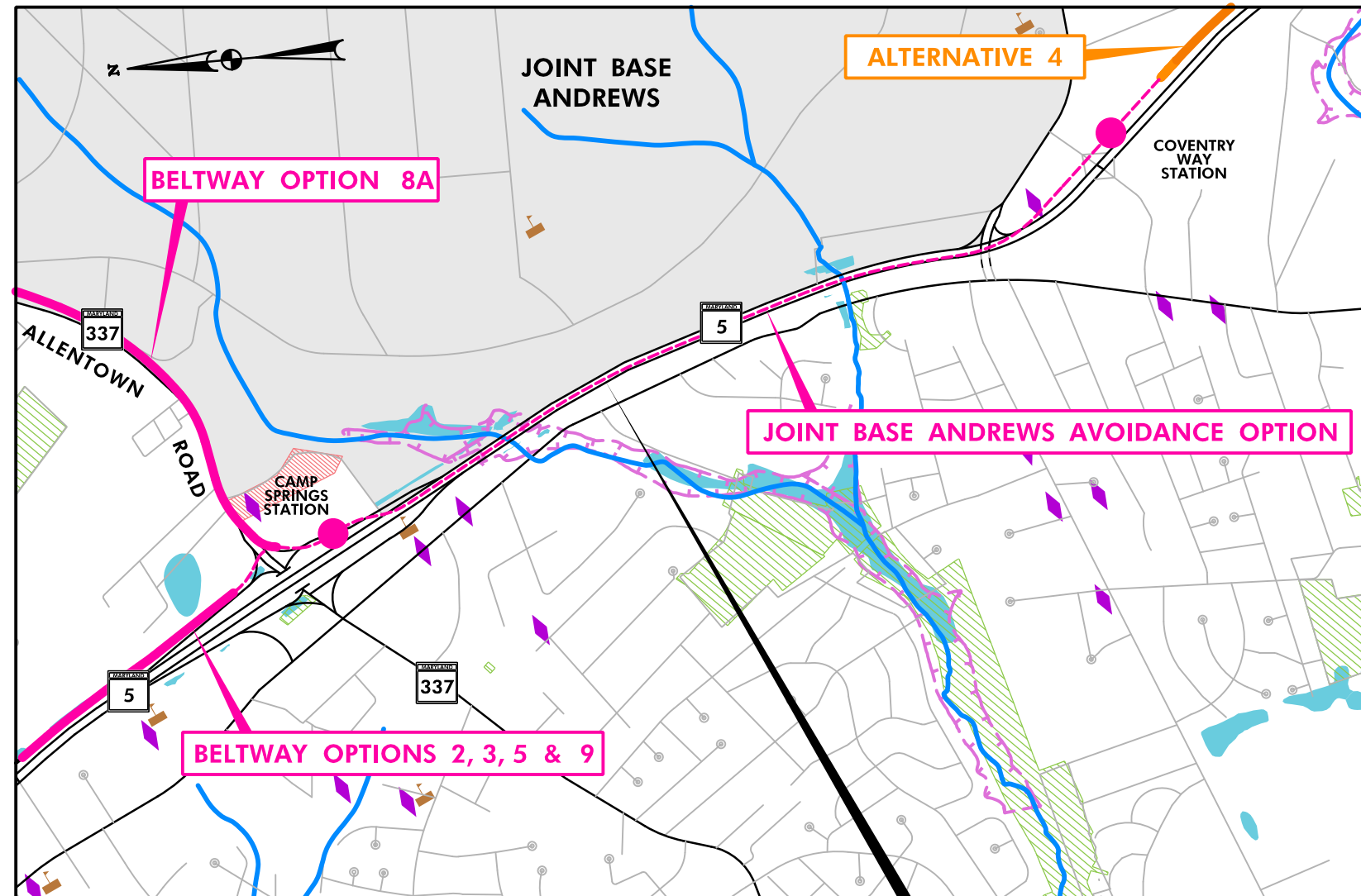
- East side of MD 5.
- Alignment diverges from Alternative 4/5 and enters hospital property south of Surratts Road.
- Runs along eastern perimeter of the property.
- Allows access to the rear of the hospital.
- Assumes SHA-proposed Surratts Road interchange as built.
- North of Surratts Road, the alignment runs between MD 5 and Fox Run Drive and ties into Alternative 4/5.

LEGEND

- | | |
|-------------------------------|-----------------------------|
| ALTERNATIVE 4 / 5 | PARKS |
| HOSPITAL OPTION 1 | NATIONAL PARK SERVICE |
| HOSPITAL OPTION 2 & 3 | WETLANDS |
| HOSPITAL OPTION 4A | 100-YEAR FLOODPLAIN |
| BRANCH AVE. METRO STATION | STREAMS |
| JOINT BASE ANDREWS | PRIORITY FUNDING AREA (PFA) |
| SENSITIVE SPECIES REVIEW AREA | CEMETERY |
| CHURCH | PROPOSED STATION LOCATION |
| SCHOOL | |

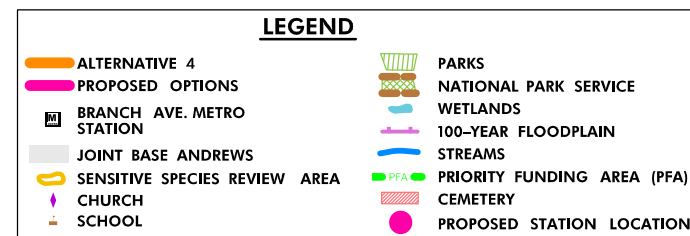
Source: Appendix A

Figure 3-9: Joint Base Andrews Avoidance Option



Joint Base Andrews Avoidance Option Description

- 2-lane LRT/BRT alignment transitions from Alternative 4 on the east side of MD 5 to median on aerial structure just south of Old Alexandria Ferry Road.
- Runs in MD 5 median on aerial structure.
- Transitions from MD 5 median to the east side of MD 5 on aerial structure just south of Allentown Road.
- Avoids impact to Joint Base Andrews.
- Proposed aerial stations at Camp Springs and Coventry Way
- Ties to Alternative 4 and Beltway Options 2, 3, 5, 8A or 9.
- Alignment is aerial over Allentown Road for Beltway Options 2, 3, 5 & 9.



Source: Appendix A

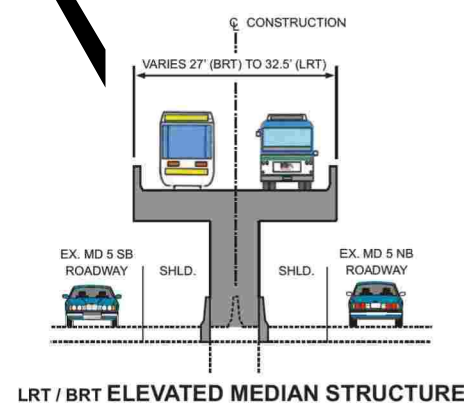
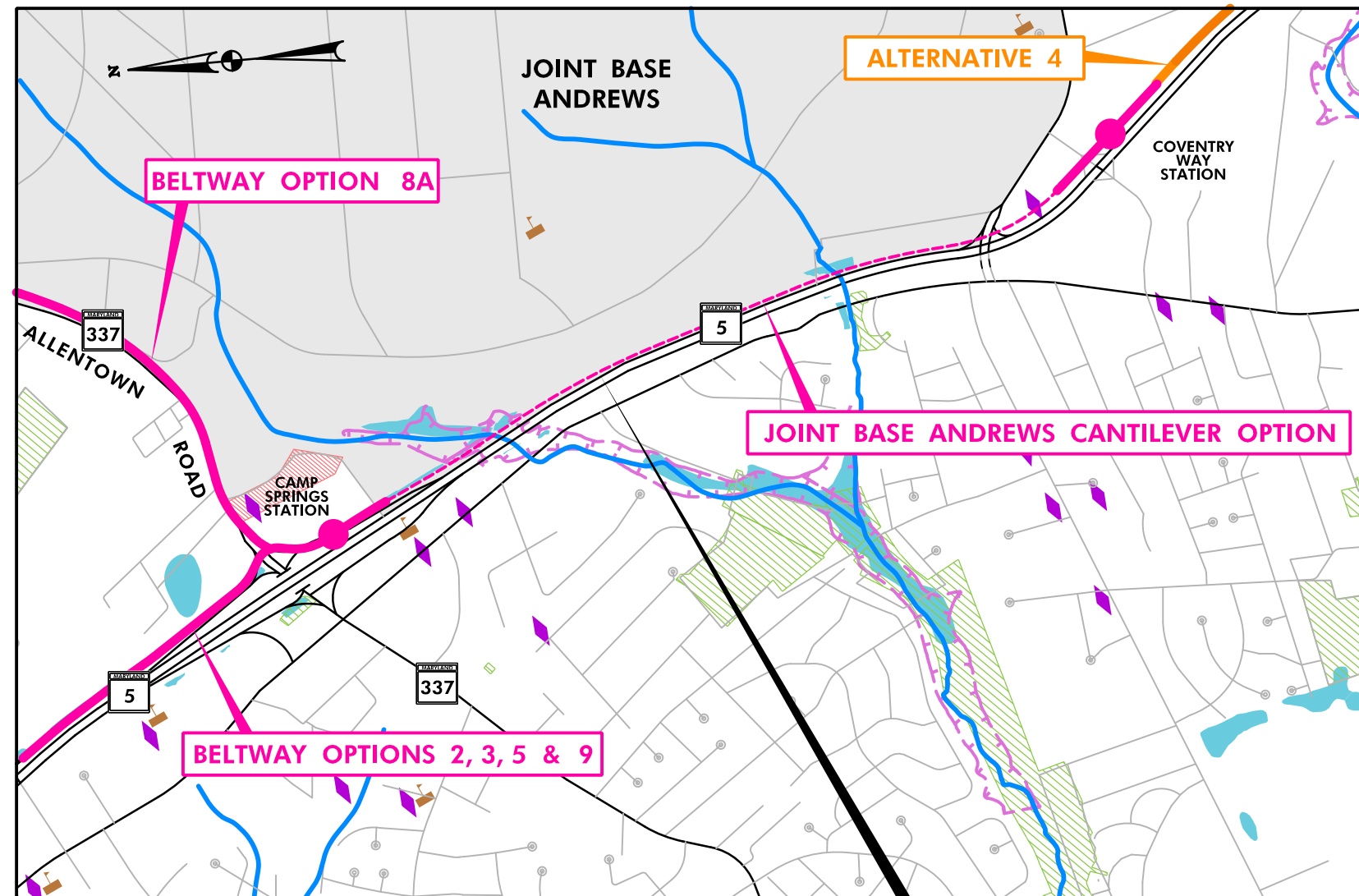
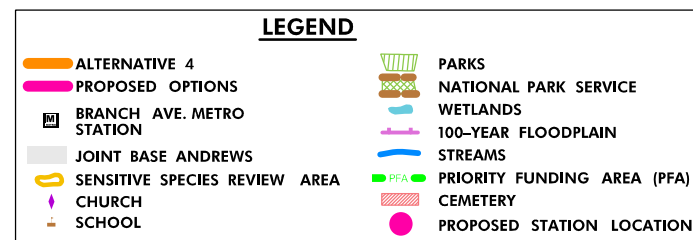


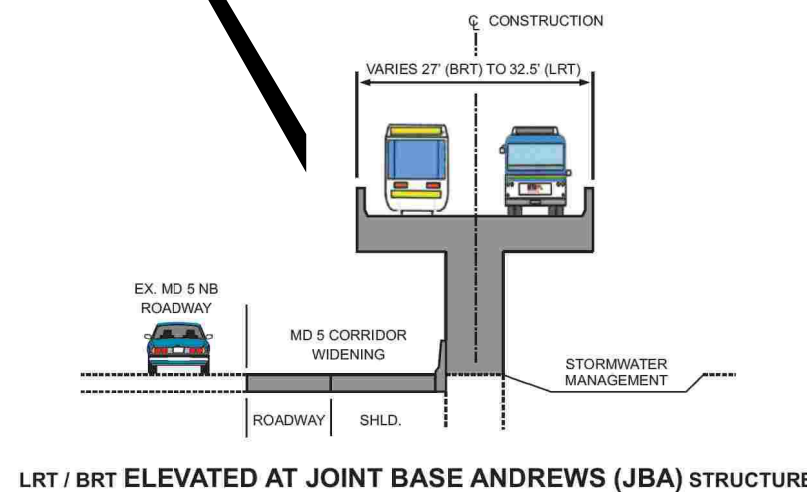
Figure 3-10: Joint Base Andrews Cantilever Option



1,500' 0' 1,500' 3,000'
SCALE: 1" = 1,500'



Source: Appendix A



LRT / BRT ELEVATED AT JOINT BASE ANDREWS (JBA) STRUCTURE

Joint Base Andrews Cantilever Option Description

- East side of MD 5.
- South of Allentown Road, the Cantilever Option runs adjacent to the off-ramp for Allentown Road at-grade before entering onto an aerial structure cantilevering over the northbound MD 5 roadway.
- The option crosses over Old Alexandria Ferry Road on aerial structure before descending and crossing Coventry Way at-grade and tying back into the Alternative 4 alignment.
- Minimal property impact to Joint Base Andrews.
- The proposed Camp Springs Station is at-grade and the option can tie into Beltway Options 2, 3, 5, 8A or 9 and Alternative 4.

Figure 3-11: Alternative 4 Beltway Crossing Option 7 BRT and LRT (MD 5 Median)

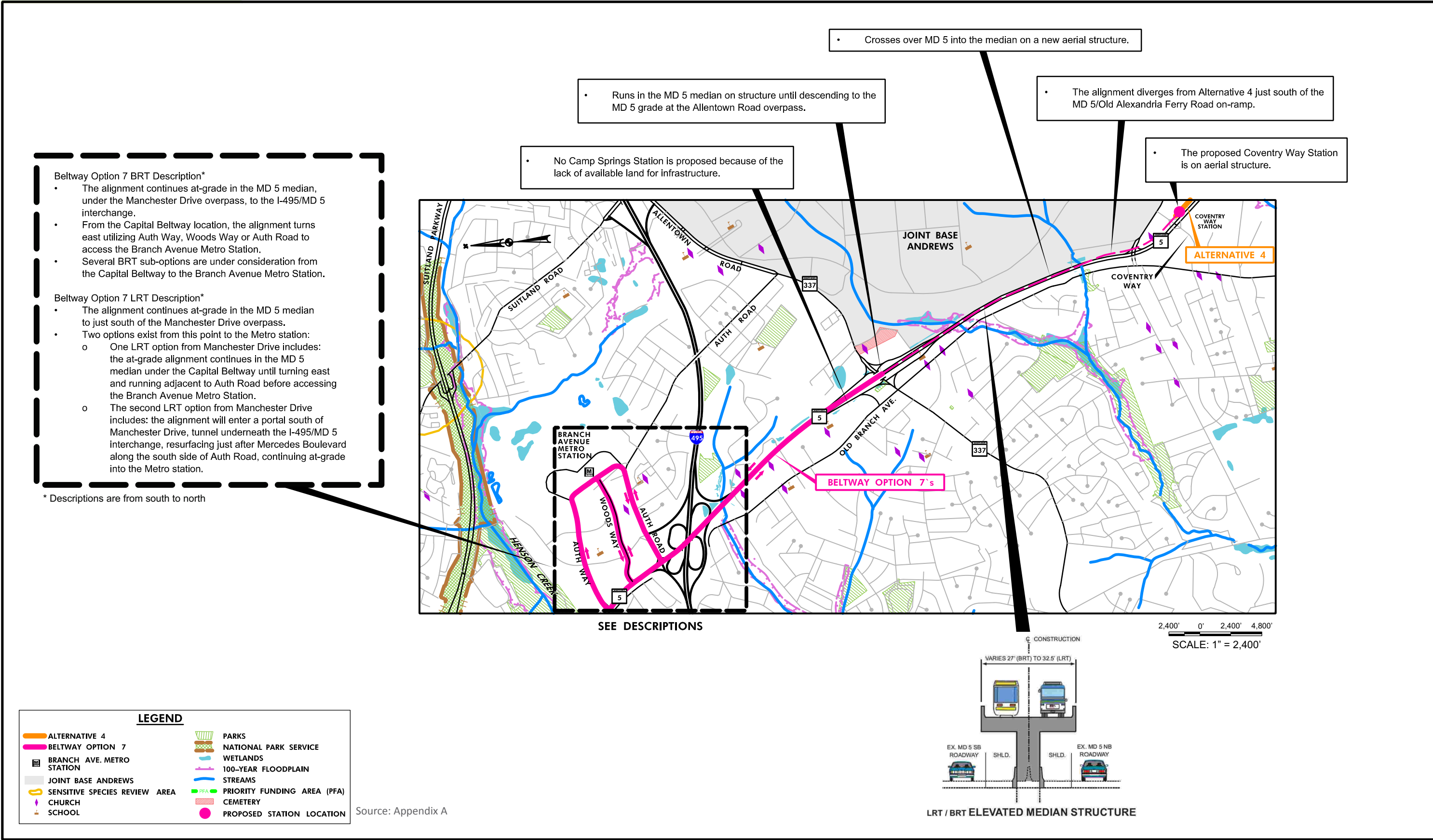
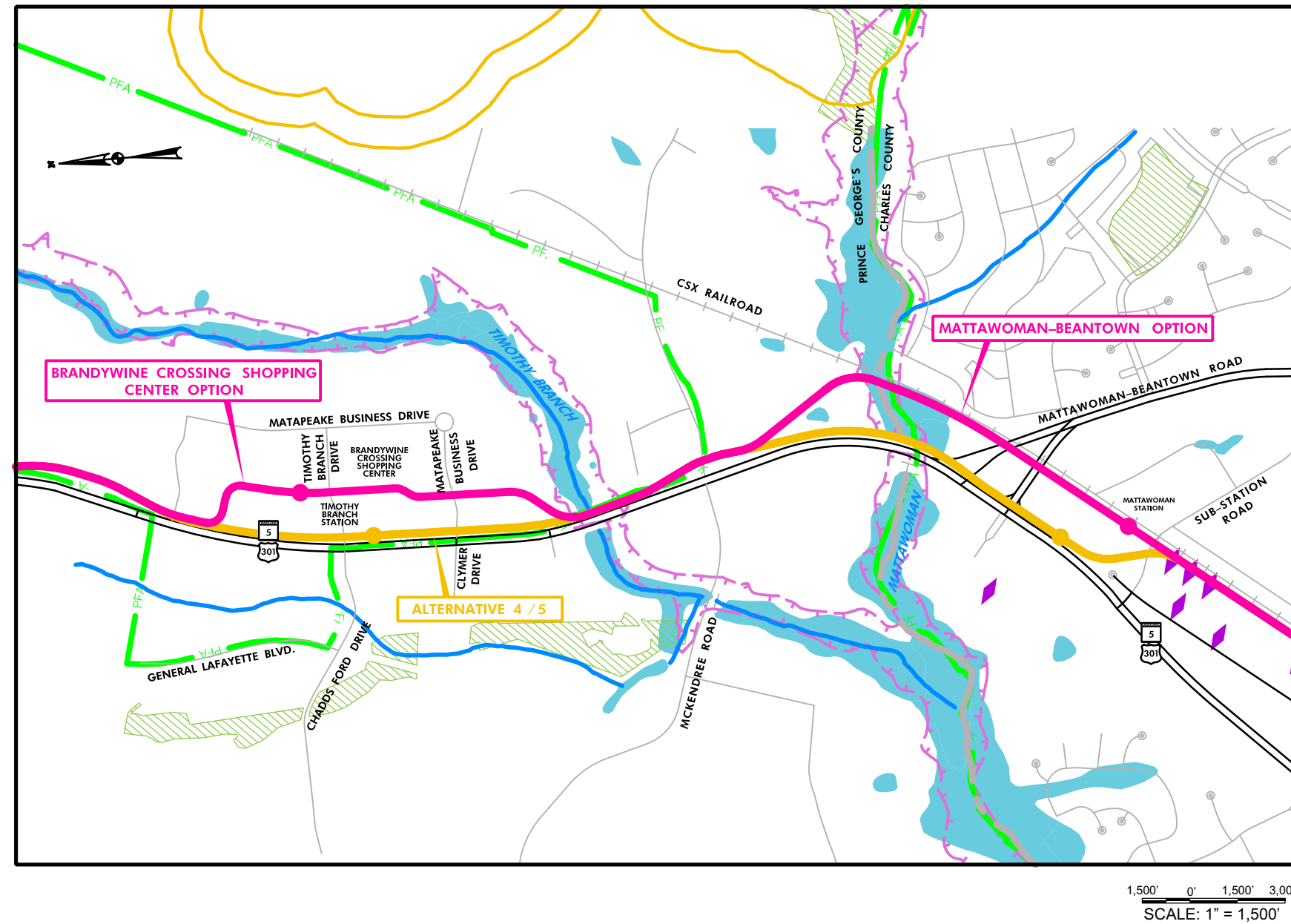


Figure 3-12: Brandywine Crossing Shopping Center and Mattawoman-Beantown Options



Brandywine Crossing Shopping Center Option Description

- East side of MD 5/US 301.
- On the north side of the Brandywine Crossing Shopping Center, the option turns left from the Alternative 4/5 alignment at Carmax, then right at the approximate mid-point of the Shopping Center.
- The alignment continues south bisecting the center, crossing Timothy Branch Drive and Matapeake Business Drive at-grade before turning right upon exiting the complex.
- The option runs southwest before merging into the Alternative 4/5 alignment in the vicinity of the Timothy Branch.

Mattawoman-Beantown Option Description

- East side of MD 5/US 301.
- The alignment diverges from Alternative 4/5 just south of McKendree/ Cedarville Road continuing southward until merging parallel to the CSX rail line.
- The option continues on aerial structure over the Mattawoman Creek, Mattawoman-Beantown Road and Mattawoman Drive before returning to grade just north of Sub Station Road.
- Immediately south of Sub Station Road, the alignment ties back into Alternative 4/5.

LEGEND

- | | |
|-------------------------------|-----------------------------|
| ALTERNATIVE 4 / 5 | PARKS |
| PROPOSED OPTIONS | NATIONAL PARK SERVICE |
| BRANCH AVE. METRO STATION | WETLANDS |
| JOINT BASE ANDREWS | 100-YEAR FLOODPLAIN |
| SENSITIVE SPECIES REVIEW AREA | STREAMS |
| CHURCH | PRIORITY FUNDING AREA (PFA) |
| SCHOOL | CEMETERY |
| | PROPOSED STATION LOCATION |

Source: Appendix A

Key Map for Alternatives and Options

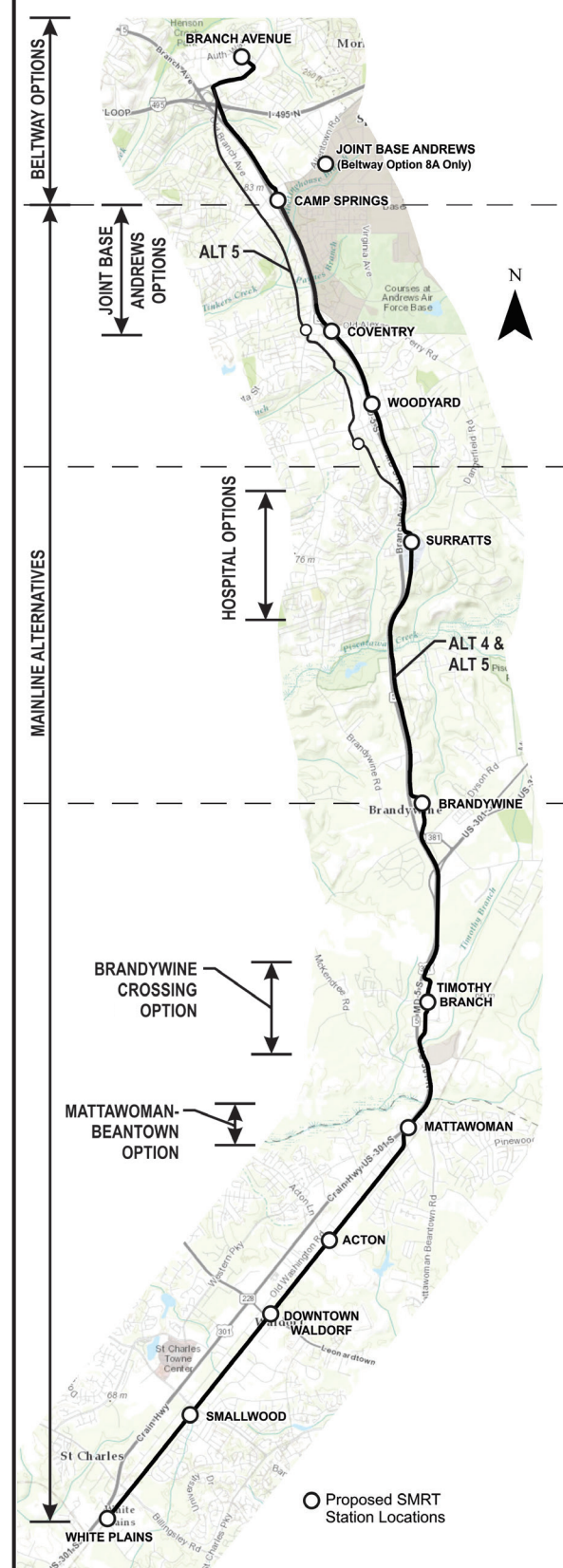


Figure 3-13: Progression of Alignment Alternatives and Options Through the Study

Alternatives and Options Developed in the 2010 Study and Presented at the 2014 SMRT Open House	Alternatives and Options Developed Post-2014 SMRT Open House	Alternatives and Options Presented at the 2015 SMRT Open House	Alternatives and Options Developed Post-2015 SMRT Open House	Alternatives and Options Presented in the Draft Final Report / 2017 SMRT Online Public Meeting	Mapping/Figure References
Mainline Alternatives:					
Alternative 1					Figure A-1
Alternative 2					Figure A-2
Alternative 3					Figure A-3
Alternative 4					Figure A-4
Alternative 5					Figure A-5
Beltway Crossing Options:					
Beltway Crossing Option 1					Figure 3-5
Beltway Crossing Option 2					Figure 3-5
Beltway Crossing Option 3					Figure 3-5
Beltway Crossing Option 4					Figure 3-5
Beltway Crossing Option 5					Figure 3-5
Beltway Crossing Option 6					Figure 3-5
Beltway Median Options 7 BRT & 7 LRT					Figure 3-6
					Figure 3-11
					Figure 3-11
					Figure 3-11
Beltway Crossing Option 8					Figure 3-7
Beltway Crossing Option 9					Figure 3-7
Options to Provide Connections Between Mainline Alternatives*:					
Option 1					Figure A-1 & 2
Option 2					Figure A-3
Option 3					Figure A-1, 2, 4 & 5
Option 4					Figure A-1, 2, 4 & 5
Option 5					Figure A-1, 2 & 4
Option 6					Figure A-3 & 5
Option 7					Figure A-1 & 2
Option 8					Figure A-1 & 2
Option 9					Figure A-5
Other Specific Local Alignment Options					
Hospital Options 1, 2, 3 & 4A					Figure 3-8
Hospital Option 4B					Figure 3-8
Joint Base Andrews Avoidance Option					Figure 3-9
Joint Base Andrews Cantilever Option					Figure 3-10
					Figure 3-12
					Figure 3-12
					none

- Indicates Alignment Alternative or Option Dropped from Further Consideration
- Indicates Alignment Alternative or Option Modified and renamed or merged into another Alternative or Option
- Indicates Alignment Alternative or Option Carried Forward to a Subsequent Stage

* Not shown on key map since options are too localized for the scale of the map (**Figures 3-5 through 3-12**)

** Developed for Ridership Sensitivity Analysis only

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3b. SMRT Corridor Transit Scenarios

Mainline Alternative 4 and 5 alignments require adding a Beltway Crossing Option in order to produce a transit improvement scenario for the entire project length, from Branch Avenue to White Plains. Therefore, potential SMRT Corridor Transit Scenarios were created from combinations of alternatives/options to provide results that could be used to derive ridership, alignment costs and impacts for comparison among multiple full-length SMRT Corridor Transit Scenarios. Many combinations or permutations

are possible, but these SMRT Corridor Transit Scenarios provide the full range of ridership, cost and impact results possible among the scenarios that could be implemented. All full-length SMRT Corridor Transit Scenarios contain the following options: Hospital Option 1, the Brandywine Crossing Shopping Center Option and the Mattawoman-Beantown Option. Chapter 6 compares the ridership, costs and environmental impacts of these scenarios.

Table 3-1: SMRT Corridor Transit Scenarios

SMRT Corridor Transit Scenario	Mainline Alternative Included in SMRT Corridor Transit Scenarios	Beltway Crossing Option and Localized Option (if applicable) Included in Scenario
1	Mainline Alternative 4	Beltway Crossing Option 2 (Tunnel crossing under I-495)
2	Mainline Alternative 4	Beltway Crossing Option 3 (Aerial crossing over I-495)
3	Mainline Alternative 4	Beltway Crossing Option 5 (Aerial crossing over I-495)
4	Mainline Alternative 4	Beltway Crossing Option 7D (MD 5 median crossing under I-495)
5	Mainline Alternative 4	Beltway Crossing Option 7E (MD 5 median crossing under I-495)
6	Mainline Alternative 4	Beltway Crossing Option 8A (Aerial crossing over I-495)
7	Mainline Alternative 4	Beltway Crossing Option 9 (Aerial crossing over I-495)
8	Mainline Alternative 4	JBA Cantilever Option, Beltway Option 9 (Aerial crossing over I-495)
9	Mainline Alternative 4	JBA Avoidance Option, Beltway Option 9 (Aerial crossing over I-495)
10	Mainline Alternative 5	Beltway Crossing Option 1 (Tunnel crossing under I-495)
11	Mainline Alternative 5	Option 6 (Tunnel crossing under I-495)

3d. Transit Service Plans

This section, with associated **Appendix I**, provides an overview of the Transit Service Plans assumed to evaluate the operations of the corridor service SMRT Corridor Transit Scenarios and stations discussed earlier in Chapter 3. A more detailed discussion of the Transit Service Plans is contained in **Appendix I**.

Transit service plans include the service provision policies and standards used to implement and operate the SMRT service within the corridor, including LRT and BRT design and operating principles, and feeder service (commuter, local, and shuttle/circulator) characteristics within the MD 5/US 301 Corridor.

Service Provision Policies

Service provision policies deal with factors most readily apparent to potential riders, and are therefore, in addition to destinations served, the most crucial to attracting a pool of riders for the service.

The policies assumed in this study were derived from MDOT/MTA policy, the assumptions used for the Corridor City Transitway and Purple Line, and consultation/feedback from the SMRT Technical Advisory Working Group. Highlights of the service provision policy assumptions for SMRT are provided in **Table 3-2**.

Service provision standards outline the service that will be provided, and answer the basic questions of what type of service will be provided (service design), how much service will be provided (headways), when will it be provided (span of service), and what will it cost (fares, transfers, and parking).

Table 3-2: SMRT Service Policy Assumptions

Policy Assumptions	Initial
LRT Vehicle	95-foot LRT Vehicle Capacity = 150 passengers per car (66 seats); Total = 300 with a 2-car train Cross platform, multiple door access
BRT Vehicle	60-foot Articulated BRT Vehicle Capacity = 90 passengers per bus (60 seats); Total = 270 with a 3-bus platoon Cross-platform, multiple door access
Span of Service	Weekdays: 4:30 AM to 12 midnight Weekend/Holiday: 6 AM to 7 PM
Transitway Speeds	Maximum: 55 mph for dedicated right-of-way (BRT and LRT) Turn and Grade Design speeds Delay at intersection crossings Plus: acceleration, deceleration, dwell, and turn restrictions for stations Dwell: 20 seconds at stations
Fares	LRT and BRT = MDOT/MTA Commuter Zone Fare (two fare zones) Local Feeder = Free transfer to/from SMRT
Parking Cost	Free at all stations within the Corridor WMATA parking Policy at Branch Avenue
Transit Signal Priority	At all State Road grade crossings (Gates, etc. at county roads)
Headways	Peak Headway: 6 minutes (BRT and LRT) Off-Peak Headway: 15 minutes Night and Weekend Headways: 30 minutes

Source: Sabra, Wang & Associates

3e. Summary and Key Issues

As the SMRT Project advances beyond this stage to more advanced stages of project development (funding dependent), there are numerous key issues that will require additional study, coordination, engineering and documentation in various forms to reach resolution. The following is a list and brief description of those issues identified in the SMRT Study that are anticipated to have the largest effect on decisions, processes and time frames for project advancement. It is important that these issues are captured and remain in the forefront in future stages to minimize unnecessary delays or repeat steps that have been completed. Please see **Figure 3-15** for the general locations of the issues described below.

1. Interface of Transit Services at the Branch Avenue Metrorail Station:

In the area adjacent to the Branch Avenue Metrorail Station WMATA is currently developing the Branch Avenue Metrorail Station Vision Plan. The plan includes mixed-use development, parking structures and surface lots, and open space. Ongoing coordination would need to occur with WMATA to ensure that the necessary right-of-way for the transitway is preserved to provide a good interface with the existing Branch Avenue Metrorail Station. Coordination with WMATA would also require discussions regarding potential capacity issues for the Branch Avenue Metrorail Station.

2. Future One Town Center Development: Located south of Capital Gateway Drive and adjacent to the WMATA Metrorail line, proposed SMRT Beltway Crossing Option 8A accounts for this development in its design based on preliminary plans submitted to M-NCPPC and MDOT/MTA for review on November 20, 2015. MDOT/MTA submitted comments on the preliminary plans to M-NCPPC showing the proposed SMRT Beltway Crossing Option 8A and impacts with the development referenced in the plan. Under current development plans, additional revisions are required in order to accommodate the transit alignment. Additional coordination is required with M-NCPPC, WMATA and the developer for this project if SMRT Beltway Crossing Option 8A is selected for further study.

3. Wesson Drive Environmental Easement Area: An undeveloped resource area which includes woodlands, floodplain, streams and potential wetlands. The SMRT Beltway Crossing Option 8A alignment runs along the east

side of Wesson Drive and Bridgeport Drive continuing south to an aerial crossing of I-95/I-495 (Capital Beltway). Properties impacted include multiple owners (including Prince George's County), and a Washington Suburban Sanitary Commission (WSSC) utility easement exists throughout the length of the option in this area. SMRT Beltway Crossing Option 8A is the only alignment that directly serves JBA.

A field visit occurred on June 9, 2016 with the Maryland Department of the Environment (MDE), and there are no "fatal flaws" or "red flags" with this alignment (see **Appendix L**). The impacts to resources can be described as "minimal wetland impacts." Potential avoidance/minimization mitigation measures could include smaller projects such as tree plantings or larger projects such as stream restoration on site, bridging wetlands/floodplain or shifts in the transitway alignment. Further coordination is required with all resource agencies if the option is selected for additional study.

4. WSSC Alignment B Water Main: WSSC has initiated 30% design plans for "Alignment B", a 450A High Zone Redundancy Water Main Project, which potentially conflicts with several SMRT Beltway Crossing Option alignments in the MD 5/Allentown Road area, particularly Beltway Crossing Options 8A and 9. MDOT/MTA has submitted plans to WSSC that show the potential SMRT alignments, with proposed limits of disturbance. Further coordination is required with WSSC as both projects move forward.

5. MD 5/Metrorail Access Project: MDOT/SHA is currently constructing a new roadway, named Woods Way, as well as improvements to MD 5 north of the Capital Beltway, Auth Road and Auth Way. The SMRT design assumes the roadway enhancements are in place and many of the SMRT Beltway Crossing Options interact with the improvements.

6. Beltway Crossing Options at the Capital Beltway (I-495/I-95): Several options are being considered in the SMRT Study crossing the Capital Beltway (I-495/I-95) to connect the transitway with the Branch Avenue Metrorail Station. Three types of crossings are proposed including use of tunnels underneath I-495, aerial structures over I-495 or an at-grade option that utilizes the existing

MD 5 median under the Capital Beltway. The tunnel option (Beltway Crossing Option 2) was recommended in the 2010 Southern Maryland Corridor Preservation Study in an attempt to minimize or avoid environmental and community impacts; however, options developed as part of this SMRT pre-NEPA Study have been found to be more cost effective with comparable impacts. Currently, MDOT/SHA is studying CSIS (Candidate Safety Improvements Section) improvements at the Capital Beltway/MD 5 interchange and a long-term improvement may include reconstruction of the bridge over MD 5. Continuation of the ongoing discussions with MDOT/SHA is encouraged.

7. Auth Road/Old Soper Road/Capital Gateway Drive Roundabout: Several options with the current design of the transitway require crossing the southeast leg of the existing roundabout. Pending results of a traffic study, the roundabout would likely need to be removed and a traffic signal installed to safely accommodate the transit alignment.

Preliminary analysis indicates that a traffic signal can process a higher number of vehicles and pedestrians in a more orderly and efficient manner than a roundabout. Further study and coordination with various agencies is required if the alignment options at this location are selected for further study.

8. Future Allentown Andrews Gateway Development: Located in the northeast quadrant of the Allentown Road/MD 5 interchange, proposed SMRT Beltway Crossing Options 2, 3, 5, 9 or JBA Avoidance consider this development in the designs. The development plans were submitted to M-NCPPC and MDOT/MTA for review on March 1, 2016 and resubmitted on June 15, 2016 after MDOT/MTA submitted a SMRT alignment display to M-NCPPC showing the proposed SMRT Beltway Crossing Options and impacts with the development referenced into the plan (see **Appendix L**). Further SMRT alignment refinements are possible and coordination is required with M-NCPPC and the developer for this project, depending upon the SMRT Beltway Crossing Options selected for additional study.

9. Provision of Transit Service to JBA: Design of the transitway currently assumes three potential stations that can provide service to JBA. Two stations, Camp Springs and Coventry Way, provide indirect access and would require additional assistance from JBA to provide

internal shuttles connecting SMRT transit riders to their destinations within the gate. A proposed third station, affiliated with Beltway Crossing Option 8A along Allentown Road, proposes a direct access station in the vicinity of the main gate and employment destinations.

Several meetings have occurred with JBA representatives and JBA provided a position paper to MDOT/MTA on September 22, 2015 (see **Appendix L**) stating their preference for the JBA Avoidance Option with Beltway Crossing Option 8A and construction of a new pedestrian gate at the station location.

As design of the SMRT Project progresses, additional coordination would be required with JBA and Prince George's County on how best to provide service to the base and the surrounding communities, as well as any needed changes to the alignment to avoid or minimize impacts to the base community.

10. Potential MD 5/JBA Property Impacts: The JBA property line (fence line) and privatized housing (managed by a private entity) are located adjacent to northbound MD 5. The SMRT Mainline Alternative 4 limit of disturbance encroaches upon the fence line and in some locations requires removal and relocation. No residential displacements are anticipated for the alternative.

Working with JBA representatives, several minimization and avoidance alignment and typical section options have been considered as a substitute for Alternative 4 (see **Appendix L**). The options include: JBA Cantilever Option, which proposes a cantilevered aerial structure over the northbound MD 5 shoulder, and a JBA Avoidance Option, which proposes an aerial structure in the MD 5 median. The JBA Avoidance Option requires the transit stations at Camp Springs and Coventry Way to be aerial, which is more costly and difficult to access. Aerial stations are not required for Alternative 4 or the JBA Cantilever Option.

The JBA position paper, mentioned previously, prefers the JBA Avoidance Option (with Beltway Crossing Option 8A) because it is most compatible with its security requirements and would not encroach upon the fence line or private housing. Further engagement with JBA is essential as the project moves forward.

11. Limited Available Right-of-Way for the Transitway North of Woodyard Road (MD 223): Approximately ½ mile south of Woodyard Road (MD 223), the existing state-owned right-of-way drops from 300 feet to 200 feet. The large majority of this 200-foot right-of-way is currently used by the existing MD 5, and any proposed widening to MD 5, as is being considered in the MD 5 Corridor Transportation Study, would utilize any remaining state-owned right-of-way. Therefore, north of Woodyard Road (MD 223), it is expected that the transitway would have substantial property impacts as the land adjacent to MD 5 is already built-out.

12. Woodyard Road (MD 223) Corridor Planning Study: A Corridor Planning Study to investigate improvements to MD 223 from MD 4 to Steed Road has been completed. The study considered transit, bicycle and pedestrian improvements along the roadway. Coordination with MDOT/SHA is required as the project moves into the next round of design.

13. Upgrades to MD 5/US 301: Future design of the transitway would require ongoing coordination with MDOT/SHA regarding the proposed improvements to US 301 and MD 5. Several MDOT/SHA studies are ongoing and include: 1) a Corridor Study considering additional lanes on the outside and in the MD 5 median from Auth Road to the MD 5/US 301 interchange at T.B., 2) a grade-separated interchange and a Park and Ride lot at Brandywine Road (MD 373/MD 381) and 3) a Feasibility Study recommending safety improvements along existing US 301 through Waldorf from north of the MD 5/US 301 interchange at T.B. to Turkey Hill Road.

The alignment for all SMRT alternatives assumes the MD 5/US 301 upgrades are in place and the proposed transitway would go around all interchanges. If any of these proposed improvements are not implemented, additional design is required to determine the cost-benefit of shifting the alignment closer to the mainline.

14. MD 5/Surratts Road Intersection: Design of the transitway at the Surratts Road intersection requires continued coordination with MDOT/SHA. The MDOT/SHA currently has selected interchange Option A, providing a grade separation (Surratts Road over MD 5) and a diamond interchange. In the short term, MDOT/SHA has initiated a safety study at the intersection, to consider small scale improvements.

The current SMRT alignment has accounted for the proposed northbound interchange ramps but has several options that interact with the MSMHC. Additionally, a Practical Design review is being undertaken at this location.

15. Future MSMHC Development: The SMRT Study has developed four options that align adjacent to, and provide direct transit service to, the hospital. Three options provide an alignment along Hospital Drive and one option, at the request of the hospital, runs along the eastern property line in the rear of the complex.

Two coordination meetings occurred with hospital representatives, October 9, 2014 and November 15, 2015 (see **Appendix L**). At the 2014 meeting, the hospital provided the SMRT Project team their future development plans. However, at the 2015 meeting representatives stated that the plans were being revised and a new submittal date was unknown. Currently, hospital officials are not in favor of the SMRT alignment or station on their property as it could prohibit future hospital growth and possibly restrict emergency access. The hospital site is a major employment center in the corridor and medical facilities frequently request transit accessibility as patronage grows.

16. Interchange at the MD 5/US 301 Split: Design of the transitway at the T.B. interchange requires continued coordination with MDOT/SHA. The MDOT/SHA currently has several design concepts for this interchange as part of the US 301 Planning Study. In addition to coordinating with MDOT/SHA, there are historic properties in the vicinity and the area has a high water table. The current SMRT Study proposes a vertical realignment of the northbound US 301 ramp to allow the ramp to bridge over the transitway.

17. Brandywine Crossing Shopping Center: The SMRT Project team developed two at-grade alignments in the vicinity of the Brandywine Crossing Shopping Center. The original alignment remained adjacent to MD 5 but presented major traffic and at-grade crossing issues because of its proximity to the roadway. A second option was analyzed that would move the alignment into the shopping center bisecting the parking lots and supporting a potential TOD concept.

A SMRT stakeholder meeting took place with the

shopping center property manager on November 16, 2015, who was open to considering the alignment through the parking lots (see **Appendix L**). However, some of the businesses have separate owners and a meeting with them has not taken place.

18. Mattawoman-Beantown Road Area: MDOT/SHA currently has several design concepts for this location including outside and median overpasses and at-grade crossings. MDOT/SHA has also initiated a Practical Design study at the intersection.

The SMRT Project team has considered two options at this location. The Alternative 4/5 alignment remains adjacent to US 301 utilizing the MDOT/SHA Flyover Option as the basis for the design. The Alternative 4/5 alignment requires a traffic signal for the westbound MD 5 to northbound MD 5/US 301 traffic. The Mattawoman-Beantown Option runs adjacent to the existing CSX rail line and proposes an aerial structure over Mattawoman Creek, Mattawoman-Beantown Road and Mattawoman Drive eliminating the need for a new signal.

Additionally, the Charles County Commissioners are considering modifications to the Western Parkway Alignment which may affect the SMRT alignment in this area. Further coordination will be necessary (see **Appendix L**).

19. US 301 at MD 228/MD 5 Business: MDOT/SHA is conducting a Planning Study to investigate improvements at the US 301 at MD 228/MD 5 Business intersection. Additionally, MDOT/SHA has commissioned a CSIS project on MD 5 Business from MD 925 to Ell Lane. Continued coordination with MDOT/SHA is required as their project progresses.

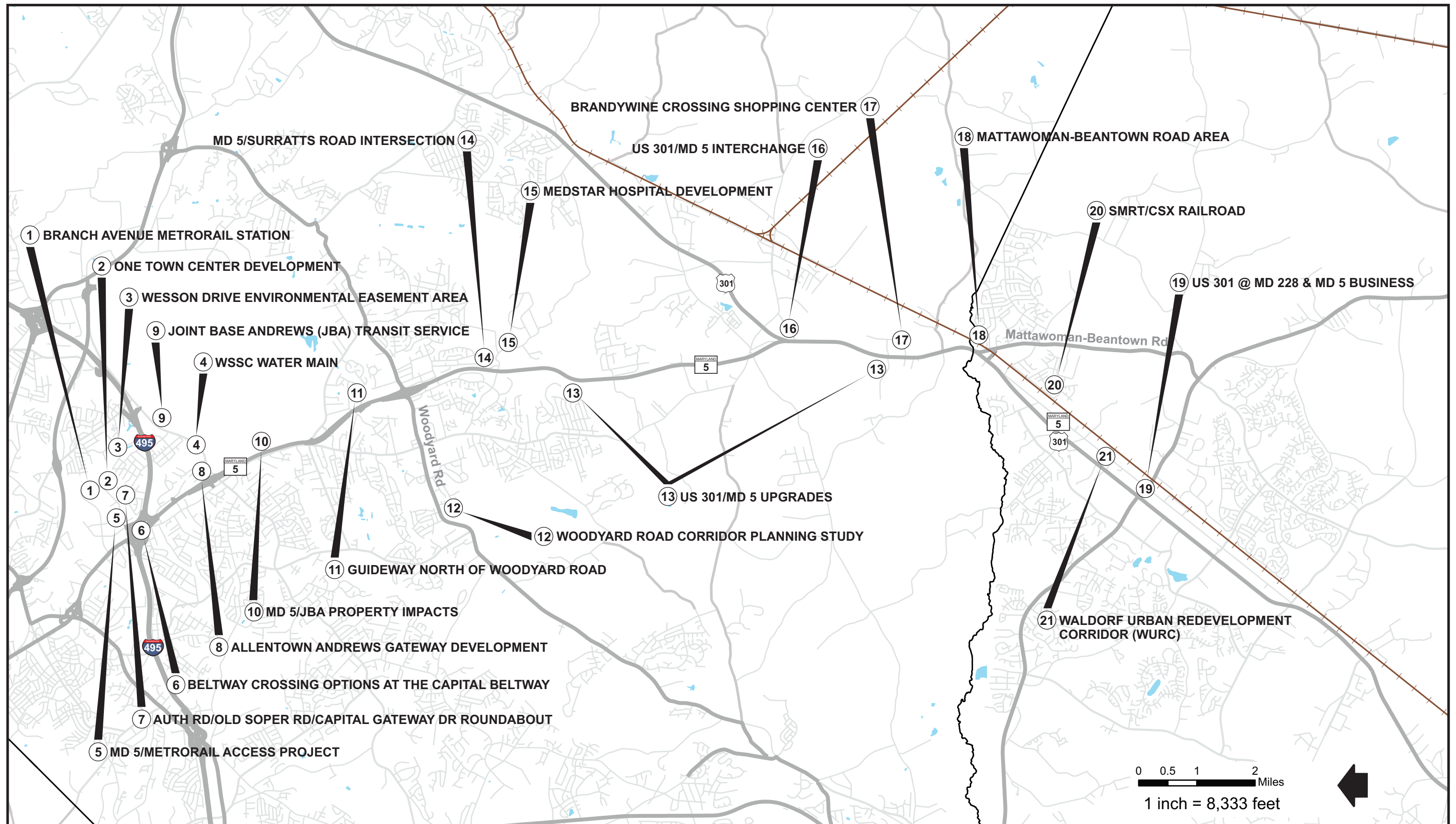
20. Alignment Adjacent to the CSX Railroad - Pope's Creek Branch: Design of the transitway adjacent to the CSX Railroad requires coordination with CSX to minimize impacts, as well as to determine requirements such as offsets from the existing railroad, crashwall design standards, and pedestrian access to the proposed transit stations, etc.

21. Waldorf Urban Redevelopment Corridor (WURC): To support anticipated growth in population and households, Charles County designated Waldorf as a Regional Activity Center and created a Redevelopment District that includes the Acton and Waldorf areas. The WURC Phase 1 and 2 Development Plans for Waldorf Center propose high-density TOD and detail a series of station locations that have been adopted into the SMRT Study.

Five future stations are proposed, two within the WURC, adjacent to the Phase 1 development site located north of the intersection of Leonardtown Road (MD Business 5) and Old Washington Road (MD 925) and at Acton Lane. The other three stations, within the 6-mile Transit Development Corridor, include Mattawoman, Smallwood Road and White Plains (from north to south). As development of Phase 1 of the WURC moves forward, coordination will be ongoing with developers of the various parcels around the stations regarding parking, station area grading and pedestrian access.

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Figure 3-15: SMRT Key Issues



Source: The Wilson T. Ballard Company/Sabra, Wang & Associates, JV

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4. TRANSIT, MULTI-MODAL TRANSPORTATION, TRAFFIC OPERATIONS AND IMPACTS

4.a. Ridership

This section provides an overview of the results of ridership forecasting that was performed on the SMRT alternatives and options that remain under consideration. A more detailed discussion of the ridership forecasting methodology and results are provided in **Appendix F**.

Transit Ridership Forecasting Model

To carry out the ridership forecasting for the SMRT Study, a travel forecasting model was developed based upon the Regional MCOG travel forecasting process.

The ridership forecasting model developed for SMRT was derived from a post-processing model recently created for WMATA which uses the land use data, trip generation, trip distribution, and highway travel times from the parent MCOG process. It allows new transit improvement combinations to be input, calculates the transit ridership and mode split shifts that result, and carries out transit assignment.

For the SMRT forecasting, highway travel times were provided by the MDOT/SHA based on the MD 5 Corridor Planning Study. The SMRT ridership model was validated to transit 2014/2015 ridership in the SMRT Project corridor.

What highway improvements were assumed to be in place for the SMRT Study?

The SMRT transit ridership forecast model was developed under two conditions:

1. No widening of MD 5 / US 301
(the highest possible transit ridership)
2. One additional lane in each direction from I-495 to the US 301 split
(the lowest possible ridership)

The SMRT engineering / alignment studies assumed an additional lane in each direction from I-495 to the US 301 split, to ensure that the SMRT Project would not preclude future highway widening.

Tested Ridership Forecasting Model Run Scenarios

As stated in Chapter 3, the basic SMRT Mainline Alternatives do not, by themselves, define a complete transit connection all the way from White Plains to the Branch Avenue Metrorail Station. Mainline Alternatives need to be combined with a Beltway Crossing Option and a highway Build/No-Build choice to provide a Ridership Forecasting Model Run Scenario. Other localized options, such as “Hospital” options can also be combined to provide additional Ridership Forecasting Model Run Scenarios (also referred to herein as Ridership Scenarios or “Runs”).

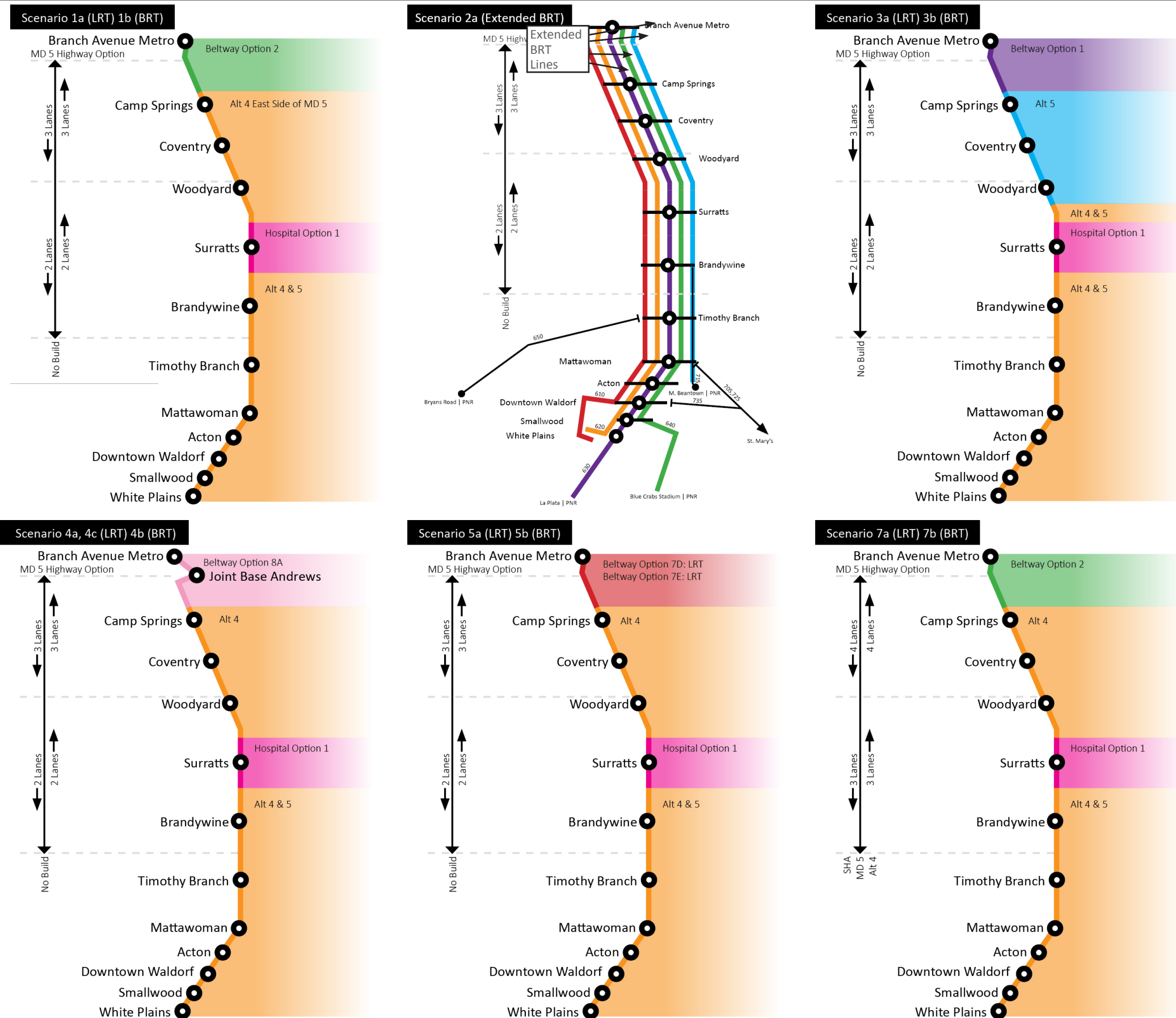
For this study, 12 possible mainline/beltway crossing/highway/other option combinations were developed and tested in the SMRT Ridership Model. The 12 Ridership Scenarios (or “Runs”) were primarily used to test the effects of different alignment changes on SMRT ridership. Mainline Alternative 4, Beltway Crossing Option 2, Hospital Option 1, and the No-Build highway travel times (Run 1a for LRT, Run 1b for BRT) were used as a base for comparison. Therefore, each subsequent “Run” generally includes one (although sometimes more than one) variation from Runs 1a/1b, and could be thought of as a sensitivity test.

Figure 4-1 illustrates the different combinations used to create the Ridership Scenarios or “Runs”. **Table 4-1** summarizes the different features included in each of these tested “Runs”; these primarily include variations in the alignment options that result in different running times for the SMRT line included in the column at the far right of **Table 4-1**.

Six “Runs” were tested for each mode: LRT and BRT. As shown in **Table 4-1**, transit times vary between 37 minutes for the fastest Ridership Scenarios to 46 minutes; the BRT Ridership Scenarios tend to be somewhat faster than the LRT Ridership Scenarios. All of the Ridership Scenarios were tested using the same alignment south of Brandywine (Alternatives 4 and 5) and the same configuration serving MSMHC at the SMRT Surratt’s Road Station (Hospital Option 1). Also shown in **Table 4-1**, due to the increased congestion in the corridor and the dedicated transitway provided by the SMRT options, the transit travel time is as much as 24 minutes, or 39%, faster than the highway time.

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Figure 4-1: Summary of Tested Ridership Forecasting Model Run Scenarios



Source: Sabra, Wang & Associates

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Table 4-1: Summary of Tested Ridership Forecasting Model Run Scenarios

Ridership Forecasting Model Run Scenario ("Runs")		Major Mode		Alignment:					Stations		Highway Options		Feeder Service		Transit Run Time (minutes)		No Build Highway Time (minutes)		Max Build Highway Time (minutes)		Highway Run Time (minutes) White Plains to Branch Ave Metro No-Build Highway/Max Build Highway (without parking time)										
Branch Avenue Metrorail Station to Camp Springs		Camp Springs to Woodyard Rd																													
Beltway Option 1 (Alt 5)		Beltway Option 2		Beltway Option 7 LRT		Beltway Option 7a BRT		Beltway Option 8A		Alt 4		Alt 5 w BW Option 1		Camp Springs		Joint Base Andrews		No-Build (Current lanes)		+1 (3 and 4 lanes) Beltway to US 301		All MTA Service Divert to SMRT Local Service mod for circulation		BRT service extend to La Plata and close in Park and Ride*		White Plains to MD 5 at I-95/I-495		White Plains to MD 5 at I-95/I-495		White Plains to Branch Ave	
1a	LRT		X					X		X		X		X		X		X		X		X		X		39	59	52	61.2/ 53.8		
1b	BRT		X					X		X		X		X		X		X		X		X		X		38					
2b	BRT		X					X		X		X		X		X		X		X		X	X	X		37					
3a	LRT	X							X	X		X		X		X		X		X		X		X		40					
3b	BRT	X							X	X		X		X		X		X		X		X		X		38					
4a	LRT						X	X		X	X	X		X		X		X		X		X		X		42					
4b	BRT						X	X		X	X	X		X		X		X		X		X		X		41					
4c	LRT						X	X			X	X		X		X		X		X		X		X		41					
5a	LRT			X			X					X		X		X		X		X		X		X		46					
5b	BRT				X		X					X		X		X		X		X		X		X		41					
7a	LRT		X					X		X			X		X		X		X		X		X		X					39	
7b	BRT		X					X		X			X		X		X		X		X		X		X					38	

*Includes St. Mary (725 Transfer) and Indian Head (650 Transfer) local Service modifications for circulation.

Source: Sabra, Wang & Associates (June 2016)

The sensitivity of the ridership to different highway options was also tested. Two highway options were carried forward from the MDOT/SHA MD 5 Corridor Planning Study:

- The **No-Build** (in each direction: 3 lanes from I-495 to Woodyard Road, 2 lanes from Woodyard Road to the US 301 split, 3 lanes from the US 301 split to Leonardtown Road, and then 2 lanes to the Governor Harry W. Nice Memorial Bridge (Nice Bridge) – Ridership Scenarios 1 through 5); and
- The **"Maximum Build"** MD 5 study Alternative 4 (in each direction: 4 lanes from I-495 to Woodyard Road, 3 lanes from Woodyard Road to the US 301 split, 3 lanes from the US 301 split to Leonardtown Road, and then 2 lanes to the Nice Bridge – Ridership Scenarios 7a/7b)*.

These two options provided both the highest and lowest ridership based upon potential differences in the MD 5/ US 301 highway configurations. As shown in **Table 4-1** the congested highway run times from White Plains to MD 5 at I-95/I-495 in both highway options (52 to 59 minutes) are substantially longer than the transit times (37 to 46 minutes). Consequently, as shown in the results section, the impact on ridership due to likely highway options is very low (see **Table 4-3**, approximate change in 400 to 500 daily boardings between Runs 1a and 7a).

The incorporation of parking constraints was also included across all of the Ridership Scenarios tested. This has the impact of shifting the ridership from parking lots where the forecast ridership exceeds the demand and dampens

the potential overall ridership slightly since riders can no longer park at their most desired location. “Shadow prices” were used to implement the parking constraints. “Shadow prices” are factors added to the ridership model that allow the model to account for, and analyze the sensitivity to, the amount of parking provided at a given station. **Table 4-2** lists the parking capacities used for each station to develop the forecasts. As shown, the assumptions include a total of over 6,500 additional dedicated Park and Ride spaces at stations in the corridor (in addition to over 3,000 spaces at the Branch Avenue Metrorail Station).

Table 4-2: Assumed Park and Ride Capacities

Station	Assumed Capacity
Branch Ave	3,072*
Joint Base Andrews	-
Camp Springs	250
Coventry	250
Woodyard	1,000
Surratts Rd	-
Brandywine	520
Timothy Branch South	90
Mattawoman North	1,720
Acton	-
Downtown Waldorf	540
Smallwood	520
White Plains	1,660
Total	9,622

* Existing Parking Spaces

Source: Sabra, Wang & Associates (June 2016)

Ridership Results

Ridership results can be captured by the daily boardings for the Ridership Scenarios and also by the difference in door-to-door transit trips to/from/within the SMRT Commute Shed. **Table 4-3** presents summary peak, off-peak, and 2040 daily boardings for the Ridership Scenarios. The daily boardings are also shown in **Figure 4-2**.

As shown, forecasted SMRT ridership varies by a maximum of only 17%, from just over 24,000 (Run 5a) to 28,000 (Run 2b) daily riders. Note, that the lower ridership shown in Runs 4c, 5a, and 5b can be attributed to the elimination of the SMRT Camp Springs Station. The vast majority of ridership occurs during the peak periods (between 72-73% for all scenarios). This represents a higher percentage of off-peak ridership than was seen in preliminary forecasts, and is caused primarily by the implementation of peak period parking constraints. However, this observation is still consistent with the observed transit market for commute

trips from the study corridor into the Washington D.C. core, while the off-peak ridership represents another potential market for high-capacity transit in the SMRT Project corridor. The detailed station level boardings by mode of access during the peak period are provided in **Appendix F**. For most stations, the ridership was relatively stable across the Ridership Scenarios. **Table 4-4** highlights the range of ridership results, by station, for each of the tested Ridership Scenarios.

The SMRT Branch Avenue Metrorail Station shows the highest daily boardings by far, which is related to transfers from the Metrorail system, including all of the evening return commute trips. Other stations with high levels of ridership include Mattawoman, Smallwood, and Downtown Waldorf. However, it should be noted that due to the nature of the mode choice model and the close proximity of several stations, ridership for closely located stations should be considered as a group. For example, the stations at Camp Springs, Coventry, and Woodyard are located within three miles of each other, and may draw riders (particularly drive access riders) from the same or similar catchment areas.

Door-to-door transit trips to and from the study area help capture the number of travelers that will shift from automobile or other modes due to the SMRT service. Under the No-Build conditions in 2040, approximately 102,000 transit trips are expected to be generated in the SMRT Project corridor on an average weekday. With the implementation of SMRT, this number is expected to increase by approximately 18,000 daily transit trips (an 18% increase).

Table 4-3: Summary of 2040 Ridership Results – Peak, Off-Peak and Daily Boardings

Run	Mode	Daily Boardings		
		Peak	Off-Peak	Total
1a	LRT	20,200	7,700	27,900
1b	BRT	19,700	7,600	27,300
2b	BRT	20,400	7,600	28,000
3a	LRT	19,900	7,600	27,500
3b	BRT	19,700	7,500	27,200
4a	LRT	19,500	7,000	26,500
4b	BRT	18,300	6,900	25,200
4c	LRT	18,300	6,700	25,000
5a	LRT	17,500	6,400	23,900
5b	BRT	18,000	6,800	24,800
7a	LRT	19,800	7,700	27,500
7b	BRT	19,600	7,600	27,200

Source: Sabra, Wang & Associates (June 2016)

Figure 4-2: 2040 Daily Boardings for Ridership Forecasting Model Run Scenarios

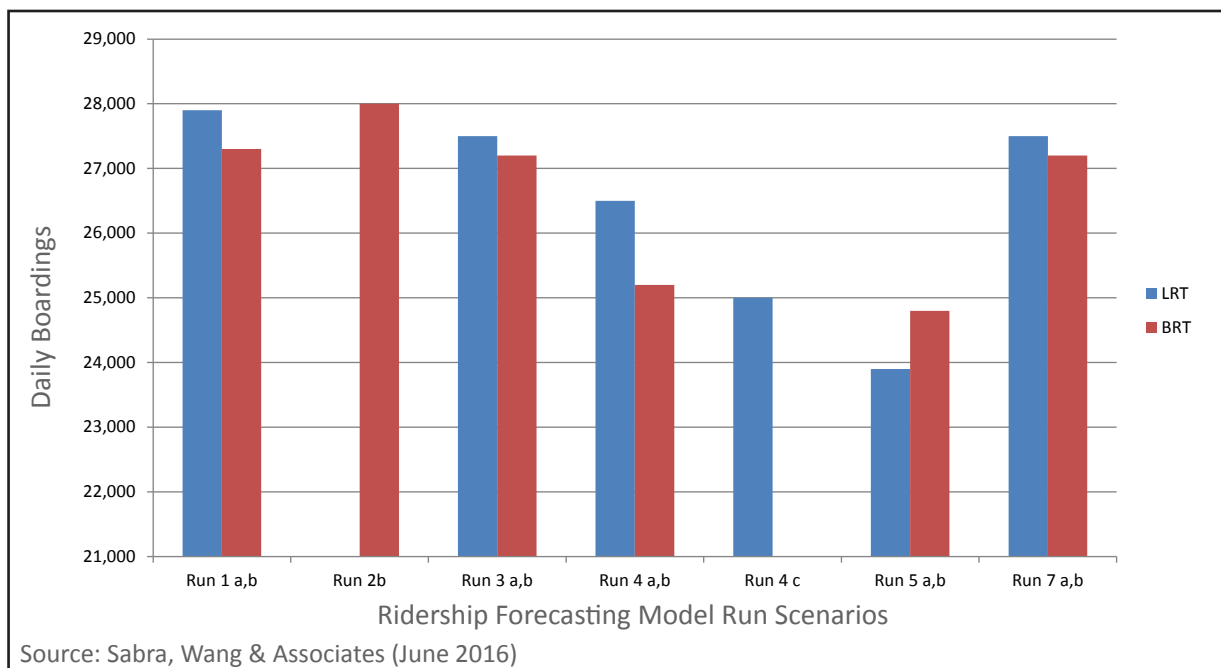


Table 4-4: Range of Daily Boardings by Station

Groupings ²	Station	Daily Boarding Range	
		LRT	BRT ³
1	Branch Ave Metrorail	6,200 – 8,200	6,200 – 7,900
2	Joint Base Andrews ¹	600 – 1,200	700
	Camp Springs ¹	1,000 – 1,800	1,100 – 2,200
3	Coventry	900 – 1,600	900 – 1,600
	Woodyard	1,300 – 1,700	1,400 – 1,800
	Surratts	200 – 300	200 – 300
4	Brandywine	200 – 300	300
	Timothy Branch	200	200
5	Mattawoman	4,300 – 5,000	4,300 – 4,800
	Acton	1,800	1,800
	Downtown Waldorf	3,500 – 3,600	3,300 – 3,500
	Smallwood	2,700 – 2,800	2,600 – 2,900
6	White Plains	1,000 – 1,300	600 – 1,400

Notes:

1. The Joint Base Andrews and Camp Springs stations are not included in all Ridership Scenarios. Ranges are shown for Ridership Scenarios which included the station.
2. The heavy lines in this table separate the stations into groupings. As stated in the ridership results section, the ridership model cannot reliably differentiate daily boardings between stations within a grouping due to similarities in drive access time. The groupings should be looked at as a whole in evaluating boardings.
3. For purposes of ridership sensitivity analysis, an option was developed to extend the BRT service out from the MD 5/US 301 corridor to Southern MD Blue Crabs Stadium, St. Charles Towne Mall, Mattawoman-Beantown, South Potomac Church and LaPlata. These extensions would not result in meaningful additions to ridership.

Source: Sabra, Wang & Associates (June 2016)

The total number of transit trips generated in the corridor remains relatively constant across the 12 tested Ridership Scenarios, varying only between 119,300 and 120,500 as shown in **Table 4-5** and **Figure 4-3**.

Table 4-5: 2040 Daily SMRT Door-To-Door Transit Trips

Run	Mode	Total Daily Transit Trips
No-Build		101,700
1a	LRT	120,500
1b	BRT	120,100
2b	BRT	120,400
3a	LRT	120,300
3b	BRT	120,100
4a	LRT	120,300
4b	BRT	120,100
4c	LRT	120,200
5a	LRT	119,600
5b	BRT	119,400
7a	LRT	119,800
7b	BRT	120,100

Source: Sabra, Wang & Associates (June 2016)

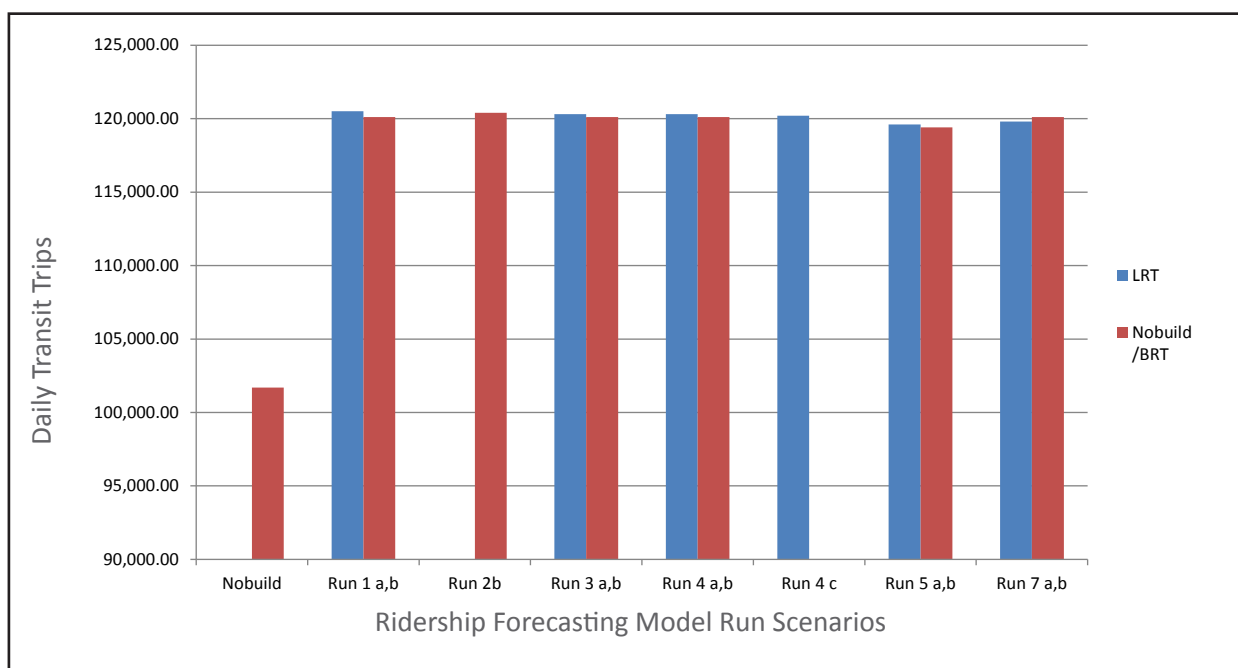
The introduction of LRT and BRT in the SMRT Project corridor leads to an increase in daily transit trips by 18,000. The majority of the new transit trips in the SMRT Project corridor (over 70%) are home-based work and home-based other. The largest growth in transit trips occurs for trips within the Charles County portion of the SMRT Project corridor. District-to-district transit trip tables for each of the Ridership Scenarios are included in **Appendix F**.

Load Factors

As previously noted, in all of the tested Ridership Scenarios, more than 72% of daily ridership occurs during the peak periods. Furthermore, around 80% of this peak period ridership occurs in the peak direction (northbound in the morning, southbound in the evening). This results in very high passenger loads during the peak period in the peak direction, especially in the northern portion of the SMRT Project corridor, north of Coventry. The following assumptions were made about vehicle capacity in the SMRT Project corridor:

- BRT: articulated buses with 60 seats and a maximum capacity of 90 passengers. BRT will operate up to three-vehicle platoons for a total maximum capacity of 270 passengers.
- LRT: 66 seats per car, total capacity of 150 passengers per car. LRT will operate two-car consists for a total maximum capacity of 300 passengers.

Figure 4-3: 2040 Daily Door-To-Door Transit Trips to/from/within the SMRT Project Corridor



Source: Sabra, Wang & Associates (June 2016)

Based on these capacities, **Table 4-6** shows the peak-hour load factor at the location with the highest load, the number of vehicles required to carry the peak-hour loads, and the resulting peak frequency requirements. The peak-hour load location will be the same in the morning and evening peak hours, but will occur in opposite directions.

Table 4-7 shows the morning peak-hour load factors between stations for each of the tested runs, reported

in passengers per vehicle (per bus or per LRT train). As shown, the highest loads are in the northern portion of the alignment. The LRT runs assume a vehicle capacity of 300 passengers per train which can accommodate the given loads along the length of the corridor. The BRT has a vehicle capacity of only 90 passengers per bus, and at 6-minute headways are generally over capacity north of Smallwood. Run 4b is an exception, and does not reach capacity until the Mattawoman-Beantown Station.

Table 4-6: Required Peak-Hour Frequencies

Run	Mode	Peak-Hour Load	Location of Peak-Hour Load Factor	Peak-Hour Trips Required	Peak Hour Headway Required (min.)
1a	LRT	2,800	Coventry-Camp Springs	9	6.5
1b	BRT	2,700	Coventry-Camp Springs	30	6.0 (3-bus platoon)
2b	BRT	2,700	Woodyard-Coventry	30	6.0 (3-bus platoon)
3a	LRT	2,700	Coventry-Camp Springs	9	6.6
3b	BRT	2,700	Coventry-Camp Springs	30	6.0 (3-bus platoon)
4a	LRT	2,600	Woodyard -Coventry	9	6.7
4b	BRT	2,400	Woodyard -Coventry	27	6.0 (2 to 3-bus platoon)
4c	LRT	2,400	Coventry-JBA	8	7.5
5a	LRT	2,300	Coventry-Branch Ave	8	7.7
5b	BRT	2,400	Coventry-Branch Ave	27	6.0 (2 to 3-bus platoon)
7a	LRT	2,700	Coventry-Camp Springs	9	6.6
7b	BRT	2,700	Coventry-Camp Springs	30	6.0 (3-bus platoon)

Source: Sabra, Wang & Associates (June 2016)

Table 4-7: Morning Peak-Hour Load Factors (Passengers per Vehicle) Between Stations – Northbound

Between Stations	1a	1b	2b	3a	3b	4a	4b	4c	5a	5b	7a	7b
Branch Ave Metrorail												
	268	259	256	263	258	247	221	233	233	243	262	258
Joint Base Andrews												
						251	225					
Camp Springs								239				
	279	269	265	273	268	260	233				272	268
Coventry												
	276	266	266	270	266	262	236	238	229	240	270	265
Woodyard												
	248	239	233	244	239	233	208	218	214	224	242	239
Surratts												
	247	238	232	242	238	232	206	216	213	223	240	237
Brandywine												
	244	236	229	240	236	231	206	215	212	222	238	235
Timothy Branch												
	242	234	227	238	234	229	205	213	211	220	236	234
Mattawoman												
	106	104	105	104	104	90	90	93	92	98	103	103
Acton												
	96	94	95	94	94	81	82	84	83	89	93	93
Downtown Waldorf												
	94	93	94	92	93	82	80	84	83	97	92	92
Smallwood												
	30	30	12	28	31	21	23	23	23	29	29	30
White Plains												

Source: Sabra, Wang & Associates (June 2016)

Mode of Access

Table 4-8 summarizes the morning peak-period boardings by mode of access to each station, averaged across all of the tested Ridership Scenarios. The Walk/Bus access mode includes all of the non-motorized access (walk, bike) and those riders transferring from another transit service. In all of the tested Ridership Scenarios, these modes comprise the highest portion of peak-period boardings along the whole SMRT line.

In almost all Ridership Scenarios, Park and Ride access comprises the largest portion of trips on the SMRT service. This is true at the majority of stations, with particularly high Park and Ride shares at Timothy Branch, Brandywine, and White Plains. Several of the extended BRT stations included in Run 2b also show large percentages of Park and Ride boardings. Branch Avenue also shows a relatively high percentage of Park and Ride boardings in the morning, but this is for a relatively small number of southbound boardings.

Table 4-8: Peak Period Access Mode by Station – Average Across all Ridership Scenarios

Station	Peak Period Access Mode (Average % and Total)				
	Walk/Bus		Kiss and Ride		Park and Ride
Branch Ave Metrorail	12%	50	0%		88% 360
Joint Base Andrews*	100%	200	0%		0%
Camp Springs*	60%	180	0%		40% 120
Coventry	47%	160	0%		53% 180
Woodyard	75%	1,210	0%		25% 410
Surratts	100%	80	0%		0%
Brandywine	16%	40	0%		84% 210
Timothy Branch	8%	10	0%		92% 120
Mattawoman	59%	4,610	23%	1,780	18% 1,430
Acton	57%	1,000	43%	760	0%
Downtown Waldorf	19%	290	26%	390	55% 830
Smallwood	43%	1,480	52%	1,790	5% 170
White Plains	6%	80	10%	130	83% 1,040

*Notes:

1. Station not included in all Ridership Scenarios. Average only includes Ridership Scenarios which included the station.
2. The heavy lines in this table separate the stations into groupings. As stated in the ridership results section, the ridership model cannot reliably differentiate daily boardings between stations within a grouping due to similarities in drive access time. The groupings should be looked at as a whole in evaluating boardings.

Source: Sabra, Wang & Associates (June 2016)

Key Ridership Conclusions

The 12 tested Ridership Scenarios provide needed insights into the ridership potential of different modes, alignment options, and station locations. In general, all of the Ridership Scenarios result in similar total daily boardings forecasted for 2040 between 24,000 and 28,000 daily riders. This is in part because the Ridership Scenarios are very similar from a user perspective, resulting in only small differences in travel times and a few differences in station locations. Transit mode and travel times are the primary drivers of ridership in the SMRT Project corridor. Some key points of interest:

- SMRT ridership is particularly strong in the peak period, which accounts for more than 72% of daily ridership in all Ridership Scenarios.
- SMRT ridership is very directional, with more than 80% of daily ridership occurring in the peak direction (northbound in the morning).
- The LRT runs generally have ridership that is 2% higher than similar BRT runs.
- The 24,000 to 28,000 daily ridership range forecasted for 2040, in combination with the heavy peak and directional characteristics, is at the highest limit of what a BRT system could handle, but is comfortably within capacity for LRT.
- By 2040, BRT would need to operate in 3-bus platoons at 6-minute headways to handle peak loads, which is feasible, and would result in BRT annual operating costs 25% to 50% higher than for LRT.
- If ridership would continue to grow beyond 2040, LRT would have sufficient capacity without any transitway or station improvements, but BRT would require transitway widening and station platform improvements in some areas.

The model runs were also used to test the impact of alignment variations on ridership levels, by varying individual elements and comparing ridership to Runs 1a/1b. Some important results related to these variations include:

- The extended BRT Option (Run 2b), which allows BRT riders to board at the off-line Park and Ride lots, does not result in any more than a marginal increase over runs without the extended BRT (Runs 1a, 3a, 1b, 3b all have ridership totals within 3% of Run 2b).
- The Mainline Alternative 5 alignment on the east side of MD 5, north of MD 223, (Runs 3a/3b) has only a marginal effect on run-times, and therefore only a small impact on ridership levels. As LRT, Run 3a has only 1% lower ridership than Run 1a (due to a slightly longer run time), while the BRT version (Run 3b) has almost identical ridership to Run 1b.
- Several variations of service to, and access to transit within JBA were tested, resulting in the following conclusions:
 - » Runs 4a/4b/4c, which is modeled Beltway Crossing Option 8A resulted in some of the lowest ridership numbers of any of the tested Runs other than options 5a/5b, primarily due to the increased run-times required by this alignment.
 - » Removing the Camp Springs Station does not improve run-times enough to offset the loss of access to SMRT at the station.
- Beltway Median Option 7, removal of the Camp Springs Station) significantly decreases SMRT ridership (9% lower for BRT and 14% lower for LRT).
- Highway widening reduces total ridership on SMRT by only 1%. This is partly because the additional capacity attracts demand from parallel roadways, resulting in no net improvement in automobile or transit times in the corridor.

4.b. Station Area Planning

The implementation of the SMRT system would represent a new type of transit connectivity in a corridor that is rapidly changing. Access planning guidelines will be critical to capitalizing on its potential to transform the corridor. Station access planning is not a one-size-fits-all proposition. It is vital that access guidelines for the corridor take into account the role of each station within the overall SMRT Project corridor, and the particular passenger markets that the stations will serve. The SMRT station planning effort is focused on the following goals:

- Evaluate each station's **role within the SMRT system**.
- Define how each station will **integrate with current and planned land uses** within a ½-mile radius.
- Quantify the needed access facilities (parking, bus facilities, pedestrian/bicycle infrastructure) at each station.
- Determine the **best layout of station facilities**.
- **Identify needed pedestrian and bicycle infrastructure improvements** beyond the footprint of each station to a distance of ½-mile away.
- **Estimate cost to construct** each station.

The following section presents a brief overview of how these priorities have been addressed by the SMRT Project team. The first two planning objectives, station role and integration with land use, have been addressed through the creation of a station access typology that categorizes each of the 13 SMRT stations into one of five types (see **Appendix B-2**).

Station type then serves as a guide to inform decisions regarding access facility needs, pedestrian/bicycle connections, and station layout. Other factors, such as which routings are practical for feeder bus service or the presence of major transportation barriers, weigh on those decisions as well.

Station cost estimates were determined through the quantification of various built features, such as square feet of paved surface or linear feet of safety railing, which are dependent on access facility quantities and planned station layout. Cost estimates are covered in detail in Section 4d. of this report and in **Appendix H**.

SMRT Station Typology

To prioritize the appropriate station access facilities and facilitate station area planning and design, the SMRT Project team devised a typology of station types exhibited in the corridor. The basis for assigning stations to one type or another was concentrated on two factors – access pattern and land use pattern.

Access pattern refers to the role that each station plays within the overall system. Is the station primarily a transfer point from local routes (or to longer regional lines), or is it specifically focused on serving destinations within its own immediate environs. For the SMRT line, the SMRT Project team identified three umbrella categories with which the role of any station may be categorized:

- **Intermodal**, in which the primary focus is on providing connections between SMRT and other primary regional transit service.
- **Mid-Line Local**, in which the station focus is on serving local destinations.
- **Collector**, in which the focus is on providing access to the system from a broad SMRT Commute Shed through parking and feeder bus.

Secondly, land use pattern refers to the density, physical character, and mix of uses for planned development within ½ mile of the station. Stations that are surrounded by a walkable development pattern featuring a mix of uses within walking distance will have very different access patterns than those that feature only one of those characteristics, or neither. The SMRT Project team defined four land use patterns that encompass the range of conditions in the corridor:

- **Town Center/Mixed-Use**, which describes dense, mixed-use activity centers with strong commercial and/or employment components, and which also exhibit a walkable, grid-based street pattern.
- **Special Anchor**, which feature one overriding institutional land use that will have a greater impact on station planning decisions than any other factor.
- **Residential Neighborhood**, which refers to areas where residential development is predominant.
- **Rural/Isolated**, which refers to areas where existing and planned development intensity is low, and primary trip generators or attractors are beyond walking distance.

When the above categories were applied to the known SMRT station areas, all stations could be slotted into five of the possible 12 combinations (see **Table 4-9**). It should be noted that few stations fit types within a typology perfectly, and often exhibit characteristics of other station types. In some cases, station planning decisions were based on considerations other than their type in the typology.

Table 4-9: SMRT Station Types

			Land Use Patterns			
			1	2	3	4
Access Patterns			Town Center/Mixed-Use	Special Anchor	Residential Neighborhood	Rural/Isolated
Access Patterns	A	Intermodal	●			
	B	Mid-Line Local	●	●	●	
	C	Regional Collector				●

Source: Appendix B-2

Type A-1: Intermodal – Town Center/Mixed-Use

This station type describes those stations where transfers between transit modes are the primary station function. These stations are characterized by connections to regional transit lines (Metrorail, MTA Commuter Bus) and connections to multiple local bus lines. Stations of this type are also locations where transit-oriented development (TOD) has been planned for the future in order to capitalize on the benefits of the transit station. As such, their development patterns can be expected to exhibit a diverse mix of uses and a strong street grid, facilitating access to the station for all modes. At these locations, transfers between transit lines are the primary consideration for station planning and design, including transfers that are neither to or from SMRT.
*SMRT stations of this type: **Branch Avenue Metrorail, Mattawoman***

Type B-1: Mid-Line Local – Town Center/Mixed-Use

Stations of this type are characterized by proximity to existing or planned TOD with substantial commercial and/or employment components, albeit with fewer transit

connections than those of type A-1. These stations may include major parking and/or feeder bus facilities, but facilitating these access modes is a secondary design priority to integrating station facilities with surrounding development. As such, pedestrian and bicycle connections are of particular importance.
*SMRT stations of this type: **Woodyard, Timothy Branch, Acton, Downtown Waldorf***

Type B-2: Mid-Line Local – Special Anchor

In certain locations, the presence of a specific institutional land use override other considerations that impact what type a station might be assigned. At these stations, the primary anchor is the reason the station location was chosen, and providing access between SMRT and those anchor land uses is the focus of station planning and design. Connections to the special anchor will generally be pedestrian links, although shuttle services (public or employee-only) could be part of an access plan. The presence of a special anchor may constrain access to the station, as is the case with JBA in the SMRT Project corridor.
*SMRT stations of this type: **Joint Base Andrews, Surratts***

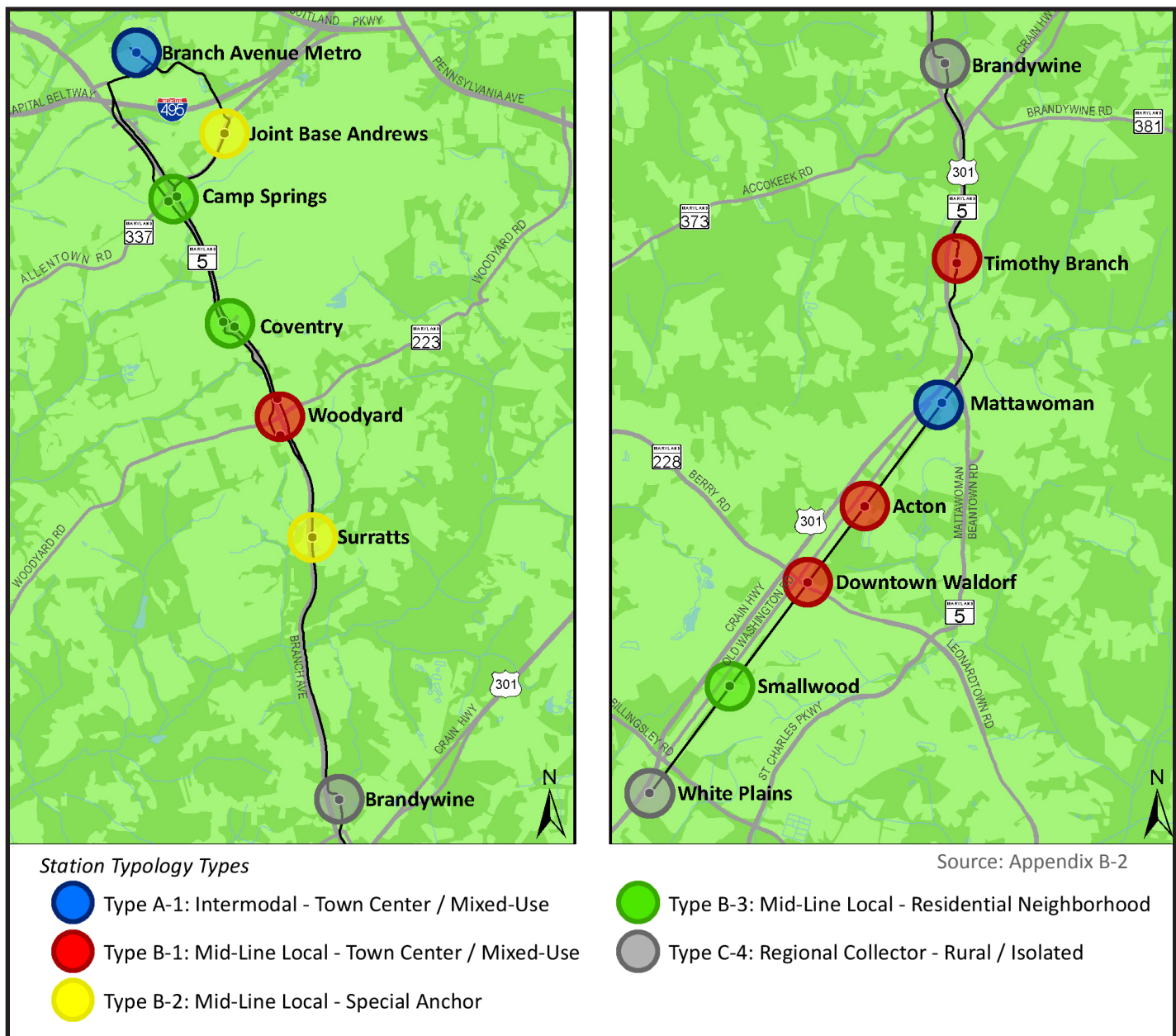
Type B-3: Mid-Line Local – Residential Neighborhood

Several of the SMRT stations are surrounded by land use patterns that are heavily focused on residential development. While these stations may be located within an activity node or in an area slated for TOD, the intensity of planned development is less, and the mix of uses more skewed towards residential than at those stations in type B-1. Pedestrian/bike access is important for these areas as well, but parking and feeder bus access takes on greater importance, as the station is likely to be a collector for passengers coming from surrounding low- and medium-density neighborhoods.
*SMRT stations of this type: **Camp Springs, Coventry, Smallwood***

Type C-4: Regional Collector – Rural/Isolated

Within any transit line, a few stations serve primarily as collection points where passengers travelling from the outer edges of the line’s travel shed can access mainline service directly. Such stations are generally located in areas where little development is expected, in order to provide the needed space for parking and the surplus road capacity for a large surge of passengers during peak hours. Large parking facilities and robust feeder bus loops are typical for these stations, and the primary design criterion is efficient transfers between modes. *SMRT stations of this type: **Brandywine, White Plains***

Figure 4-4: SMRT Stations by Typology Type



Land Use Patterns

Table 4-10 lists the master plans, sector plans and any other published guidance documents pertaining to proposed SMRT stations. Several station areas are within development focus areas laid out by one or more land use plans established by either Prince George's County (M-NCPPC) or Charles County. In those cases, the planned development intensity and mix of uses has played a primary role in determining those stations' assigned types within the SMRT station access typology.

Table 4-11 details the existing and planned land use patterns at each of the 13 SMRT station locations, as well as the key connections identified as critical to supporting each station's ridership projections. The table shows that a higher level of development intensity in general is planned for the station areas along the corridor. The type and density of development has played into decisions regarding appropriate station access facilities (see **Table 4-13**) and necessary pedestrian/bicycle connections. Additional detail regarding existing and planned land use in each station area can be found in **Appendix B**.

Table 4-10: Land Use Plans Applicable to SMRT Stations

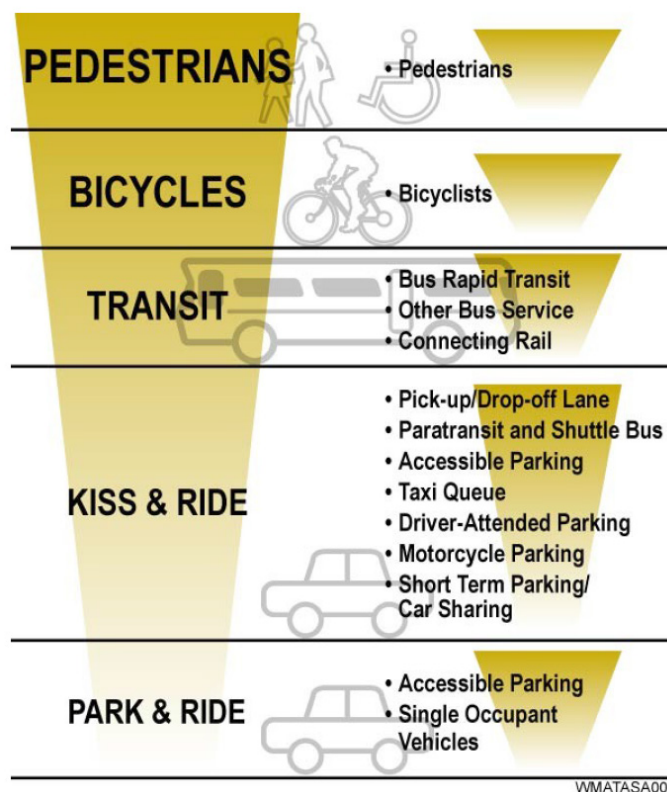
Agency	Plan Title	Year Published	Stations Covered
M-NCPPC	Southern Green Line Station Area Sector Plan	2014	Branch Avenue Metrorail
M-NCPPC	Central Branch Avenue Corridor Revitalization Sector Plan	2013	Joint Base Andrews, Camp Springs, Coventry, Woodyard, Surratts
Charles County Department of Planning and Growth Management	Waldorf Urban Redevelopment Corridor Phase I Report	2013	Acton, Downtown Waldorf

Source: Appendix B-2

Station typology and ridership estimates form the primary rationales to determine station access facilities needs, along with the SMRT feeder bus service plan and physical constraints at each site. Merely being able to quantify the need for various access facilities does not fully inform decisions regarding the ideal layout of each station. In order to guide the process of developing physical station plans, the SMRT utilized commonly-accepted industry norms regarding the placement of station access facilities.

Commonly-accepted industry practice regarding transit station design dictates that non-motorized access facilities should be provided the most direct, easiest access to the station entrance or platform, and that transit-to-transit connections be facilitated with bus stops and bays that are closer to station platforms than are Kiss and Ride and Park and Ride facilities. **Figure 4-5** shows WMATA's station access hierarchy structure, which is typical of other transit agencies' policies. WMATA goes further to define policy distances from its station entrances within which certain types of station access facilities must be located at its Metrorail Stations. Another transit agency that has set forth a similar distance-based policy on the location of station facilities (for a light rail system) is the Denver Regional Transit District. The SMRT Study considers both agencies' policies, and devised a facility-location guideline that encompasses elements of each (see **Table 4-12**).

Figure 4-5: WMATA Station Access Hierarchy Diagram



Source: WMATA Station Site and Access Planning Manual

Table 4-11: Existing and Planned Land Use Patterns at SMRT Stations

Station	Land Use Categories						TOD Planned for Area?	Notes
	Existing			Planned				
	Residential	Employment	Commercial	Residential	Employment	Commercial		
Branch Avenue Metrorail							Major	- TOD pattern is already partially implemented. - Existing Metrorail Park and Ride lots (>3,000 spaces) will be converted to garage parking. - Development area constrained by WMATA rail yard and stream valleys.
Joint Base Andrews							Minor	- The portion of Joint Base Andrews closest to the station will be the focus of new development on the base, including expanded medical center. - TOD to replace aging strip malls on Allentown Road.
Camp Springs							Minor	- Majority of new development is planned on west side of MD 5. - Camp Springs envisioned as a “unique cultural arts and recreation center.”
Coventry							Minor	- Development constrained by JBA perimeter. - Adjacent portion of JBA is a low-density portion of the facility.
Woodyard							Major	Woodyard Road envisioned as a “Main Street” and commercial/employment core for the community of Clinton.
Surratts							Minor	TOD would be constrained to the immediate vicinity of the hospital, surrounding areas would remain low-density residential.
Brandywine								- Station area is currently disconnected from all development. - Hampton Farm subdivision expected to expand into area adjacent to station
Timothy Branch								- Major residential developments planned at the edge of the ½-mile radius from the station. - Infill development of Brandywine Crossing Shopping Center a possibility.
Mattawoman							Minor	TOD is part of a developer’s plan (Chaney).
Acton							Major	Waldorf Urban Redevelopment Corridor plan envisions a dense, walkable, mixed-use, transit-oriented downtown area for the Town of Waldorf.
Downtown Waldorf							Major	Waldorf Urban Redevelopment Corridor plan envisions a dense, walkable, mixed-use, transit-oriented downtown area for the Town of Waldorf.
Smallwood								- Major shopping malls are at or beyond the edge of the ½-mile radius from the station. - No major development is expected in the station area.
White Plains								- Station area primarily contains light industrial uses. - No major development is expected in the station area.

Key: Intensity/Density of Development: ● = High; ● = Moderate; ○ = Low (blank cell signifies little to none)

Source: Appendix B-2

**Table 4-12: Station Location Standards
(Distance to Station Entrance)**

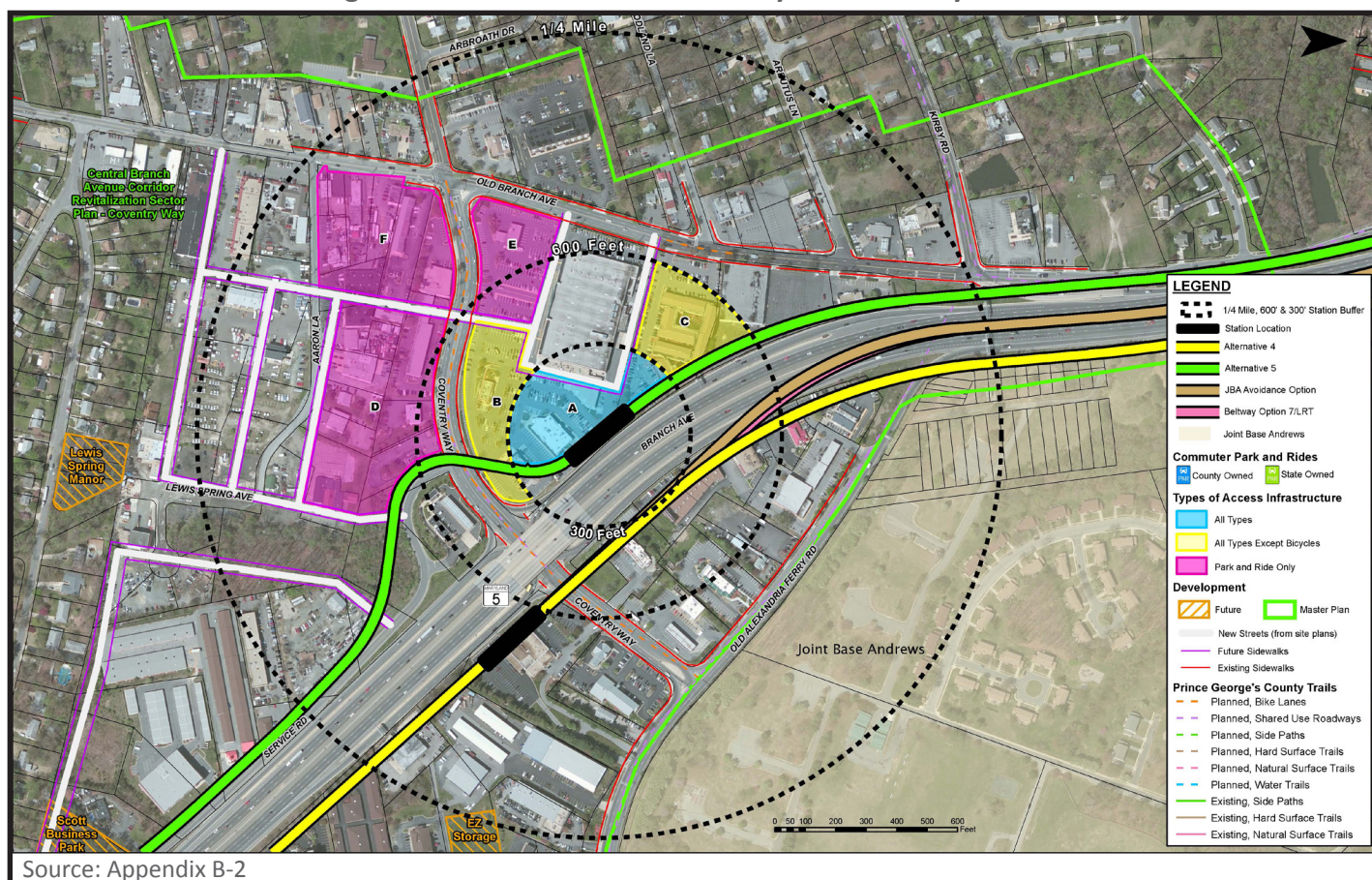
	WMATA	Denver RTD	Recommended
Bike Parking	N/A	N/A	300 Ft.
Bus Bays	500 Ft.	Through routes within 420 Ft. All routes within 600 Ft.	600 Ft.
Kiss and Ride	600 Ft.	240 Ft.	600 Ft.
Park and Ride	1,500 Ft.	50% within 600 Ft. 75% within 900 Ft. 100% within 1,500 Ft.	1/4-Mile

Source: Appendix B-2

The SMRT Study analysis utilizes this guideline by superimposing concentric circles over each station area at 300 feet, 600 feet, and ¼-mile distances from the station platforms, and defining zones within each that could be utilized for different types of station facilities. This structure formed the background for decisions on how to best lay out station facilities. **Figure 4-6** shows an example of this analysis technique applied to the Coventry Station, and **Figure 4-7** shows the resultant layout of station facilities in keeping with the SMRT station access facilities hierarchy.

Table 4-13 details the assumptions made by the SMRT Project team regarding access facilities at each station. These assumptions were based on preliminary ridership estimates, as well as each station's type, the surrounding land use pattern, and logical connections to sources of ridership such as residential neighborhoods or employment concentrations. The facility requirements shown in this table, combined with the hierarchy analysis outlined above, formed the basis for decisions regarding the most logical physical layout of each station.

Figure 4-6: SMRT Station Zone Analysis – Coventry Station



Source: Appendix B-2

Table 4-13: Station Access Facility Assumptions

Station	Bike Racks	Bus Bays	Shuttle Drop-Off Zone	Kiss and ride (spaces)	Commuter Parking (spaces)
Branch Avenue Metrorail	No New Infrastructure Expected				
Joint Base Andrews	10	4	-	10	150
Camp Springs	20	5	60 Feet	20	250
Coventry	10	3	60 Feet	15	250
Woodyard	15	4	60 Feet	15	1,000
Surratts	5	3	60 Feet	5	0
Brandywine	5	3	-	5	520
Timothy Branch	5	3	60 Feet	5	90
Mattawoman	25	4	60 Feet	30	1,720
Acton	5	3	120 Feet	5	0
Downtown Waldorf	5	4	120 Feet	25	540
Smallwood	15	9	-	25	520
White Plains	10	4	120 Feet	25	1,660

Source: Appendix B-2

Figure 4-7: Station Site Plan of Coventry Station


Source:
Appendix B-2

Pedestrian/Bicycle Connectivity

Table 4-14 details the existing walkability of each station area, the barriers to pedestrian/bicycle connectivity, and the pedestrian and bike connections most critical to providing optimal access to each station. Where TOD is planned, the expectation is that pedestrian and bicycle connectivity will inherently be improved due to the creation of interconnected street grids with quality sidewalks. Additional detail regarding pedestrian and bicycle infrastructure priorities at each station area can be found in **Appendix B**.

Table 4-14: Pedestrian/Bicycle Conditions at SMRT Stations

Station	Current Walkability	Barriers to Pedestrian/Bicycle Movement	Needed Connections
Branch Avenue Metrorail	Good	• WMATA Metrorail Storage Yard	• Shared-use roadway or shared-use path treatments for vital local connections (Auth Road, Old Soper Road, Auth Way, Auth Pl, and Capital Gateway) • Bike lanes on MD 5 north of Auth Road • Hard surface trails connecting separated neighborhoods
Joint Base Andrews	Fair	• Perimeter of Joint Base Andrews • I-495 Capital Beltway (Limited Access Highway)	• Walkable street grid in TOD redevelopment area • Signalized intersections with high-quality pedestrian treatments to provide safe crossings of Allentown Road • New pedestrian-only security gate near/adjacent to SMRT station • New pedestrian/bike crossings over I-495
Camp Springs	Fair	• Perimeter of Joint Base Andrews • MD 5 Branch Avenue (Limited Access Highway)	• Walkable street grid in TOD redevelopment area • New pedestrian-only security gate adjacent to SMRT station • Improved pedestrian/bicycle accommodations along Allentown Road, including improved crossing of MD 5
Coventry	Fair	• Perimeter of Joint Base Andrews • MD 5 Branch Ave (Limited Access Highway)	• Walkable street grid in TOD redevelopment area • Improved pedestrian/bicycle accommodations at Coventry Way at MD 5
Woodyard	Fair	• MD 5 Branch Avenue (Limited Access Highway)	• Walkable street grid in TOD redevelopment area • New pedestrian/bike bridge over MD 5 • Signalized intersections on Mike Shapiro Drive at entrances to new development • Improved pedestrian/bicycle accommodations along Woodyard Road, including improved crossing of MD 5
Surratts	Poor	• MD 5 Branch Avenue (Limited Access Highway)	• Add quality sidewalks to internal hospital roadways • Quality pedestrian/bicycle crossing of MD 5 as part of interchange project • Create connections between separated neighborhoods west of MD 5.
Brandywine	Poor	• MD 5 Branch Avenue (Limited Access Highway)	• Include pedestrian/bicycle accommodations in design of new overpass above MD 5, and strong pedestrian/bicycle infrastructure throughout interchange project • Direct connection to the Hampton subdivision
Timothy Branch	Fair	• MD 5/US 301 Crain Highway (Limited Access Highway)	• Maintain/improve quality sidewalks on internal shopping center roadways, Timothy Branch Drive, and Matapeake Business Drive • Create a pedestrian crossing over/under MD 5/US 301

Table 4-14: Pedestrian/Bicycle Conditions at SMRT Stations (cont.)

Station	Current Walkability	Barriers to Pedestrian/Bicycle Movement	Needed Connections
Mattawoman	Fair	- US 301 Crain Highway (Limited Access Highway) - Pope's Creek Branch (CSX) freight rail line - MD 5 Mattawoman Beantown Rd	- Implement street grid in Chaney TOD developments with strong sidewalks and bike-friendly streets - Pedestrian crossing of CSX tracks linking TOD to station - Improved pedestrian crossing of CSX tracks at Substation Road and Mattawoman Drive
Acton	Poor	- US 301 Crain Highway (Limited Access Highway) - Pope's Creek Branch (CSX) freight rail line	- Walkable street grid in TOD redevelopment area and in Chaney "Lake Acton" development - Grade separated pedestrian/bicycle crossing of US 301 Crain Highway in the vicinity of Acton Lane - Improved pedestrian crossing of CSX tracks at Acton Lane
Downtown Waldorf	Fair	- US 301 Crain Highway (Limited Access Highway) - Pope's Creek Branch (CSX) freight rail line	- Walkable street grid in TOD redevelopment area - Improved pedestrian crossing of CSX tracks at Leonardtown Road - Incorporate pedestrian/bicycle sidepath as part of Leonardtown Road under/over-pass
Smallwood	Poor	- US 301 Crain Highway (Limited Access Highway) - Pope's Creek Branch (CSX) freight rail line - Smallwood Dr (Divided, high-speed arterial)	- Add safe pedestrian treatments to Smallwood Drive bridge over CSX tracks - Direct pedestrian connection from station to Sherman Road
White Plains	Poor	- US 301 Crain Highway (Limited Access Highway) - Pope's Creek Branch (CSX) freight rail line	- Improved pedestrian crossings of US 301 at Demarr Road and CSX tracks at Demarr Road 5-foot multi-use path incorporated in SMRT design, connecting to Indian Head Rail Trail

Source: Appendix B-2

4.c. Grade Crossing and Traffic Operations

At-grade Crossing Treatments

The proposed SMRT alignment alternatives will cross a variety of existing vehicle, pedestrian, and bicycle facilities at-grade (see **Appendix G**). To enable safe interaction between existing transportation modes and the proposed SMRT, at-grade crossings will require certain treatment types. Two types of traffic control devices exist, passive and active.

Passive traffic control devices provide static messages of warning, guidance, or mandatory action for the driver. The purpose of these devices is to identify and direct attention to the location of a crossing so pedestrians and drivers can take appropriate action. Passive traffic control devices include regulatory, warning, and guide signs, supplemental pavement markings, detectable warning surfaces, and more.

Active traffic control devices are those that give advance notice of the approach of a light rail vehicle or BRT vehicle. Active traffic control devices are supplemented with the same signs and pavement markings used for passive control. Active traffic control devices include flashing light signals, bells, automatic gates, active advance warning devices (e.g., audible-visual pedestrian warning signs, blank out signs), and highway traffic signals.

In addition to passive and active control devices, different types of prioritization strategies can be implemented to improve SMRT travel time and reliability (see **Appendix G**). For signalized intersections, two types of prioritization can be programmed into the signal controller. Transit signal priority (TSP) uses software and hardware to conditionally modify traffic signals with minimal disruption to progression, often in real-time, in order to facilitate a bus or light rail vehicles through an intersection. Multiple TSP strategies exist such as passive, active extension, active

truncation, active phase insert, active phase rotation, and delay vs. schedule adherence. The other type of prioritization that can be used at signals is preemption which trumps priority and is always granted, without regard for disruption to signal coordination. With or without prioritization strategies, other treatments such as queue jumps can be used.

Two agencies within the U.S. Department of Transportation regulate at-grade crossings depending on the crossing's uses.

FRA

The Federal Rail Administration (FRA) has jurisdiction over all railroads except "rapid transit operations in an urban area that are not connected to the general railroad system of transportation" and has specific regulations that it can enforce. Although the proposed SMRT alternatives will have dedicated tracks/transitways that won't be used by heavy rail, some of the SMRT crossings are adjacent to railroad crossings so may share crossing treatments (i.e., operate as one crossing) and would be required to follow FRA guidelines.

FTA

The Federal Transit Administration (FTA) has jurisdiction over public transportation and provides financial and technical assistance to public transportation systems. FTA is currently in the proposed rulemaking stages of getting safety oversight authority to monitor, oversee and enforce safety of public transit as FRA currently has the ability to do for rail.

Standards

National standards and guidance for traffic control devices are set forth in the 2009 Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD). Part 8 of the MUTCD gives specific guidance for railroad and light rail transit grade crossings. Additional guidance for railroad crossings is provided in the 2007 Railroad-Highway Grade Crossing Handbook by USDOT FHWA.

Key criteria such as the LRT speed, vehicle speed, average daily traffic (ADT), crossing type, and existing traffic control devices determine the crossing treatment requirements as set forth in Part 8 of the MUTCD.

For BRT at-grade crossings, there is no generally accepted set of guidelines or procedures to increase safety at busway intersections. However, Transit Cooperative Research Program (TRCP) 117 provides guidelines and current practices for dedicated busways of existing North American corridors. Most busway intersections in North America are signal controlled for all users at the intersections, although there are a few stop-controlled intersections. Signal controlled intersections should be equipped with functioning pedestrian signals and can have a variety of priority strategies, but do not use preemption. Automatic gates are not used at BRT crossings in North America.

Traffic Operations Analysis

Analysis of at-grade crossings was performed to see the effect the SMRT would have on existing operations. The SMRT Project corridor consists of a number of coordinated and free traffic signals. Most of the signals along the alternatives have a phase parallel to the alignment of the SMRT that would allow vehicle movements concurrently with the LRT/BRT movement. In these cases, where the alignment is close enough to an existing traffic signal, the traffic signal for vehicles and the LRT/BRT can operate as one signal. Effective green is a term used to describe the green time the LRT/BRT can operate per cycle without other vehicle conflict. In some cases, the effective green time may require restricting of mainline left and right turns to prevent vehicular conflict with the LRT/BRT.

Signalized Intersections

A potential concern for planners considering a rapid transit system that will have grade crossings at or near major intersections is whether the proposed transit crossings (with allocation of a traffic signal green phase to the transit vehicle) will significantly affect the vehicular capacity and/or operations of the given intersections. For this SMRT Study, a planning level traffic analysis has been performed to identify any major concerns. The signalized intersections with the worst existing levels of service (LOS) were selected along the MD 5/US 301 corridor. The existing signal timings were then used to determine the effective green times. Additionally, operations at these intersections were evaluated for 2040 conditions. Multiple sources were used to determine the 2040 volumes including the following:

- SHA MD 5 Corridor Study – No-Build with SMRT Corridor Transit Scenario AM(PM)
- SHA US 301 Corridor Study – 2040 No-Build AM(PM)
- MWCOG Travel Model Simple Annual Growth Rate – For areas not included in above studies
- Results of the analysis of signalized intersections are shown in **Table 4-15** and **Table 4-16**.

The results show that a concurrent phase for the LRT/BRT would be effective at most signals as it would receive greater than 50 seconds of green time per cycle. The results also show little change in LOS between existing and 2040 volumes.

For the intersection of the MD 5 Ramps at MD 337, a new phase would be required in order to accommodate the LRT/BRT crossing of MD 337 (Allentown Road). Here, a new phase would be required to accommodate the LRT/BRT. The new phase, assumed to be 20 seconds, was tested under existing and 2040 conditions. Under existing conditions, there was no change in LOS and the LOS remained at LOS C. With 2040 volumes, the LOS changed to LOS D.

Table 4-15: Coordinated Traffic Signals Analysis

Intersection	Peak	Existing LOS	2040 LOS	Cycle Length (sec)	Effective Green (sec)	LRT/BRT Phasing
US 301 at Billingsley Road*	PM	E	F	210	52	Concurrent
US 301 at Timothy Branch Drive/Chadds Ford Drive	PM	F	F	210	128	Concurrent
US 301 at Cedarville Drive/McKendree Road	PM	F	F	210	141	Concurrent
MD 925 at MD 228/MD 5 Business (Leonardtwn Road)	PM	E	E	210	53	Concurrent
MD 5 Ramps at MD 337	PM	C	D	150	0	Concurrent

Note: *Volumes based on MWCOG Simple Annual Growth Rates

Source: Sabra, Wang & Associates

Table 4-16: Free Traffic Signals Analysis

Intersection	Peak	Existing LOS	2040 LOS	Cycle Length (sec)	Effective Green (sec)	LRT/BRT Phasing
MD 5 (Branch Avenue) at MD 373 (Accokeek Road)*	AM	C	Proposed Interchange	179	82	Concurrent
MD 5 (Branch Avenue) at Brandywine Road	AM	F		179	70	Concurrent
MD 5 (Branch Avenue) at Surratts Road	AM	F	F	362	235	Concurrent

Note: *Volumes based on MWCOG Simple Annual Growth Rates

Source: Sabra, Wang & Associates

Unsignalized At-Grade Crossings

In addition to at-grade crossings near signalized intersections, there are at-grade crossings at uncontrolled locations. Of these locations, the roadways with the highest Average Daily Traffic (ADT) were selected, because they would be most critical and may require signalization. To analyze the potential effect of signalization to accommodate LRT/BRT crossings, the following assumptions were made. It was assumed that there would be 3-minute headways per direction, so as a worst-case condition, every 90 seconds a transit vehicle could be assumed. Hence, a 90-second cycle was assumed, and a 20-second phase was given for a LRT/BRT crossing each cycle. Volumes were based on the previously mentioned sources. Results of the unsignalized crossings are shown in **Table 4-17**.

Results show that none of the highest ADT crossing locations would fail if signalized for LRT/BRT crossings. It is recommended that the roundabout of Auth Road/Old Soper Road/Capital Gateway Drive be removed and replaced with a traffic signal if the LRT/BRT alignment selected crosses the southeast leg of the roundabout. A traffic operations analysis was conducted for roundabout control under proposed conditions with signalized control for only the transit priority, and it resulted in excessive queuing and poor levels of service. At the projected vehicle and pedestrian traffic volumes, and considering the need to accommodate a 'transit only' phase, a traffic signal can process a higher number of vehicles and pedestrians in a more orderly and efficient manner than a roundabout.

Crossing Recommendations/Costs

The guidelines and flow charts talked about in the Policy section were followed for each at-grade crossing along each of the alternatives. Recommendations were made for each crossing and planning-level costs were assumed. Maps of the recommended treatment for each at-grade crossing along each of the alternatives are shown in **Figures G-1 thru G-12** in **Appendix G**. Planning-level costs were based on the assumptions shown in **Table 4-18**.

Table 4-17: Unsignalized Grade Crossing Analysis

Roadway	Cycle Length (sec)	LRT/BRT Phase (sec)	2040 AM LOS	AM Queue Length	2040 PM LOS	PM Queue Length	Max LRT/BRT Phase (sec)
Old Alexandria Ferry Road	90	20	B	621	A	220	30
Auth Road (southeast leg of roundabout)	90	20	D	1,191 SB	E	1,319 NB	0
Capital Gateway Drive	90	20	A	115 EB	A	21 EB	61

Source: Sabra, Wang & Associates

Table 4-18: Grade Crossing Cost Assumptions

Traffic Control Device	Cost
New Signal	\$250,000 (includes TSP)
Reconfigure Existing Signal	\$100,000 (includes TSP)
Add TSP to Proposed Signal	\$10,000
Stop Controlled	\$5,000
Flashing Light Signal and Automatic Gates	\$150,000
Flashing Light Signal	\$60,000
Ped and Bike Treatments/Uncontrolled	\$2,500

Source: Sabra, Wang & Associates

The SMRT Project corridor was split into three segments based on location. The three zones were Northern Prince George's County, Southern Prince George's County, and Charles County. A summary of each area is shown below:

Northern Prince George's County

- Number of total transitway crossings ranges between 12-34 (mode neutral) depending on alignment system-wide
- 2 crossings per station
- New signals (4-12 for BRT)
- New active lights and/ or gates (5-24 LRT)
- Prices range between \$0.93 and \$3.94 million for LRT and between \$1.22 and \$3.28 million for BRT

Southern Prince George's County

- Number of total transitway crossings ranges between 31-42 (mode neutral) depending on alignment
- 2 crossings per station
- New signals (9-10 for BRT)
- New active lights and/ or gates (21-26 LRT)
- Prices range between \$3.70 and \$4.43 million for LRT and between \$2.72 and \$2.91 million for BRT

Charles County

- Number of total transitway crossings is 17 (mode neutral) for all alignments
- 2 crossings per station
- New signals (6 for BRT)
- New active lights and/ or gates (7 LRT)
- Prices range from \$1.18 million for LRT to \$1.63 million for BRT

4.d. Capital Costs

Estimating Methodology

The 2016 SMRT project cost estimates have been developed in general accordance with the Federal Transit Administration (FTA) guidelines for estimating capital costs. The capital cost estimates will provide a planning-level estimate useful for long-range project planning. FTA guidelines call for cost estimates to be prepared using the latest version of the FTA's Standard Cost Categories (SCC). In the estimates, cost components for the various options and alternatives are developed and summarized into the SCC format.

These cost categories form the basis for the format and structure used for the capital cost detail and summary sheets developed for this project. Unit quantities were calculated from the conceptual engineering drawings. The 2007 Purple Line Corridor Transit Study, Corridor Cities Transitway (CCT) and the 2010 Southern Maryland Transit Corridor Preservation Study were consulted for unit costs. The costs have been escalated to 2016 prices based on the Bureau of Labor Statistics CPI Inflation Factor of 1.11 (2009 to 2016). Current assessed property values were utilized for the right-of-way costs.

General Approach

Each of the alternatives and options developed have conceptual engineering drawings and written descriptions prepared that provide needed definition for each of the construction cost components. These resources form the basis for the identification of the various facility elements used to prepare the cost estimates. These facility elements can be classified into one of two broad groups, either typical or non-typical elements.

Typical facility costs are developed for elements that can be defined by a typical cross-section and applied over a given length of alignment or based on a conceptual scope of work developed as appropriate for a specific typical facility. The typical facility composite unit cost is then developed by combining the costs for all of the individual construction elements applicable to a given typical section or facility and creating a representative composite unit cost. Typical sections or facilities were developed for each of the alternatives/options. Non-typical facility costs were developed based on conceptual engineering and design related to the unique facility under consideration. For those non-typical facilities elements that are necessary

for overall system operation, but whose costs cannot be allocated to a specific geographic segment of the system (e.g., stormwater management, utilities, environmental mitigation, crash walls, sound walls, etc.), these costs are included in at a lump-sum level.

After details were prepared for both typical and non-typical facilities and the cost data developed, it was placed into a cost-stream format based on the stationing of the alignment for each alternative. This format relates the cost directly to the plan and profile drawings and assists in summarizing costs, as well as in the analysis of various alignment segments.

Capital Cost Categories

In accordance with the latest version of the FTA's SCC, the capital cost components of the various alternatives were classified into the following cost categories:

- 10 Transitway and Track Elements
- 20 Station, Stops, Terminals, and Intermodal
- 30 Support Facilities: Yards, Shops, Administration Buildings
- 40 Sitework and Special Conditions
- 50 Systems
- 60 Right-of-Way, Land, and Existing Improvements
- 70 Vehicles
- 80 Professional Services
- 90 Unallocated Contingency

The following provides brief descriptions of these cost categories and their constituent elements. **Appendix H** provides detailed back-up for all of the cost analyses performed as part of this study.

10 Transitway and Track Elements: This category includes those items required to prepare the physical way upon which the transit system will be constructed. The transitway elements can be broken down into three primary types of construction: at-grade construction, aerial structure construction, and retained cut or fill/underground construction. The transitway elements also include traffic control, drainage systems for the transitway, site work, structural elements, erosion and sediment control, roadway paving (BRT only), and ballasted or embedded transitway elements up to the sub-ballast level (LRT only). The track elements (LRT only) include the running rails, ties, ballast, direct

fixation track, embedded track, and special trackwork components (turnouts, crossovers, etc.) associated with the transitway construction.

20 Stations, Stops, Terminals and Intermodal: This category includes all station elements including station structures, platforms, ramps, elevators/escalators, station access, as well as, structured parking facilities where applicable.

30 Support Facilities: Yards, Shops and Administration Buildings: This category includes vehicle maintenance and storage buildings, trackwork for storage of rail vehicles, vehicle cleaning and painting facilities, office support areas, maintenance of way facilities, and general major shop equipment.

40 Sitework and Special Conditions: This category includes demolition, clearing, utility relocation, hazardous materials, stormwater management and environmental mitigation, site structures including retaining, crash and sound walls, pedestrian/bike access, landscaping, vehicle accessways, surface parking lots, and temporary facilities.

50 Systems: This category includes train control and signals (LRT only), traffic signals and crossing protection, traction power substations (LRT only), catenary and third rail (LRT only), communications, fare collection system and equipment, and central control.

60 Right-of-way, Land and Existing Improvements: This category includes the right-of-way necessary for the dedicated transitway. It also includes right-of-way needed for station areas and some maintenance,

storage and stormwater management facilities. Costs for right-of-way are largely dependent on changing economic conditions and the type of development around the Alternatives/Options. The right-of-way estimate is based on current conditions and includes a 50% contingency.

70 Vehicles: This category includes the cost for revenue and non-revenue vehicles.

80 Professional Services: This category includes contingency allowances for preliminary engineering (4%), final design (6%), project and construction management (5%), agency program management (8%), project insurance (2%), permits and review fees (3%), surveys and testing (3%), and start-up costs (1%). These allowances were calculated by applying a percentage to the total construction cost estimated for each cost category (excluding right-of-way and vehicle costs).

90 Unallocated Contingency: This category addresses the unknowns and uncertainties in the project scope and schedule. The unallocated contingency was calculated as 5% of the total of the cost categories listed above, except for the right-of-way, vehicles and professional service categories, which assumed an unallocated contingency of 2% of the total.

Table 4-19 provides a summary of the overall Capital Costs for each of the SMRT Corridor Transit Scenarios, broken down by FTA Standard Cost Categories. Please see Chapter 3 for descriptions of the SMRT Corridor Transit Scenarios.

Table 4-19: Summary of Preliminary SMRT Corridor Transit Scenario Costs

Bus Rapid Transit (BRT) (\$ millions)												
Cost Categories		10 Transitway and Track Elements	20 Station, Stops, Terminals, and Intermodal	30 Support Facilities	40 Sitework and Special Conditions	50 Systems	Categories 10-50 Construction Subtotal	60 Right-of-Way, Land, and Existing Improvements	70 Vehicles	80 Professional Services	90 Unallocated Contingency	Total SMRT Corridor Transit Scenario Cost
Alternative 4 w/Options (East side of MD 5)												
1	Beltway Option 2 (Tunnel crossing under I-495); Hospital Option 1	\$405.9	\$54.2	\$48.3	\$229.0	\$24.0	\$761.4	\$308.1	\$62.2	\$243.5	\$50.3	\$1,425.5
2	Beltway Option 3 (Aerial crossing over I-495); Hospital Option 1	\$163.7	\$54.2	\$48.3	\$230.5	\$24.8	\$521.5	\$315.1	\$62.2	\$166.7	\$36.9	\$1,102.4
3	Beltway Option 5 (Aerial crossing over I-495); Hospital Option 1	\$176.2	\$54.2	\$48.3	\$231.8	\$24.8	\$535.3	\$313.2	\$62.2	\$171.1	\$37.7	\$1,119.5
4	Beltway Option 7D (MD 5 median crossing under I-495); Hospital Option 1	\$209.1	\$58.4	\$48.3	\$228.3	\$24.4	\$568.5	\$260.9	\$68.9	\$181.6	\$38.6	\$1,118.5
5	Beltway Option 7E (MD 5 median crossing under I-495); Hospital Option 1	\$208.4	\$58.4	\$48.3	\$250.0	\$25.0	\$590.1	\$267.2	\$68.9	\$188.5	\$39.9	\$1,154.6
6	Beltway Option 8A (JBA Station and aerial crossing over I-495); Hospital Option 1	\$153.8	\$56.4	\$48.3	\$238.0	\$25.2	\$521.7	\$317.1	\$72.2	\$166.8	\$37.2	\$1,115.0
7	Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$156.4	\$54.2	\$48.3	\$229.8	\$24.5	\$513.2	\$305.1	\$62.2	\$164.1	\$36.3	\$1,080.9
8	JBA Cantilever Option w/ Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$204.0	\$54.2	\$48.3	\$227.6	\$24.2	\$558.3	\$302.6	\$62.2	\$178.5	\$38.8	\$1,140.4
9	JBA Avoidance Option w/Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$235.7	\$65.2	\$48.3	\$229.5	\$24.1	\$602.8	\$301.5	\$62.2	\$192.8	\$41.2	\$1,200.5
Alternative 5 w/Options (West side of MD 5)												
10	Beltway Option 1 (Tunnel crossing under I-495); Hospital Option 1	\$409.0	\$54.2	\$48.3	\$235.4	\$25.1	\$772.0	\$300.6	\$66.6	\$246.9	\$50.9	\$1,437.0
11	Option 6 (Tunnel crossing under I-495); Hospital Option 1	\$409.5	\$54.2	\$48.3	\$233.4	\$24.4	\$769.8	\$298.4	\$66.6	\$246.2	\$50.7	\$1,431.7

Source: Appendix H

Table 4-19: Summary of Preliminary SMRT Corridor Transit Scenario Costs (cont.)

Light Rail Transit (LRT) (\$ millions)												
Cost Categories		10 Transitway and Track Elements	20 Station, Stops, Terminals, and Intermodal	30 Support Facilities	40 Sitework and Special Conditions	50 Systems	Categories 10-50 Construction Subtotal	60 Right-of-Way, Land and Existing Improvements	Category 70 Vehicles	80 Professional Services	90 Unallocated Contingency	Total SMRT Corridor Transit Scenario Cost
Alternative 4 w/Options (East side of MD 5)												
1	Beltway Option 2 (Tunnel crossing under I-495); Hospital Option 1	\$496.8	\$54.2	\$110.6	\$229.6	\$158.6	\$1,049.8	\$308.1	\$170.7	\$335.3	\$68.6	\$1,932.2
2	Beltway Option 3 (Aerial crossing over I-495); Hospital Option 1	\$259.3	\$54.2	\$110.6	\$232.3	\$158.9	\$815.3	\$315.1	\$170.7	\$260.2	\$55.5	\$1,616.8
3	Beltway Option 5 (Aerial crossing over I-495); Hospital Option 1	\$269.5	\$54.2	\$110.6	\$232.3	\$158.5	\$825.1	\$313.2	\$170.7	\$263.3	\$56.1	\$1,628.4
4	Beltway Option 7D (MD 5 median crossing under I-495); Hospital Option 1	This is BRT-only										
5	Beltway Option 7E (MD 5 median crossing under I-495); Hospital Option 1	\$304.7	\$58.4	\$110.6	\$250.5	\$160.0	\$884.2	\$267.2	\$192.6	\$282.7	\$59.0	\$1,685.7
6	Beltway Option 8A (JBA Station and aerial crossing over I-495); Hospital Option 1	\$244.5	\$56.4	\$110.6	\$238.4	\$161.5	\$811.4	\$317.1	\$170.7	\$259.0	\$55.4	\$1,613.6
7	Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$246.4	\$54.2	\$110.6	\$230.5	\$157.8	\$799.5	\$305.1	\$170.7	\$255.2	\$54.5	\$1,585.0
8	JBA Cantilever Option w/ Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$300.8	\$55.2	\$110.6	\$228.3	\$159.4	\$854.3	\$302.6	\$170.7	\$272.7	\$57.5	\$1,657.8
9	JBA Avoidance Option w/ Beltway Option 9 (Aerial crossing over I-495); Hospital Option 1	\$338.6	\$65.2	\$110.6	\$230.1	\$161.4	\$905.9	\$301.5	\$170.7	\$289.3	\$60.4	\$1,727.8
Alternative 5 w/Options (West side of MD 5)												
10	Beltway Option 1 (Tunnel crossing under I-495); Hospital Option 1	\$503.0	\$55.2	\$110.6	\$236.2	\$159.8	\$1,064.8	\$300.6	\$170.7	\$340.0	\$69.3	\$1,945.4
11	Option 6 (Tunnel crossing under I-495); Hospital Option 1	\$503.7	\$55.2	\$110.6	\$233.7	\$160.5	\$1,063.7	\$298.4	\$170.7	\$339.6	\$69.2	\$1,941.6

Source: Appendix H

4.e. Operations and Maintenance Costs

Operations and Maintenance (O&M) cost estimates are important in the planning process for major transit projects because design-year projections are one of the inputs required to determine measures of cost effectiveness. An O&M cost model estimates the annual cost to operate, maintain and administer a transit system for each of the Ridership Scenarios.

O&M costs are expressed as the annual total of employee earnings and fringe benefits, contract services, materials and supplies, utilities, and other day-to-day expenses incurred in the operation and maintenance of a transit system. It is important to include not only the costs associated with the LRT and BRT Priority Service within the right-of-way but also the concomitant costs associated with changes in providing the feeder bus system (commuter, local, and shuttle/commuter) supporting the priority service.

O&M Cost Approach and Model

The general assumptions for the SMRT Life Cycle Costing are as follows:

- Approach and assumptions consistent with the Federal Transit Administration's New Starts and Small Starts Guidance on costing
- All costs are reported in 2016 Dollars
- 2040 Horizon Year travel forecasts and service are used as basis for cost estimates
- 20-year project life used for life-cycle costing;
- Annualization factors of 250 weekdays and 114 holiday weekend days of service
- Weekday priority service span 4:30AM to Midnight,
- 7 hours peak service, 6 hours midday service, and 6.5 hours night service
- Holiday/Weekend priority service extends 6AM to 7PM
- 13 hours of night service
- Feeder bus service operates during the same time period as the priority service (with some exceptions in Charles County).

The SMRT O&M cost model is based on the fully allocated O&M cost model developed for the 2008 MTA CCT and Purple Line Projects and updated with local parameters. Both studies used the same costing model which was validated to three years of agency and National Transit Database (NTD) statistics. The NTD is the FTA's national database of statistics for the transit industry. Different unit

costs are generated for BRT and LRT service. For this study, the model was adjusted from 2007 dollars to 2016 dollars using the Bureau of Labor Statistics Consumer Price Index.

Key BRT and LRT unit cost factors include:

- Number of vehicles in maximum service
- Number of directional route miles (track miles)
- Number of annual passenger car revenue miles
- Number of annual passenger car revenue hours

The updated O&M cost model used to estimate the LRT and BRT overall O&M costs for SMRT are shown below in **Table 4-20** for BRT and **Table 4-21** for LRT:

Table 4-20: BRT O&M Cost Model

O&M Cost	Cost Per Peak Vehicles	Cost Per Route Mile	Cost Per Revenue Mile	Cost Per Revenue Hours
From Source	\$67,727	\$79,642	\$5.11	\$58.52
Base Year	2007	2007	2007	2007
2016 \$ factor	1.164	1.164	1.164	1.164
2016 \$ Unit Costs	\$78,834	\$92,703	\$5.95	\$68.12

Source: Appendix H

Table 4-21: LRT O&M Cost Model

O&M Cost	Cost Per Peak Vehicles	Cost Per Route Mile	Cost Per Revenue Mile	Cost Per Revenue Hours
From Source	\$70,645	\$160,325	\$3.22	\$54.43
Base Year	2007	2007	2007	2007
2016 \$ factor	1.164	1.164	1.164	1.164
2016 \$ Unit Costs	\$82,231	\$186,618	\$3.75	\$63.36

Source: Appendix H

For feeder service, the changes in the O&M costs from the No-Build condition was estimated using the models from the CCT and Purple Line studies updated with local information. The Charles County VanGo unit costs were derived from data on operating costs per Annual Revenue Mile and Annual Revenue Hour from the MTA database of system costs. For Prince George's County service, it was assumed that the unit costs were 90% of the Montgomery County local service models used for the CCT and Purple Line. These assumptions result in the local service cost model(s) shown in **Table 4-22**.

Total O&M Costs for Ridership Scenarios

The total annual O&M costs for each Ridership Scenario are shown in **Table 4-23**. These highlight the higher O&M costs for BRT overall versus LRT. The higher costs for Runs 4a, 4b and 4c are due to the longer alignment and new transit station at JBA that tests Beltway Crossing Option 8A. It is noted that the Extended BRT (Run 2b) has lower O&M costs than the other BRT Alternatives once the shift in feeder service is taken into account. Vehicle replacement costs have not been included in the O&M estimate. See **Appendix I** for detailed information regarding the O&M cost estimates.

Table 4-22: Additional O&M Feeder Service Cost Model

Provider	Annual Cost Per Vehicle	Annual Cost Per Revenue Mile	Annual Cost Per Revenue Hour
WMATA	\$89,673.22	\$4.24	\$70.25
MTA	\$77,412.22	\$3.90	\$66.89
Prince George's Co. The Bus	\$86,938.81	\$2.10	\$54.12
Charles Co. VanGo and Shuttle	N/A	\$4.11	\$78.80

Note: Table 4-22 reflects Feeder Bus Cost Model unit cost factors used to estimate costs reflected in Table 4-23.
Source: Appendix H

Table 4-23: Total Annual O&M Costs by Ridership Forecasting Model Run Scenario (\$ millions)

Ridership Scenario	Description	LRT			BRT		
		SMRT Service	Feeder Service	Total	SMRT Service	Feeder Service	Total
1a & 1b	LRT Alt 4 with Beltway Option 2, Hospital Option 1	\$23.5	\$0.8	\$24.3	\$33.7	\$0.8	\$34.5
2b	Extended BRT	N/A	N/A	N/A	\$36.0	\$(5.1)	\$30.9
3a & 3b	LRT Alt 5 with Beltway Option 1, Hospital Option 1	\$23.7	\$0.8	\$24.5	\$34.9	\$0.8	\$35.7
4a & 4b	LRT Alt 4 with Beltway Option 8a, Hospital Option 1, JBA	\$24.0	\$0.8	\$24.8	\$35.6	\$0.8	\$36.4
4c	LRT ALT 5 with Beltway Option 8A, Hospital 1, JBA, no Camp Springs	\$24.0	\$0.8	\$24.8	N/A	N/A	N/A
5a & 5b	LRT Alt 4 with Beltway Option 7, Hospital Option 1	\$24.2	\$0.8	\$25.0	\$34.8	\$0.8	\$35.6
7a & 7b	LRT Alt 4 with Beltway Option 7, Hospital Option, Build Highway	\$23.5	\$0.8	\$24.3	\$33.7	\$0.8	\$34.5

Source: Appendix H

5. ENVIRONMENTAL CONSEQUENCES, LAND USE AND ZONING, AND ECONOMICS

5a. Resources Assessed and Potential Consequences



A detailed Environmental Inventory was completed by MTA for the SMRT Study in May 2016 (available as a separately bound technical report) using existing data for the SMRT study area and Project corridor obtained via the Watershed Resources Registry (WRR), various GIS datasets, previous studies, and direct resource regulatory agency coordination (see **Appendix L**).

Based on information gathered for the SMRT Environmental Inventory, this section highlights potential consequences of the SMRT Project on environmental resources, and presents next steps/mitigation strategies that will be considered during NEPA. Resources assessed include:

- Property and Community Facilities
- Parkland
- Environmental Justice Communities
- Cultural Resources
- Hazardous Materials
- Streams, Wetlands and 100-Year Floodplain
- Woodlands
- Rare, Threatened and Endangered Species and
- Prime Farmland Soils and Soils of Statewide Importance

With the above resources shown on project mapping, the SMRT Project team developed concept level alternatives, options and station areas that avoid and/or minimize impacts to the maximum extent practicable (**Appendix B1**). Impacts that are assumed “unavoidable” for planning purposes have been calculated, discussed with regulatory agencies, and are shown in detail for alternatives/options in **Table 5-1**. The following text focuses on environmental consequences of the SMRT Corridor Transit Scenarios as presented in **Table 6-1**.

The following topics were not assessed as part of this study, but will be assessed during NEPA: Air Quality; Noise/Vibration; and Tribal Resources.

Property and Community Facilities

Preliminary right-of-way investigations show a considerable portion of property adjacent to MD 5/ US 301 within the SMRT Project corridor is owned by the MDOT's SHA or MTA. Additionally, WMATA and M-NCPPC

own properties within the Project corridor where alternatives/options and station areas are proposed, but not necessarily adjacent to MD 5/US 301. In addition to state and county-owned property, a number of private property owners (residential and business/commercial) do also exist, and could be impacted by the proposed alternatives/options and station areas. In addition to right-of-way, major communities and community facilities (e.g., schools, religious facilities, cemeteries) were inventoried within the SMRT Project corridor.

Based on the preliminary right-of-way information obtained for this Study, between 72 to 94 businesses/commercial and 41 to 55 residential properties; one school (Prince George's Community College) and up to seven religious facilities; could be affected depending on the SMRT Corridor Transit Scenario chosen. The SMRT Project team will continue to meet with and engage property owners, communities and community facilities to keep them informed about the project. During a NEPA study, impacts to communities, businesses, individual residences and community facilities will be avoided or minimized where possible. If property acquisition is required for right-of-way, acquisition proceedings will conform to the requirements set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and the Uniform Relocation Act Amendments of 1987 (as amended).

Parkland

Ten local parks, trails and stream valley parks (SVP) were identified within the SMRT Project corridor including:

- Andrews Manor Park;
- Auth Village Park;
- Henson Creek SVP;
- Manchester Estates Park;
- Michael J. Polley Neighborhood Park;
- Piscataway Creek SVPs I and II;
- Rose Creek Connector Trail;
- Tinkers Creek SVP;
- Indian Head Rail Trail; and
- Waldorf Natural Resource Barracks.

All alternatives, options and station areas proposed would avoid impacts to parkland, with the exception of Mainline Alternative 5, which could impact 0.13 acre of Tinkers Creek SVP. The SMRT Project team would coordinate

during NEPA with the appropriate officials with jurisdiction over any unavoidable impacts to parkland (e.g., M-NCPPC, Maryland Department of Natural Resources (MDNR). A Section 4(f) analysis would also be completed for any unavoidable impacts to any publicly-owned public parks or recreational facilities (USDOT, 1966).

Environmental Justice (EJ)

Many areas of the Washington metropolitan region, including areas within the MD 5/US 301 corridor, contain a higher percentage of low-income and/or minority populations, as compared to the region as a whole. Within the SMRT Project corridor, population information for areas within a quarter mile were used to identify predominantly minority or low income communities (2010 U.S. Census Block Groups). Larger minority populations were identified in the urban areas inside the Capital Beltway in Prince George's County and east of White Plains in Charles County. While the number of individuals living in poverty is lower in the SMRT study area than countywide average, the highest poverty levels lie in the northern and southern ends of the corridor. Field reviews have shown evidence of a possible homeless community along MD 925 in Waldorf.

Depending on the SMRT Corridor Transit Scenario chosen, two to three EJ communities could possibly be affected. Per Executive Order (EO) 12898, it is the policy of MDOT and MTA to ensure that no disproportionately high or adverse effects result to minority or low-income populations as a result of MDOT/MTA funded projects. Additional socioeconomic analyses will be conducted during NEPA to determine precisely where EJ areas exist and whether they could be affected (positively or negatively) by the SMRT Project. Subsequent stages of project development will require in-depth field studies and public involvement to make those determinations. Evaluation of the location, needs, and concerns of these groups will be conducted to ensure that the project would not disproportionately or adversely affect any EJ populations. Additionally, if during NEPA any homeless communities are identified within the SMRT Project corridor, MDOT/MTA will use a best practices guide for homeless encampments on public right-of-way.

Cultural Resources

Nine sites that are eligible for listing on the National Register of Historic Places (NRHP) resources were identified within the SMRT Project corridor, and are depicted in **Appendix B1** as "NRE" (National Register Eligible).

They are:

- Bells Methodist Church;
- Hunt Casket Shop;
- William T. Robinson House;
- Marlow-Huntt Store;
- Marlow-MacPherson House;
- T.B. Colored School #1;
- Morningside Historic District;
- Old Waldorf School; and
- Gwynn Park.

In addition to the known NRE sites listed above, during NEPA, the SMRT Project team will coordinate with the Maryland Historical Trust (MHT) to determine National Register eligibility for a number of sites that have been identified as "potentially historic." Seven archaeological sites were identified within the SMRT Project corridor; however, none are on the NRHP or listed as NRE. Coordination with MHT will occur during NEPA to determine if these archaeological sites are NRE, and to determine if an archaeological Phase I/II study is required to examine any untested areas.

Depending on the SMRT Corridor Transit Scenario chosen, 7 to 17 historic or potentially historic sites would be affected (some may no longer retain eligibility due to changes in setting and/or demolition). No archaeological sites are anticipated to be impacted. During NEPA, the SMRT Project team will update the cultural resources review and consult with MHT on any potential effects to historic properties and/or archaeological sites. A Section 4(f) analysis would be completed for any unavoidable impacts to historic properties.

Hazardous Materials

A review of environmental agency databases was conducted in 2010, identifying 73 known sites with potential hazardous materials along the SMRT Project corridor. These sites consisted mostly of gas stations, dry cleaners, and automotive service stations. In August 2015, locations of gas stations and dry cleaners along the SMRT Project corridor were updated using internet resources and a windshield survey (**Appendix B1**). Depending on the SMRT Corridor Transit Scenario chosen, 10 to 14 sites with potential hazardous materials could be affected.

During NEPA, a more detailed database search will be conducted (e.g., Environmental First Search, Inc.) to confirm potential hazardous material locations in and adjacent to the SMRT Project corridor and determine whether Phase 1 Environmental Site Assessment and/

or Initial Site Assessment is required. Possible avoidance options will be investigated if necessary. Properties where hazardous materials are generated or stored, and locations of past hazardous materials releases, require precautions and possibly site clean-up requirements as part of the right-of-way acquisition process, prior to construction.

Streams

The SMRT Project corridor contains approximately 12 miles (mi.) of Use Class I streams within four sub-watersheds. The Maryland Department of the Environment (MDE) Anti-degradation Policy ensures designated Use Class I streams are protected and maintained for the basic uses of water contact recreation, fishing, protection of aquatic life and wildlife, and agricultural and industrial water supply. Generally, no instream work is permitted in Use Class I streams during the period of March 1 through June 15, inclusive, during any year. These instream closure periods have been established to protect streams during spawning and “fish runs.” Impaired stream segments were identified throughout the SMRT Project corridor, with the exception of streams within the Zekiah Swamp sub-watershed, which meet MDE water quality criteria. While many of the streams within the Project corridor are designated as impaired, some headwater streams exceed the minimum water quality standard for their designated Use Class (i.e., MDE-designated Tier II streams). To comply with the federal Clean Water Act (1972), streams exceeding minimum water quality standards should be protected from degradation that can be caused by nearby development/land use changes.

Depending on the SMRT Corridor Transit Scenario chosen, 11 to 12 stream crossings could occur, some of which already exist due to current infrastructure:

- Meetinghouse Branch;
- Paynes Branch;
- Pea Hill Branch;
- Piscataway Branch;
- Timothy Branch;
- Mattawoman Creek;
- Piney Branch; and
- Unnamed Tributaries to Mattawoman Creek, Henson Creek and Piscataway Creek.

During NEPA, MDOT/MTA will coordinate with regulatory agencies regarding potential effects due to any changes in stream hydrology resulting from stormwater runoff and deforestation within the drainage basin. Total Maximum Daily Load (TMDLs) or specific pollutant thresholds are

required for 1st-through 4th-order streams in all study area sub-watersheds except Zekiah Swamp. The SMRT Project team will also work with MDE to determine Best Management Practices (BMPs) appropriate for meeting TMDL requirements, as needed. Mitigation opportunities may consider larger projects such as to restoring developed flood prone areas to natural floodplain habitat, repairing eroded streambanks, restoring fish habitat and improving water quality (in areas that can be improved).

Impacts to Tier II stream segments, or watersheds with no assimilative capacity, must be offset (e.g., 1:1 tree replacement), and more stringent erosion and sediment control must be used to insure protection of water quality downstream. Tree replacement could occur where proposed alternatives require impacts to existing contiguous forest or in non-forested areas near headwater streams within the same watershed, and in impervious-abundant settings where community cooling and additional stormwater runoff treatments are needed.

Wetlands

Wetlands were identified within 201 acres of the SMRT Project corridor, the majority of which are forested-shrub, and are associated with Piscataway Creek, Mattawoman Creek and Zekiah Swamp. Three Wetlands of Special State Concern (WSSC) were identified outside the SMRT Project corridor, but within the study area.

Depending on the SMRT Corridor Transit Scenario chosen, 10.4 to 14.1 acres of wetland could be affected. No direct impacts are anticipated to WSSC. Under the Section 404 of the Clean Water Act, impacts to Waters of the U.S., including wetlands and open water features, must be avoided, minimized, or mitigated to ensure that there is no net loss of functions and values of jurisdictional wetlands. To the extent practicable, future design should incorporate avoidance and minimization of impacts to known wetland areas. Where avoidance and minimization would not be practicable, mitigation for impacts to wetlands could be achieved through the use of temporary and permanent BMPs. A Section 404 permit would likely be required from the U.S. Army Corps of Engineers (USACE) to authorize placement of dredge or fill material in any Waters of the U.S. including wetlands and open water features. Prior to application for a permit, a wetland delineation survey would be conducted, including a jurisdictional determination with MDE and USACE. This would include documented wetland boundaries and an assessment of unavoidable impacts to jurisdictional resources.

100-Year Floodplain

One hundred-year floodplains mapped by the Federal Emergency Management Administration (FEMA) are associated with nine stream systems within the SMRT Project corridor:

- Henson Creek;
- Meetinghouse Creek;
- Tinkers Creek;
- Pea Hill Branch;
- Burch Branch;
- Piscataway Creek;
- Timothy Branch;
- Piney Branch; and
- Mattawoman Creek.

Depending on the SMRT Corridor Transit Scenario chosen, 7.3 to 10.1 acres of floodplain could be affected. Floodplain boundaries from FEMA Digital Flood Insurance Rate Maps (DFIRMS) were used to calculate impacts for this study. Additional floodplains may exist for smaller streams that are not mapped by FEMA. During NEPA, the floodplains of these smaller streams would be determined by use of existing Flood Information Studies, using boundaries observed through field investigations or from the results of hydrologic and hydraulic (H&H) analysis. The SMRT Project team would coordinate with MDE on potential impacts to 100-year floodplains.

Woodlands

Review of the WRR shows expanses of woodlands (with potential specimen trees), wetlands, and other natural lands exist within the remaining undeveloped areas within the study area and adjacent to the SMRT Project corridor, providing sensitive Forest Interior Dwelling Species (FIDS) habitat. Thick forests border Paynes Branch and Meetinghouse Branch on the west side of MD 5; both sides of MD 5 south of Surratts Road extending south through the Piscataway Creek SVP until south of the Prince George's County line; and both sides of US 301 in Charles County near Billingsley Road. Depending on the SMRT Corridor Transit Scenario chosen, 104.7 to 132.9 acres of woodland, of which 63 to 78.5 acres is classified as FIDS habitat, could be affected.

A forest stand delineation and/or roadside tree survey will be completed during NEPA to fully assess the potential for impacts on woodlands, specimen trees and vegetation within the study corridor. Maryland has implemented a framework for habitat and resource protection that includes identification, project review and compliance, and recommended protection through local master plans and zoning. MDNR Wildlife and Heritage Service (WHS) guidelines for development adjacent to and/or within FIDS

habitat will be used to minimize FIDS impacts and supporting native plants and wildlife. Mitigation could include planting new trees, which may result in benefits such as reduced stormwater runoff, fewer unhealthy air quality days, creation of less heat-island effects and increased community cooling.

Rare, Threatened and Endangered (RTE) Species

State-listed RTE species and/or their habitat are known to exist near or within the SMRT Project corridor. Watersheds designated by MDNR as "Stronghold Watersheds," also known as "Maryland Healthy Watersheds," are the State's most important watersheds in need of protection where RTE freshwater fish, amphibians, reptiles, or mussel species have the highest numbers (abundance and number of occurrences). These watersheds have been identified in Piscataway Creek, Zekiah Swamp and Western Branch sub-watersheds.

Regardless of the SMRT Corridor Transit Scenario chosen, impacts to RTE are not anticipated. Coordination will continue with DNR and U.S. Fish and Wildlife Service (USFWS) during NEPA regarding sensitive species and existing and potential for RTEs (and their habitats). Through permit review, MDE supports the recommendation by MDNR to encourage stringent enforcement of all appropriate BMPs for sediment and erosion control during all work near the Cheltenham area, Mattawoman Creek, and Zekiah Swamp and to protect water quality and hydrology in identified habitat areas near White Plains. As agencies work together to protect RTE species habitat within designated Stronghold Watersheds, they will at the same time protect the integrity of stream systems for water quality benefits.

Cumulative Impacts

Further analysis and agency coordination will need to be performed by MDOT/MTA during NEPA, based on the 2016 Environmental Inventory conducted for this study. Resources that may be cumulatively impacted by future projects when combined with other past, present, and reasonably foreseeable future projects may include wildlife habitat loss, noise impacts, economic impact, and direct/indirect loss of wetlands.

Summary

Table 5-2 summarizes impacts to all of the environmental resources evaluated in this study using the SMRT Corridor Transit Scenario defined in Chapter 3 (see **Table 3-1**).

Table 5-1: Comparison of Resources Affected by Potential SMRT Alternatives and Options¹

	Mainline Alternative 4 ⁷		Mainline Alternative 5 ⁷		Beltway Option 1 (w/Alt. 5) ³		Beltway Option 2 (w/Alt. 4) ³		Beltway Option 3 (w/Alt. 4) ³		Beltway Option 5 (w/Alt. 4) ³		Option 6 (w/Alt. 5) ³	
	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles
Environmental/Community Impacts														
Socioeconomic Resources														
Properties/Resources Potentially Displaced														
Residential (No. of Structures)	14	29	3	29	+9	0	+5	0	+10	0	+8	0	+9	0
Other Business/Commercial (No. of Structures)	26	50	41	50	+3	0	+4	0	+3	0	+3	0	+2	0
Environmental Justice Areas (No.) ²	0	2	1	2	0	0	0	0	0	0	0	0	0	0
Churches (No.) ⁵	2	4	2	4	0	0	0	0	0	0	0	0	0	0
Schools (No.) ⁶	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Cemeteries (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Environment														
Stream Crossings														
New Stream Crossing (No.)	0	2	0	2	0	0	0	0	+1	0	+1	0	+1	0
Existing Stream Crossing (No.)	6	1	6	1	+1	0	+1	0	0	0	0	0	0	0
Wetland (Acres)	4.79	7.52	5.29	7.52	+0.18	0	+0.96	0	+1.11	0	+1.29	0	+0.08	0
FEMA 100-year Floodplain (Acres)	7.05	4.50	8.64	4.50	0	0	0	0	0	0	0	0	0	0
Forest (Acres)	61.01	47.36	57.38	47.36	+3.84	0	+6.97	0	+10.22	0	+7.18	0	+2.90	0
Potential FIDS Habitat (Acres)	39.78	17.91	42.23	17.91	0	0	0	0	0	0	0	0	0	0
Hazardous Material Sites (No.)	4	4	8	4	0	0	0	0	0	0	0	0	0	0
Sensitive Species Project Review Areas (No.)	2	0	2	0	0	0	0	0	0	0	0	0	0	0
County Parks (Acres)	0	0	0.13	0	0	0	0	0	0	0	0	0	0	0
Cultural Resources														
Historic Sites														
NR Sites or MIHP Recommended Eligible (No.)	2 ⁴	0	2 ⁴	0	0	0	0	0	0	0	0	0	0	0
MIHP Eligibility Not Recommended (No.)	3	0	5	0	+3	0	0	0	0	0	0	0	+6	0
MIHP Not Evaluated (No.)	0	1	0	1	+1	0	+1	0	+1	+1	0	0	+1	0
MIHP Demolished (No.)	2 ⁴	0	2 ⁴	0	+1	0	0	0	0	0	0	0	+1	0
Engineering and Operations														
Length of Alignment (miles)	16.5		16.7		+2.3		+2.3		+2.3		+2.3		+2.3	
Length of Alignment by County (miles)	10.6	5.9	10.8	5.9	+2.3	0	+2.3	0	+2.3	0	+2.3	0	+2.3	0
Length of Structures (Aerial/Tunnel)	1,695 LF (A)		1,570 LF (A)		+80 LF (A), +6,500 LF (T)		+80 LF (A), +6,100 LF (T)		+2,310 LF (A)		+3,450 LF (A)		+80 LF (A), +6,900 LF (T)	

Source: The Wilson T. Ballard Company / Sabra, Wang & Associates JV

Notes:

¹ Potential Environmental/Community Impacts are estimated based on GIS desktop surveys.

² Environmental Justice Area impacts are determined based on Census Tracts exhibiting potential EJ indicators (i.e., low-income, minority).

³ Add values to Mainline Alternative 4 or 5 to determine total length and impacts for each given Option.

⁴ The Marlow-MacPherson House is counted as both an MIHP Recommended Eligible site and MIHP Demolished site because the house itself has been demolished, but the property is NR eligible and the “carriage house” still stands.

⁵ Prince Cross of Calvary Church CLGI - 6416 Old Branch Avenue; Camp Springs Masonic Temple - 6311 Old Branch Avenue; Waldorf African Methodist Episcopal Church - 12353 Washington Square; Eyes of Faith Ministries - Pinefield Station @ Substation Road; Waldorf Christian Center Church - Pinefield Station at Substation Road; Perfecting Saints Baptist Church - 6504 Old Branch Avenue; Truth, Righteousness and Love - 6415 Old Alexandria Ferry Road; God's Will Christian Church - 6611 Old Alexandria Ferry Road

⁶ Prince George’s Community College (Skilled Trade) - 6400 Old Branch Avenue

⁷ Proposed Maintenance Facility (White Plains) Environmental Impacts include: Forest - 76.09 Acres, Wetland - 2.54 Acres, Class 1 FIDS - 4.27 Acres; Impacts are not included in the Summary of Impacts Table.

Table 5-1: Comparison of Resources Affected by Potential SMRT Alternatives and Options¹ (cont.)

	Beltway Option 7D (w/Alt.4 - BRT only)³		Beltway Option 7E (w/Alt.4 - LRT and BRT)³		Beltway Option 7F (w/Alt.4 - BRT only)³		Beltway Option 8A (w/Alt. 4)³		Beltway Option 9 (w/Alt. 4)³		JBA Cantilever Option (w/Alt. 4)³		JBA Avoidance Option Tie to Beltway Option 2, 3, 5 or 9 (w/Alt. 4)³	
	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles
Environmental/Community Impacts														
Socioeconomic Resources														
Properties/Resources Potentially Displaced														
Residential (No. of Structures)	0	0	+5	0	0	0	0	0	+6	0	0	0	0	0
Other Business/Commercial (No. of Structures)	-3	0	-2	0	-3	0	+4	0	+3	0	0	0	-2	0
Environmental Justice Areas (No.)²	0	0	0	0	0	0	+1	0	0	0	0	0	0	0
Churches (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schools (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cemeteries (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Environment														
Stream Crossings														
New Stream Crossing (No.)	0	0	0	0	0	0	+2	0	+1	0	0	0	0	0
Existing Stream Crossing (No.)	+1	0	+1	0	+1	0	0	0	0	0	0	0	0	0
Wetland (Acres)	-0.96	0	-0.96	0	-0.96	0	+2.73	0	+1.34	0	-0.74	0	-1.44	0
FEMA 100-year Floodplain (Acres)	-1.11	0	-1.11	0	-1.11	0	+1.71	0	0	0	-0.43	0	-1.11	0
Forest (Acres)	-2.88	0	+0.22	0	-2.88	0	+25.38	0	+13.52	0	-2.79	0	-3.80	0
Potential FIDS Habitat (Acres)	0	0	0	0	0	0	+15.45	0	0	0	0	0	0	0
Hazardous Material Sites (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sensitive Species Project Review Areas (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County Parks (Acres)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cultural Resources														
Historic Sites														
NR Sites or MIHP Recommended Eligible (No.)	0	0	0	0	0	0	+1	0	0	0	0	0	0	0
MIHP Eligibility Not Recommended (No.)	0	0	0	0	0	0	+3	0	0	0	0	0	0	0
MIHP Not Evaluated (No.)	0	0	+1	0	0	0	0	0	+1	0	0	0	0	0
MIHP Demolished (No.)	+3	0	+1	0	+3	0	0	0	0	0	0	0	0	0
Engineering and Operations														
Length of Alignment (miles)	+2.3		+2.5		+2.3		+2.7		+2.2		0		0	
Length of Alignment by County (miles)	0	+2.5	+2.3		+2.3	0	0	0	+2.2	0	0	0	0	0
Length of Structures (Aerial/Tunnel)	+8,570 LF (A)		+8,925 LF (A)		+8,755 LF (A)		+590 LF (A)		+1,430 LF (A)		+6,525 LF (A)		+10,090 LF (A)	

Source: The Wilson T. Ballard Company / Sabra, Wang & Associates JV

Notes:

¹ Potential Environmental/Community Impacts are estimated based on GIS desktop surveys.

² Environmental Justice Area impacts are determined based on Census Tracts exhibiting potential EJ indicators (i.e., low-income, minority).

³ Add values to Mainline Alternative 4 or 5 to determine total length and impacts for each given Option.

Table 5-1: Comparison of Resources Affected by Potential SMRT Alternatives and Options¹ (cont.)

	JBA Avoidance Option Tie to Beltway Option 8A (w/Alt. 4) ³		Brandywine Crossing Shopping Center Option (w/Alt. 4/5) ³		Mattawoman Beantown Option (w/Alt. 4/5) ³		Hospital Option 1 (w/Alt. 4/5) ³		Hospital Option 2 (w/Alt. 4/5) ³		Hospital Option 3 (w/Alt. 4/5) ³		Hospital Option 4A (w/Alt. 4/5) ³	
	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles	Prince George's	Charles
Environmental/Community Impacts														
Socioeconomic Resources														
Properties/Resources Potentially Displaced														
Residential (No. of Structures)	0	0	0	0	+2	0	0	0	0	0	+8	0	0	0
Other Business/Commercial (No. of Structures)	-2	0	0	0	+1	-2	0	0	0	0	0	0	0	0
Environmental Justice Areas (No.) ²	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Churches (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schools (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cemeteries (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Environment														
Stream Crossings														
New Stream Crossing (No.)	0	0	0	0	0	+1	0	0	0	0	0	0	0	0
Existing Stream Crossing (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wetland (Acres)	-1.36	0	0	0	+0.10	-1.12	+0.09	0	+0.09	0	+0.22	0	0	0
FEMA 100-year Floodplain (Acres)	-1.11	0	+0.32	0	-0.09	-3.35	+0.03	0	+0.03	0	+0.03	0	+0.03	0
Forest (Acres)	-3.76	0	-0.95	0	-0.69	+1.72	-0.92	0	+1.78	0	+1.83	0	+4.11	0
Potential FIDS Habitat (Acres)	0	0	+1.32	0	+0.17	+1.71	+2.12	0	+3.77	0	+3.70	0	+3.46	0
Hazardous Material Sites (No.)	0	0	+1	0	0	0	+1	0	+1	0	+1	0	+3	0
Sensitive Species Project Review Areas (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County Parks (Acres)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cultural Resources														
Historic Sites														
NR Sites or MIHP Recommended Eligible (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MIHP Eligibility Not Recommended (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MIHP Not Evaluated (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MIHP Demolished (No.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Engineering and Operations														
Length of Alignment (miles)	0		+0.1		+0.1		+0.1		+0.1		+0.1		+0.2	
Length of Alignment by County (miles)	0	0	+0.1	0	0	+0.1	+0.1	0	+0.1	0	+0.1	0	+0.2	0
Length of Structures (Aerial/Tunnel)	+8,890 LF (A)		0		+575 LF (A)		0		0		0		0	

Notes:

¹ Potential Environmental/Community Impacts are estimated based on GIS desktop surveys.

² Environmental Justice Area impacts are determined based on Census Tracts exhibiting potential EJ indicators (i.e., low-income, minority).

³ Add values to Mainline Alternative 4 or 5 to determine total length and impacts for each given Option.

Source: The Wilson T. Ballard Company / Sabra, Wang & Associates JV

Table 5-2: Summary of Environmental Impacts for Potential SMRT Corridor Transit Scenarios

		ENGINEERING		SOCIOECONOMIC/CULTURAL												NATURAL ENVIRONMENT						
SMRT Corridor Transit Scenario		Length of Alignment (Miles) ¹	Length of Structures (LF) - Tunnel (T), Aerial (A)	Residential Properties ²	Business/Commercial Properties ²	Churches	Schools	Cemeteries	County Parks (Acres)	Environmental Justice Areas	NR Sites or MIHP Recommended Eligible (No.) ⁶	MIHP Eligibility Not Recommended (No.)	MIHP Not Evaluated (No.)	MIHP Demolished (No.) ⁶	Hazardous Material Sites	Stream Crossings (New)	Stream Crossings (Existing)	Wetlands (Acres)	100-Year FEMA Floodplain (Acres) ³	Woodlands (Acres)	Potential FIDS Habitat (Acres)	Sensitive Species Project Review Areas
1	Beltway Option 2 (Tunnel under I-495); Hosp. Option 1 ⁵	19.0	2,350 (A) 6,100 (T)	50	79	6	0	0	0	2	2	3	2	2	10	3	8	12.4	8.2	114.5	63.0	2
2	Beltway Option 3 (Aerial over I-495); Hosp. Option 1 ⁵	19.0	4,580 (A)	55	78	6	0	0	0	2	2	3	2	2	10	4	7	12.5	8.4	117.7	63.0	2
3	Beltway Option 5 (Aerial over I-495); Hosp. Option 1 ⁵	19.0	5,720 (A)	53	78	6	0	0	0	2	2	3	1	2	10	4	7	12.7	8.4	114.6	63.0	2
4	Beltway Option 7D (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	19.0	10,840 (A)	45	72	6	0	0	0	2	2	3	1	5	10	3	8	10.4	7.4	104.7	63.0	2
5	Beltway Option 7E (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	19.2	11,195 (A)	50	73	6	0	0	0	2	2	3	2	2	10	3	8	10.4	7.4	107.8	63.0	2
6	Beltway Option 8A (JBA Station & aerial over I-495); Hosp. Op. 1 ^{4 5}	19.4	2,860 (A)	45	79	6	0	0	0	3	3	6	1	2	10	5	7	14.1	10.1	132.9	78.5	2
7	Beltway Option 9 (Aerial over I-495); Hosp. Option 1 ⁵	18.9	3,700 (A)	51	78	6	0	0	0	2	2	3	2	2	10	4	7	12.7	8.4	121.0	63.0	2
8	JBA Cantilever Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Op. 1 ⁵	18.9	10,215 (A)	51	78	6	0	0	0	2	2	3	2	2	10	4	7	12.0	8.0	118.2	63.0	2
9	JBA Avoidance Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Op. 1 ⁵	18.9	13,780 (A)	51	76	6	0	0	0	2	2	3	2	2	10	4	7	11.3	7.3	117.2	63.0	2
	Alternative 5 w/Options (West side of MD 5)⁹																					
10	Beltway Option 1 (Tunnel under I-495); Hosp. Option 1 ⁵	19.2	2,225 (A) 6,500 (T)	41	94	6	1	0	0.13	3	2	8	2	3	14	3	8	12.1	10.1	107.8	65.5	2
11	Option 6 (Tunnel under I-495); Hosp. Option 1 ⁵	19.2	2,225 (A) 6,900 (T)	41	93	6	1	0	0.13	3	2	11	2	3	14	4	7	12.0	10.0	106.7	65.4	2
	2010 Corridor Preservation Study - Preferred Alignment																					
	Mainline Alternative 4, Beltway Option 2 (Tunnel under I-495)	18.7	6,600 (T)																			

Source: The Wilson T. Ballard Company / Sabra, Wang & Associates JV

Notes:

¹ Length of Alignment as measured from Branch Avenue Metrorail Station to the proposed White Plains Station

² Property Impacts = potential displacements within Limit of Disturbance and assumed Station infrastructure envelope

³ The floodplain acreage includes county designated floodplain present in the Wesson Drive area

⁴ Beltway Option 8A impacts are based on an at-grade crossing of Allentown Rd. If Aerial Option selected, add 1,500 LF to Length of Structure total and subtract 2 crossings from the Intersection Crossings total

⁵ Options include Brandywine Crossing Shopping Center Option and Mattawoman Beantown Option

⁶ The Marlow-MacPherson House is counted as both MIHP Recommended Eligible and MIHP Demolished because the house has been demolished, but the property is NR eligible and the "carriage house" still stands.

 Legend for Comparison of Alternatives

BETTER	NEUTRAL	WORSE
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 Legend for I-495 Crossing Type

MD 5 AT-GRADE	TUNNEL	AERIAL
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5b. Existing and Proposed Land Use and Zoning in the SMRT Study Area

Land use and zoning maps, along with Comprehensive Master Plans, are used to evaluate the compatibility of a proposed project with local planning goals for the study area (Table 5-3 and Figures 5-1A and 5-1B, 5-2A and 5-2B, 5-3A and 5-3B). Planning goals of Prince George's County and Charles County include concentrating growth in existing developed areas and activity centers served by water and sewer infrastructure and planned roadway expansion. Directing growth to these areas is a strategy to control local government spending to support infrastructure maintenance and services and water quality mitigation costs for new development.

Key components of the proposed growth strategies for Prince George's and Charles Counties are to create mixed-use centers of residential and commercial development with densities sufficient to support TOD. Residential density in mixed-use centers must be large enough to justify the expense of providing BRT/LRT transit service to connect these communities to the Washington, D.C. urban core.

Mixed-Use centers with densities to support BRT/LRT transit service are essential to creating a regional rapid transit system.

Table 5-3: Predominant Land Use and Zoning in the Study Area (Existing)

	Land Use	Zoning
Prince George's County	forest (42%) residential (26%) agricultural (10%) institutional (10%)	residential, with commercial retail, office, industrial and mixed-use TOD interspersed low-density residential along east-west rural roads extending from MD 5
Charles County	residential (38%) forest (30%) commercial (11%) agricultural (8%)	lies almost entirely within the Charles County Development District

Source: MD Department of Planning Land Use/Land Cover, 2010

What do the Area's Master Plans say about Land Use and Zoning?

- **Plan Prince George's 2035** (Adopted May 6, 2014) is the master plan for Prince George's County and was prepared by M-NCPPC. The major land use goal of this plan is to direct future growth toward transit-oriented, mixed-use centers to capitalize on existing and planned infrastructure investments, and preserve agricultural and environmental resources.
- **Prince George's County Subregion 5 Master Plan** (Adopted June 25, 2009) calls for the establishment of a mixed-use, transit-oriented Brandywine community center along MD 5 between the MD 5/US 301 interchange and north of McKendree and Cedarville Road. The plan supports population and employment growth along the MD 5 Corridor and within the Brandywine community center. The Plan supports taking action on the transit system recommendations described in the 2010 MTA Southern Maryland Transit Corridor Preservation Study, including dedication of necessary right-of-way for transit along MD 5 and US 301 as the roadways are converted to freeways.
- **Joint Base Andrews and Prince George's County Joint Land Use Study (JLUS) (2009)** supports utilizing results of the Southern Maryland Transit Corridor Study to support development of a light rail/bus rapid transit system with access to JBA, a key employment center in the County.

- **Charles County Comprehensive Plan** (Adopted August 5, 2013) calls for the development of a multi-modal transportation system to provide for the safe and efficient movement of people and goods. It encourages TOD within the established Charles County Transit Development Corridor in order to support fixed-route, high-capacity transit service from the Branch Avenue Metrorail Station to Waldorf/White Plains. The Comprehensive Plan identifies the construction of [a high-capacity] light rail transit service [from the Branch Avenue Metrorail Station to Waldorf/White Plains] as the highest [long term] transportation priority of the County. The Charles County Comprehensive Plan supports acquiring dedication of the right-of-way needed for a locally preferred route.
- **Waldorf Urban Design Study (2010) and Waldorf Urban Redevelopment Corridor (WURC) Phase One Development Plan (2013)** are guiding documents describing the transformation of downtown Waldorf into a designated Regional Activity Center with a higher density mix of uses and services. The proposed area includes the special zoning districts for the Acton and Waldorf Activity Centers, generally bounded by US 301 to the west, the CSX railway right-of-way to the east, Holly Tree Avenue to the north, and Terrace Drive to the south. Waldorf is envisioned as a hub for future regional transit, with new employment opportunities, diverse residential housing options, complete streets, public parks and open space, and mixed-use TOD, creating a walkable new urban center.

Priority Funding Areas and Activity Centers

The 1997 Maryland General Assembly passed five pieces of legislation collectively known as “Smart Growth.” Smart Growth directs the State to target programs and funding to support established communities and locally designated growth areas, and to protect resource and rural areas. A component of the Smart Growth legislation, the Priority Funding Areas (PFA) Act, directs State funding for growth-related infrastructure (e.g., highways and transitways) to PFAs, giving a geographic focus to the State’s investment in growth-related infrastructure.

By requiring all counties to identify and map areas that meet the requirements of the legislation, PFAs are existing communities and places where local governments want State funding support for existing and planned growth (**Figure 2-1**). The remaining components compliment this geographic focus by targeting specific State resources to

preserve land outside of PFAs, to encourage growth inside PFAs, and to ensure that existing communities continue to provide a high quality of life for their residents. Specifically, for the SMRT study area, development and revitalization is encouraged in the PFA's, as is the retention of the farms and forested areas south of Surratts Road to the Prince George’s/Charles County boundary within the SMRT Study area.

Regional and local activity centers have been designated in Prince George’s and Charles County to encourage growth in existing urban and suburban centers which are located inside PFAs (**Figure 2-1**):

- Branch Avenue Metrorail Station (Regional);
- Joint Base Andrews (Local);
- Woodyard Crossing (Local);
- Southern Maryland Hospital Center (Local);
- Brandywine Crossing (Local); and
- Waldorf (Regional).

Just over 50% of the Prince George’s County study area and nearly 90% of the Charles County study area lie within Priority Funding Areas.

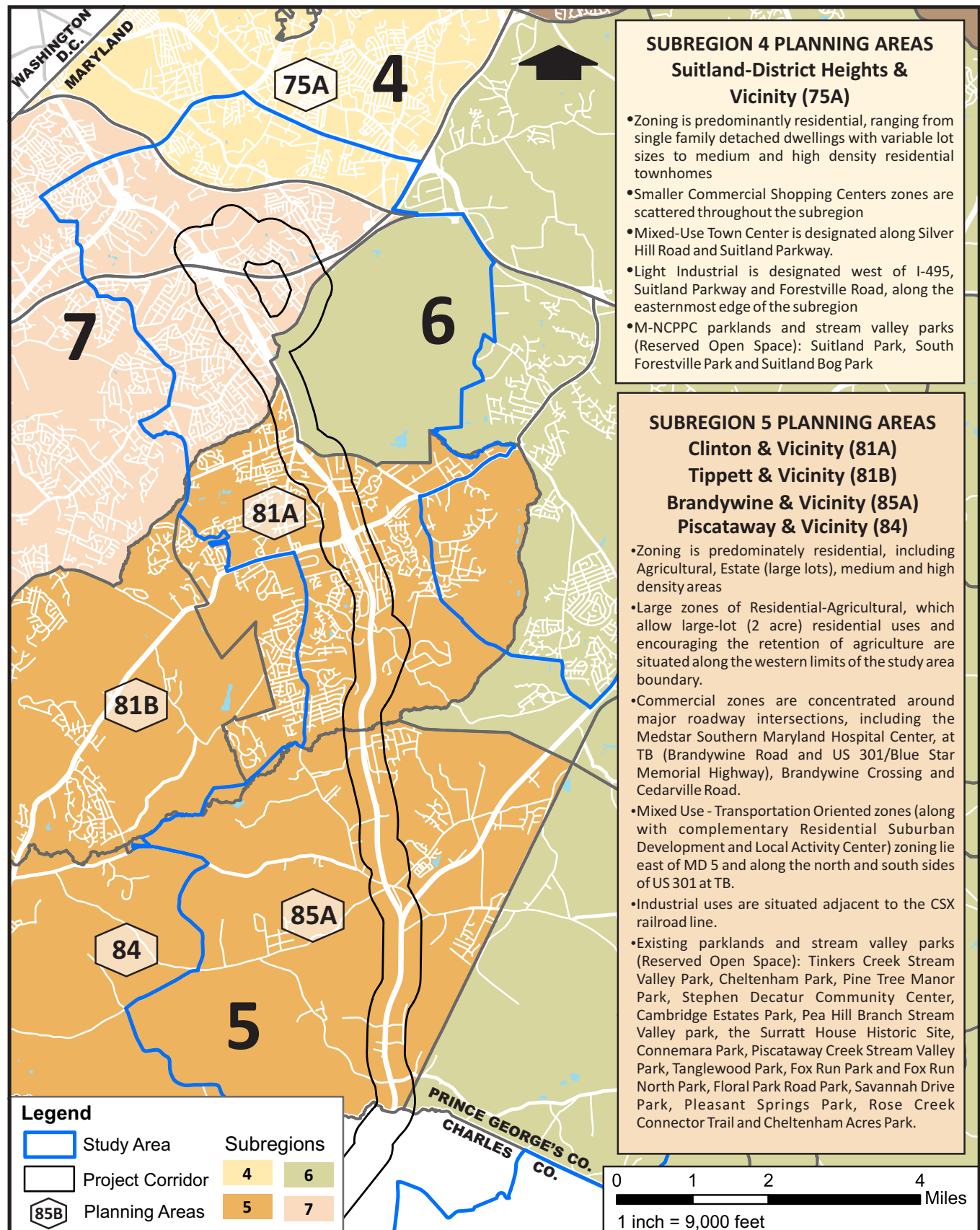
PRINCE GEORGE’S COUNTY

Suitland
Hillcrest Heights
Morningside
Temple Hills
Joint Base Andrews
Clinton
Clinton Heights
Clinton Acres
Brandywine
Brandywine Heights

CHARLES COUNTY

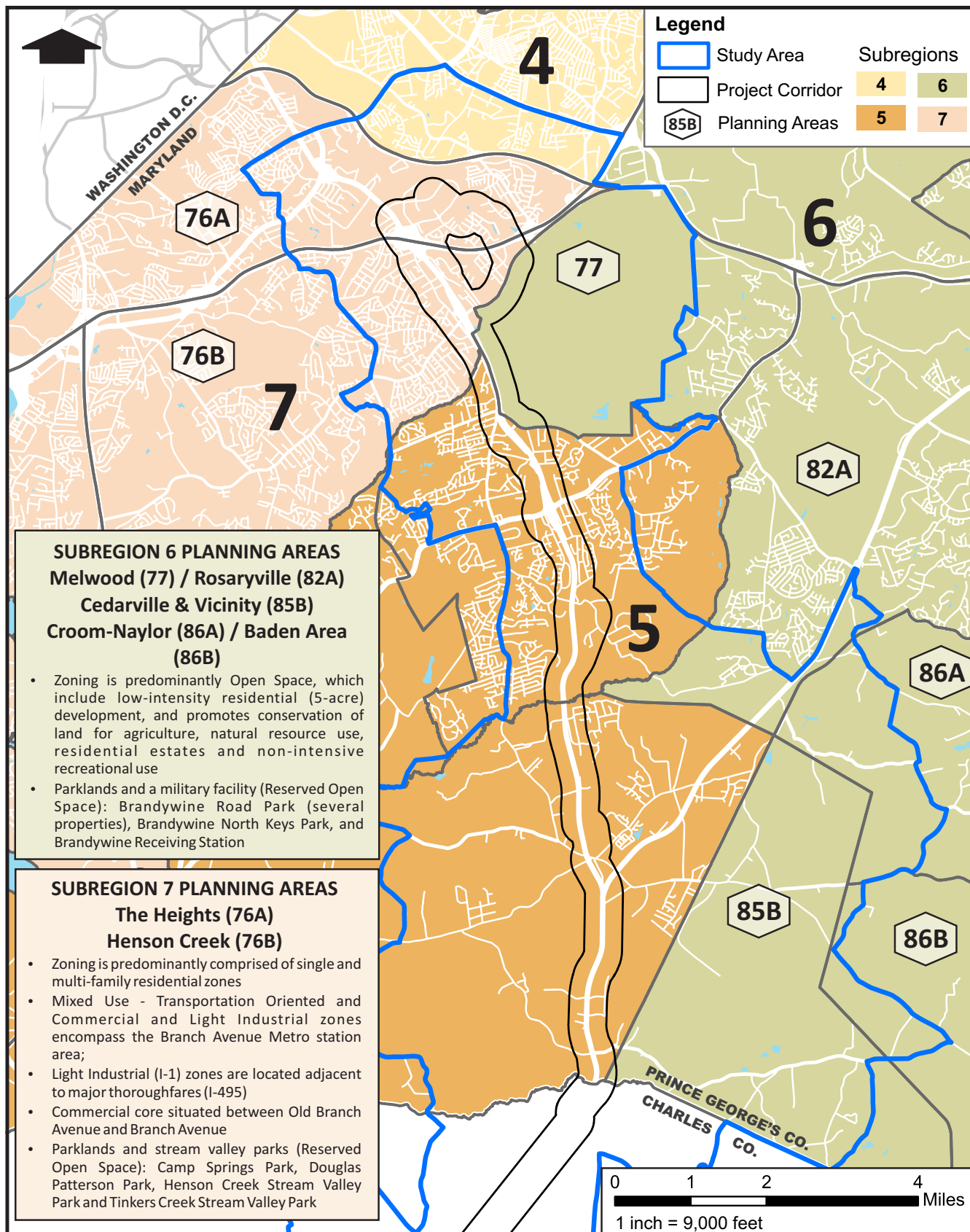
Mattawoman
Pinefield
Waldorf
Beantown
White Plains
St. Charles

Figure 5-1A: Prince George's County's Subregions 4 and 5 Planning Areas



Source: Prince George's County, Maryland Sector Plans

Figure 5-1B: Prince George's County's Subregions 6 and 7 Planning Areas



Source: Prince George's County, Maryland Sector Plans

Figure 5-2A: Zoning in Prince George's County

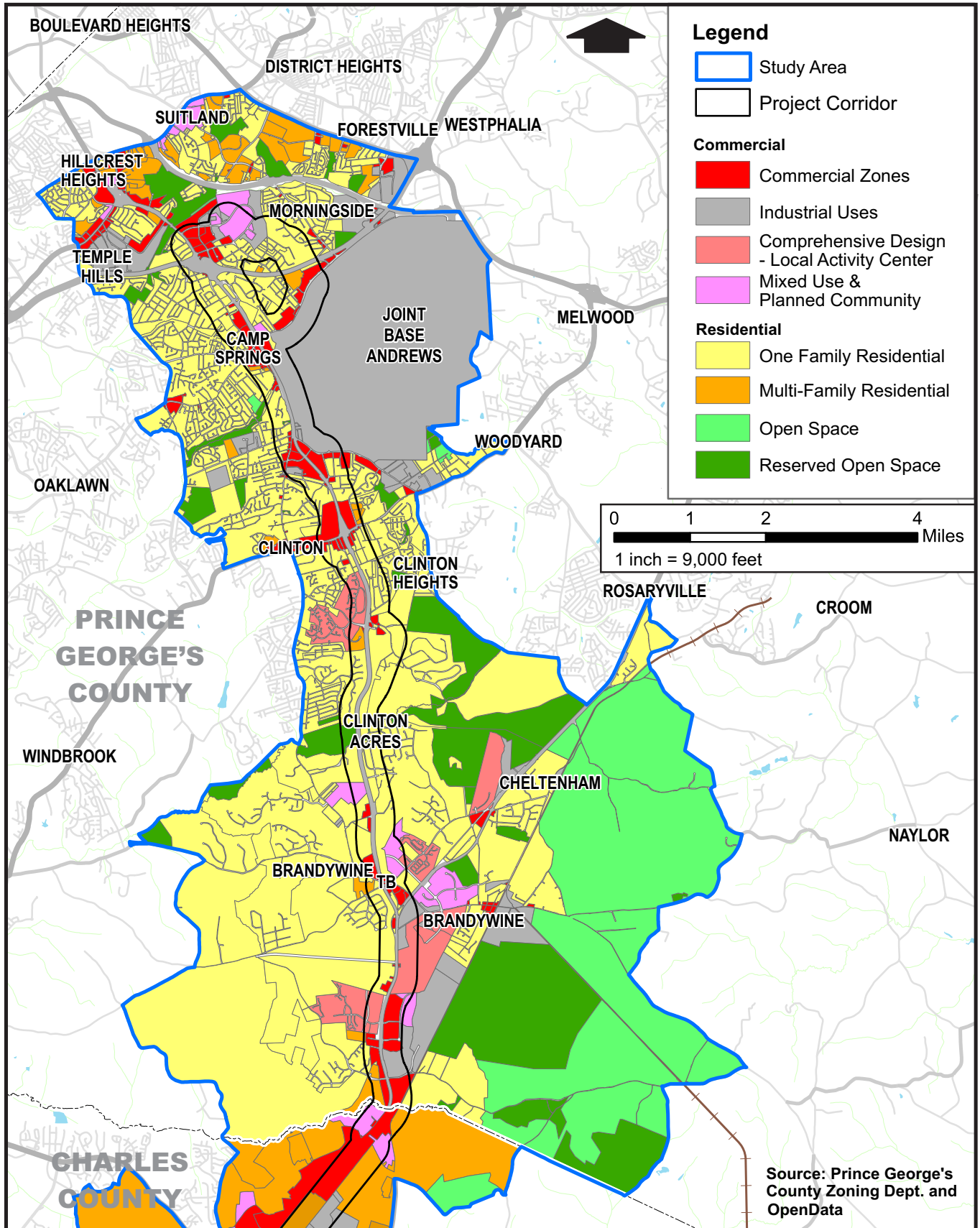


Figure 5-2B: Zoning in Charles County

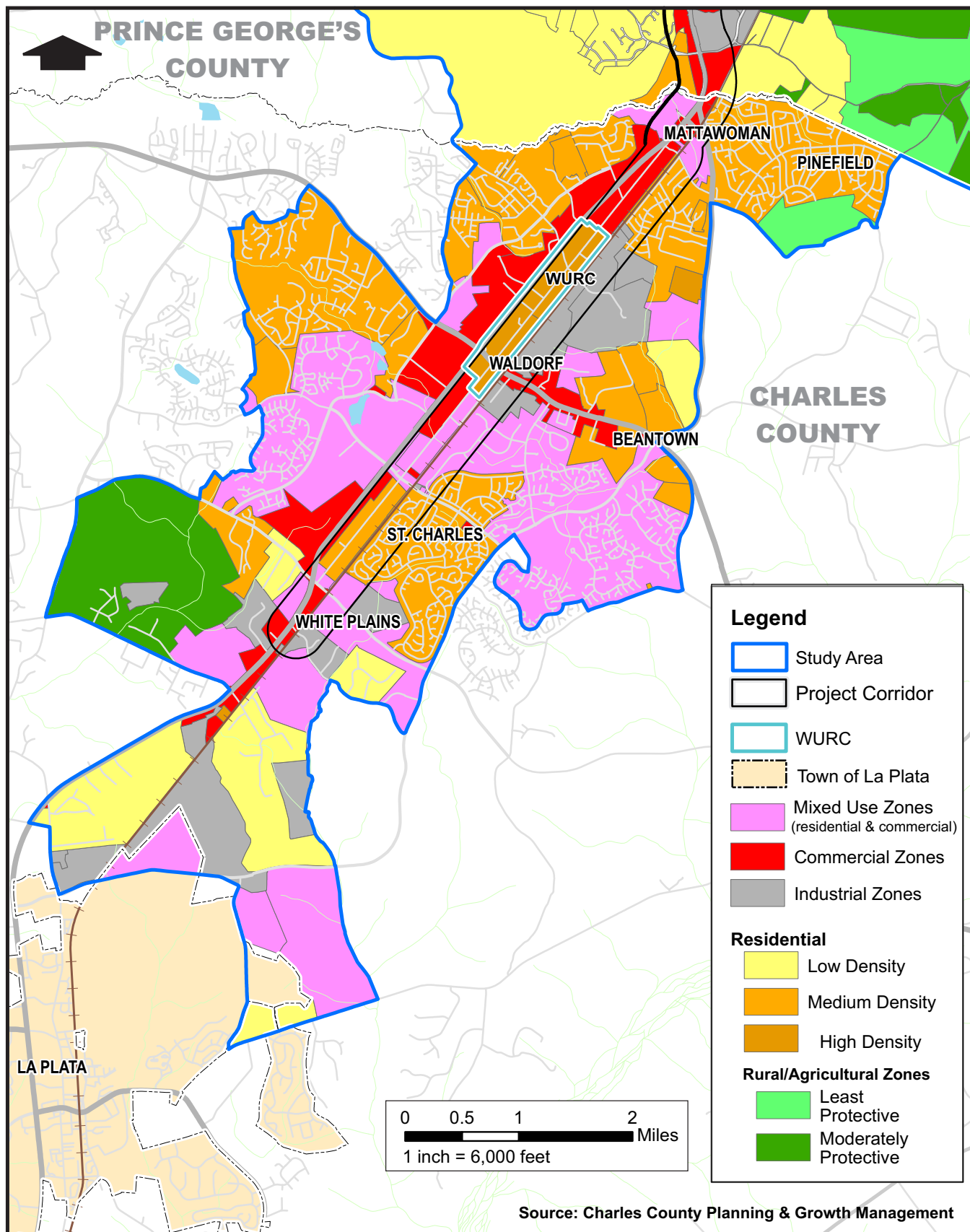


Figure 5-3A: Land Use in Prince George's County

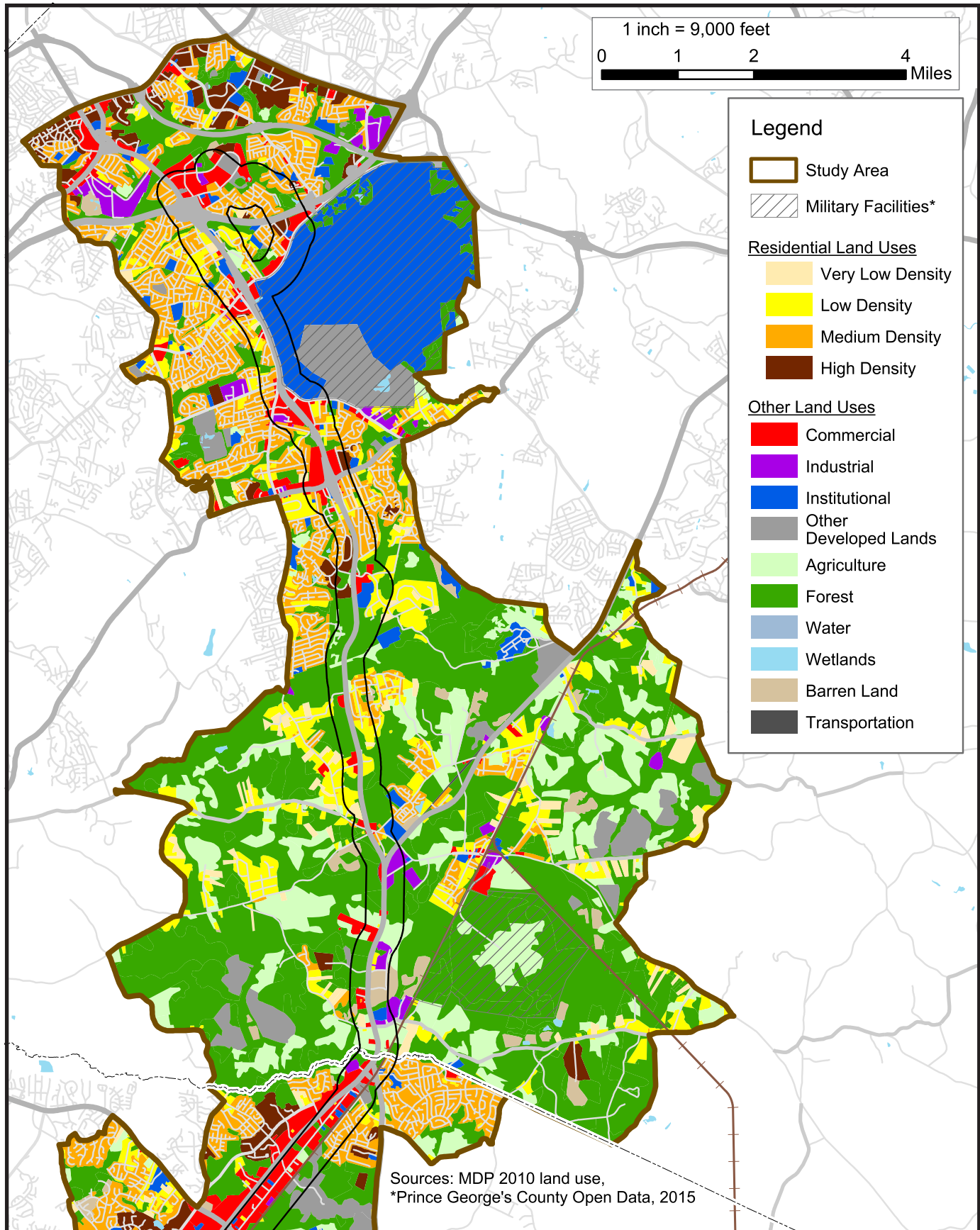
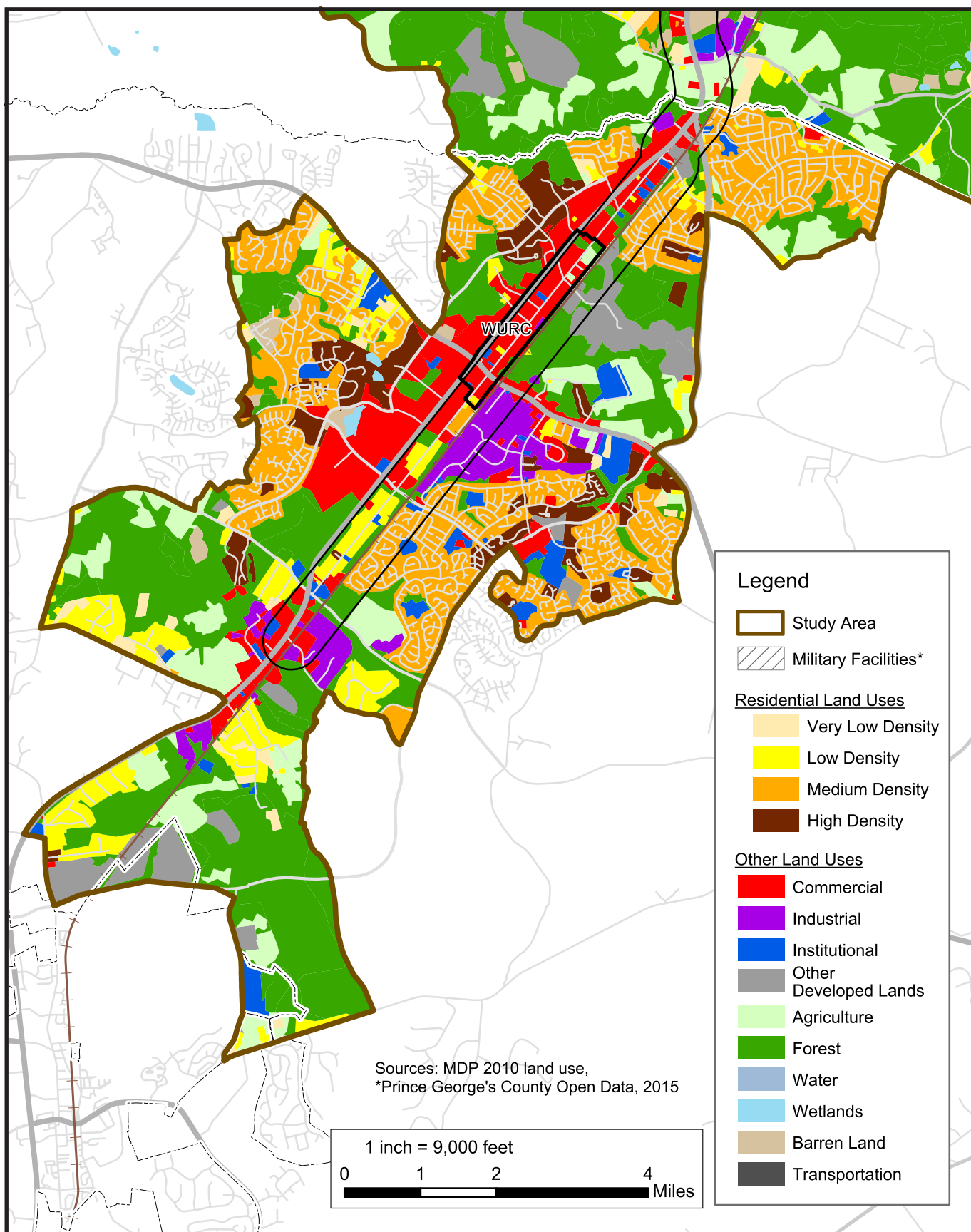


Figure 5-3B: Land Use in Charles County



5c. Economic Analysis

The purpose of this analysis is to provide a quantitative “apples-to-apples” comparison of potential TOD and economic impacts of LRT and BRT alternatives in the SMRT Project corridor. The evaluation was made using an Economic Rent Analysis methodology that assesses the impact of new transportation options in terms of their impact on the supply side of the economy (see **Appendix K**). This includes: Income Effects on households living along the SMRT Project corridor the level of employment and specifically the creation of new jobs that are the result of the increased efficiency of doing business in the SMRT Project corridor the impact on property prices, and the creation of new economic development nodes at or near the stations along the route.

At present, the SMRT Project corridor has a typically suburban character with a focus on low to medium density development. The LRT and BRT options have the potential to intensify development at key locations along the corridor and to create (with concomitant zoning and supportive policies) a series of locations that reflect more “liveable communities” along the corridor such as has happened elsewhere in the Washington, D.C. area along transit corridors. Previous experience suggests that locations like Branch Avenue Metrorail, Camp Springs, Woodyard, Mattawoman, Waldorf, and White Plains could be key development centers.

To test the impact of both the LRT and BRT options, a full Economic Rent model was developed from existing MWCOG data, as well as the finer dataset developed for demand forecasting in the SMRT Project corridor. This included refined zones, updated socioeconomic data, and both automobile and transit networks. This data was reformulated and disaggregated to reflect a behavioral modeling format that could be used to isolate the supply side impacts. This included revising the trip purposes of travel for business, commuter and social activities, as well as changing the highway and transit networks to a “generalized cost” format that includes all factors that influence travelers’ choices in making a trip (e.g., time, cost, frequency, access and egress). Finally, values of time were used to convert money into time based on behavioral preference surveys already completed for other transit corridor projects (e.g., Purple Line Study) where values of time were assessed for Washington Metrorail, LRT, BRT, and Bus.

In addition to creating a behavioral model of travel in the SMRT Commute Shed, this analysis also used measured proxy values for the strength of the economy in the SMRT Project corridor which included employment, income, and property values. These values show how the economy is performing and how it contributes to an individuals’ well-being. They estimate the key factors in the economy that impact individuals’ lives (e.g., how many people are working, what are the levels of income, and what is the value of property in the corridor).

To identify how responsive the economy in the corridor is to the quality of transportation in the SMRT Project corridor an assessment is made of the sensitivity of economic factors (employment, income, and property values) to transportation accessibility as measured by the behavioral generalized cost values developed.

In general, it was found that the region was quite sensitive to transportation accessibility. As accessibility improves, so does the productivity and character of the economy. **Table 5-4** shows how accessibility impacts employment. It can be seen that as accessibility improves, employment increases. This measures how improvement in accessibility increases employment opportunities. Similar relationships were found for Income and Property Values.

The statistical models with each case showed a responsiveness or elasticity of 1.5 to 2.0 with accessibility. This shows that as the accessibility is improved so the economy improves with a ratio of each 1% improvement, creating a 1.5% to 2.0% improvement in the economy. If new transport infrastructure causes the accessibility of the region to improve by 1% then the economy will increase by 1.5% to 2.0% based on the elasticity. Previous studies have shown that this is a relatively moderate response that is typical of suburban corridors. For example, the highly urbanized yet disconnected corridor of the Purple Line corridor from Bethesda to New Carrollton station has an elasticity of 3-4% for each 1% increase in accessibility. However, overall it was found that increased accessibility in the SMRT Project corridor has the potential to increase economic wellbeing and wealth creation in the corridor (assuming zoning and other supportive policies also take place).

Using the Economic Rent Analysis to measure the impact of the LRT and BRT alternatives, it was found that both systems potentially increase economic wellbeing. It was found that LRT provided a greater impact than BRT. The BRT will have its own right-of-way and similar schedules to the LRT, but behaviorally it has been found, based upon comparisons of BRT and LRT systems throughout the country, that both public and private developers, as well as the traveling public respond more to a LRT rail system than a BRT bus system. This is due to how individuals and developers perceive the two systems and to the stronger behavioral response to the LRT rail system. This is reflected in not only “values of time” but also the “utility” individuals place on rail and bus options. It has been known for over 30 years that the Value of Time (VOT) of rail travelers is higher than for bus, but more recently it has been found that some of the same judgement by individuals and developers is carried over into the LRT/BRT options. In the case of the SMRT Project corridor the difference between the two alternatives is between 15% and 20%.

Given the difference in preferences between LRT and BRT,

Table 5-4: Comparison of LRT and BRT Supply side Benefits

Supplieside Benefits	LRT	BRT	Difference
Employment (person years of work)	305,885 years	251,030 years	21.8%
Income in \$2015 (3% discount rate)	\$22.4B	\$19.2B	16.7%
Property Values in \$2015 (3% discount rate)	\$31.6B	\$27.4B	15.3%

Source: Appendix K

it is not surprising that the contribution to tax payments has a similar difference. **Table 5-5** shows a 16% difference in the federal income tax base expansion, state and local income tax, and property tax over the life of the project between LRT and BRT. As elsewhere it is found that the tax base expansion in 2015 dollars generated by the project is in the range of \$5 to \$6 billion. Note, however, that this analysis can only assess the potential for increases in the tax base and benefits at the federal, state, and local levels. If these are to actually take place, changes in zoning to

allow increased density and mixed land uses, additional public infrastructure improvements (e.g., schools, water, sewer, emergency services, etc.), and other concomitant policies must also occur.

Table 5-5: Tax Benefits of LRT and BRT

Transfer Payment in \$2015 (3% discount rate)	LRT	BRT	Difference
Federal Income Tax	\$4.5B	\$3.8B	16.5%
State and Local Income Tax	\$1.7B	\$1.5B	16.8%
Residential Property Tax	\$0.27B	\$0.24B	15.7%
Total Tax Values	\$6.4B	\$5.5B	16.6%

Source: Appendix K

Economic Analysis Conclusions

Major conclusions include:

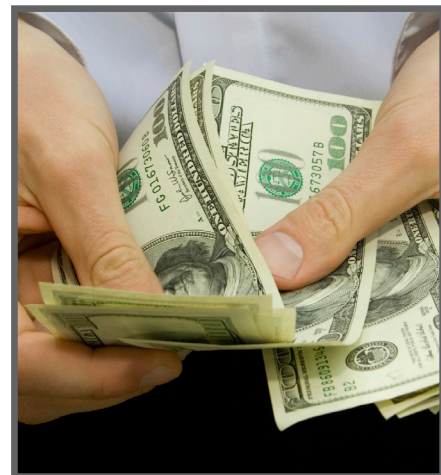
- Overall, the project will stimulate the corridor’s economy which has the potential to: add approximately \$20 billion to the income of the corridor; create between 250,000 and 300,000 person years of work; and generate about \$30 billion of increase in property values. Much of this increase in property values will be focused around stations in new development.
- The advantage in terms of stimulating the economy is with LRT over BRT.
- Finally, the stimulated economy will expand the tax base by \$5 to \$6 billion, which in itself would cover the cost of the project.

When comparing LRT with BRT:

- Both systems will add to regional household income with LRT potential providing an extra \$3 billion in income over the BRT system.
- Both systems will add to regional employment, with BRT adding 250,000 person years of work, and LRT adding 300,000 person years of work.
- Both systems will add about \$30 billion to property development and values in the corridor.

1. Household Income

Both systems will add significantly to regional household income, with the BRT adding \$19.2 billion and LRT adding \$22.4 billion.



2. Employment

Both systems will add significantly to regional employment, with BRT adding 250,000 person years of work, and LRT adding 300,000 person years of work.



3. Property Value

Both systems will add about \$30 billion to property development and values in the corridor with the BRT adding \$27.4 billion and LRT adding \$31.6 billion



6. COMPARISON RESULTS

The purpose of Chapter 6 is to build upon the analysis covered in the previous chapters and provide both an evaluation criteria framework and comparative analysis for the transit modes, alignments and options considered. This SMRT Study has assessed the various impacts and developed cost estimates for the range of alternatives and options remaining under consideration, as listed in **Table 6-1**. Mainline Alternatives 4 and 5 require adding a Beltway Crossing Option in order to produce a project-length SMRT Corridor Transit Scenario for assessment, from Branch Avenue to White Plains. Localized options can be combined with Mainline Alignments and Beltway Crossing Options with the potential for a large number of possible permutations. For analysis purposes, a limited number of SMRT Corridor Transit Scenarios were created to represent a range of possible combinations of alternatives and options. The SMRT Project team used those SMRT Corridor Transit Scenarios to evaluate transit ridership, alignment costs and impacts. All full-length SMRT Corridor Transit Scenarios contain the following options: Hospital Option 1, the Brandywine Crossing Shopping Center Option and the Mattawoman-Beantown Option.

Table 6-1 - SMRT Alternatives and Options

<i>Mainline Alternatives:</i> Alternative 4 Alternative 5 <i>Beltway Crossing Options:</i> Beltway Crossing Option 1 Beltway Crossing Option 2 Beltway Crossing Option 3 Beltway Crossing Option 5 Beltway Median Options 7D and 7F (BRT) Beltway Median Option 7E (BRT and LRT) Beltway Crossing Option 8A Beltway Crossing Option 9 Option 6 and Extended BRT Option <i>Localized Options:</i> Joint Base Andrews Avoidance Option Joint Base Andrews Cantilever Option Hospital Options 1, 2, 3 and 4A Brandywine Crossing Shopping Center Option Mattawoman-Beantown Option
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Source: Appendix A

6a. Quantitative SMRT Corridor Transit Scenario Comparison

Table 6-2 contains a quantitative comparative summary of impacts associated with the SMRT Corridor Transit Scenarios. Impact categories for comparison include Ridership, Engineering, Socio-Economic, Natural Environment, Capital Costs, Annual O&M Costs. The table is color-coded to help the reader in determining the impacts for design options that have been developed. The color-coding in the column for the various SMRT Corridor Transit Scenarios is based on the type of Capital Beltway (I-495/I-95) crossing, tunnel, aerial or at-grade in the MD 5 median. Color-coding in all of the other columns help

to determine a scenario's ranking: better, neutral or worse. For example, in the BRT Select Capital Cost Column, green denotes a "better" or lower cost, blue signifies a "neutral" or middle-of-the-road cost, and orange indicates a "worse" or higher cost as compared to each other. It is noted that costs are provided in a range because final costs have not been determined at this time. Please see Chapter 3 for a discussion about SMRT Corridor Transit Scenarios, Chapter 4 for Ridership, At-Grade Crossings and Capital Costs, and Chapter 5 for Socio-Economic and Natural Environment analysis.

6b. Overall SMRT Corridor Transit Scenario Analysis

Criteria used to analyze a representative sample of possible SMRT Corridor Scenarios include (**see Table 6.2**):

- Ridership
- Environmental Impacts
- Cost (Total and Cost per Rider)
- Transit Travel Time
- Traffic Operations
- Land Use/Master Plan Compatibility
- Compatibility with other Current or Planned Highway Projects
- Compatibility with Staged Construction
- Right-of-Way Impacts
- Geometrics

SMRT Corridor Transit Scenario Results

Ridership Analysis

The 12 tested ridership forecasting Ridership Scenarios provide some insights into the ridership potential of the different modes, alignment options, and station locations analyzed as part of the SMRT Study (see Chapter 4a).

In general, all of the alternatives result in similar total daily boardings – all within a margin of 17% between 24,000 and 28,000 daily riders. This is because the alternatives are very similar from a user perspective, resulting in only small differences in travel times and a few differences in station locations. Transit mode and travel times are the primary drivers of ridership on the SMRT Project corridor.

- SMRT ridership is particularly strong in the peak period, which accounts for more than 72% of daily ridership in all Ridership Scenarios.
- SMRT ridership is very directional, with more than 80% of daily ridership occurring in the peak direction (northbound in the morning).
- The LRT runs generally have ridership that is 2% higher than similar BRT runs.
- The 24,000 to 28,000 daily ridership range forecasted for 2040, in combination with the heavy peak and directional characteristics, is at the very highest limit of what a BRT system could handle, but is comfortably within capacity for LRT.
- By 2040, BRT would need to operate in 3-bus platoons at 6-minute headways to handle peak loads, which is feasible, but would result in BRT annual operating costs 25%-50% higher than for LRT.
- If ridership would continue to grow beyond 2040, LRT would have sufficient capacity without any transitway or station improvements, but BRT would require transitway widening and station platform improvements in some areas.

The model runs were also used to test the impact of alignment variations on ridership levels, by varying individual elements and comparing ridership to Runs 1a/1b. Some important results related to these variations include:

- The Extended BRT Option (Run 2b), which allows BRT riders to board at the off-line Park and Ride lots, does not result in any more than a marginal increase over runs without the Extended BRT (Runs 1a, 3a, 1b, 3b all have ridership totals within 3% of Run 2b).

- The Mainline Alternative 5 alignment on the east side of MD 5, north of MD 223, (Runs 3a/3b) has only a marginal effect on run-times, and therefore only a small impact on ridership levels. As LRT, Run 3a has only 1% lower ridership than Run 1a (due to a slightly longer run time), while the BRT version (Run 3b) has almost identical ridership to Run 1b.
- Several variations of service to, and access to transit within JBA were tested, resulting in the following conclusions:
 - » Runs 4a/4b/4c, which is modeled Beltway Crossing Option 8A resulted in some of the lowest ridership numbers of any of the tested Runs, primarily due to the increased run-times required by this alignment.
 - » Removing the Camp Springs Station does not improve run-times enough to offset the loss of access to SMRT at the station.
- Beltway Median Option 7, removal of the Camp Springs Station) significantly decreases SMRT ridership (9% lower for BRT and 14% lower for LRT).
- Highway widening does not significantly affect ridership on SMRT, resulting in only a 1% decrease in total ridership. This is partly because the additional capacity attracts demand from parallel roadways, resulting in no net improvement in automobile or transit times in the corridor.
- Please see **Table 6-2** for SMRT Corridor Transit Scenario LRT/BRT Daily Ridership volumes.

Environmental Analysis

With resource locations identified on project mapping, alternatives and options were developed and have had impacts calculated and discussed with regulatory agencies (see **Appendix L**). Further analysis and agency coordination will need to be performed during NEPA, based on the environmental inventory conducted for this study. Resources that may be cumulatively impacted by future projects when combined with other past, present, and reasonably foreseeable future projects may include wildlife habitat loss, noise impacts, economic impact, and direct/indirect loss of wetlands. All SMRT Corridor Transit Scenarios for natural environmental impacts include Hospital Option 1, Brandywine Crossing Shopping Center Option and Mattawoman-Beantown Option.

Depending on the SMRT Corridor Transit Scenario chosen, 11 to 12 new and existing stream crossings could occur along the corridor. All SMRT Corridor Transit Scenario, with the exception of Beltway Crossing Option 8A, potentially cross

11 streams. Beltway Crossing Option 8A with Mainline Alternative 4 (Run 4a/4b) proposes 12 stream crossings.

The SMRT Project's potential wetland impacts range from 10.4 to 14.1 acres. Beltway Crossing Options 7D and 7E with Mainline Alternative 4 (Run 5a/5b) impact the lowest amount of potential wetlands and Beltway Crossing Option 8A with Mainline Alternative 4 (Run 4a/4b) affects the highest amount. Minimization and/or avoidance measures appear to be practicable for the Beltway Crossing Option 8A Wesson Drive area and will require analysis during the next phase of project development if the option is chosen for further study.

Potential 100-Year FEMA and County-Designated Floodplain impacts range from 7.3 to 10.1 acres. Beltway Crossing Option 9, JBA Avoidance Option and Mainline Alternative 4 (Comparable Run 1a/1b) contains the lowest amount of potential floodplain impact. Beltway Crossing Option 8A with Mainline Alternative 4 (Run 4a/4b) and Beltway Crossing Option 1 with Mainline Alternative 5 (Run 3a/3b) potentially affects the highest amount of floodplain.

SMRT Corridor Transit Scenario forest/woodlands potential impacts range from 104.7 to 132.9 acres. Beltway Crossing Option 7D with Mainline Alternative 4 (Run 5b-BRT) contains the lowest amount of potential forest impact. Beltway Crossing Option 8A with Mainline Alternative 4 (Run 4a/4b) potentially affects the highest amount of woodlands.

Potential affected Forest Interior Dwelling Species (FIDS) range from 63.0 to 78.5 acres. Mainline Alternative 4 SMRT Corridor Transit Scenarios, with the exception of Beltway Crossing Option 8A, proposed the lowest amount of FIDS impacted. Beltway Crossing Option 8A with Mainline Alternative 4 (Run 4a/4b) contains the highest amount of FIDS acreage impacted.

No potential impacts to Rare, Threatened and Endangered (RTE) Species are anticipated for any of the SMRT Corridor Transit Scenarios.

Please see **Table 6-2** for a summary of the key SMRT Corridor Transit Scenario Socio-Economic and Natural Environmental effects.

Cost

The approximate cost for the BRT system ranges from \$1.1 billion to \$1.4 billion and the approximate range for a LRT system is \$1.6 billion to \$1.9 billion, depending on the various combinations of alternatives and options (see Chapter 4d and **Appendix F**).

The cost categories where there is the most noticeable difference between a LRT and BRT system are transitway and track elements, support facilities, sitework and special conditions and vehicles. Additionally, cost items that appear to be driving the overall cost are the Type of Capital Beltway (I-495/I-95) Crossing and right-of-way acquisition.

These capital cost estimates provide a planning level estimate and as a result there is level of uncertainty that needs to be assumed. Uncertainty can result in a difference between the estimated cost of a project as defined during the planning stage and the actual cost of the project that is ultimately implemented. Therefore, the capital cost estimates provided in this report would need to be refined and inflated to future year dollars as the scope and engineering design is refined for the transitway.

The total O&M costs for the BRT Ridership Scenarios range from \$30.9 to \$36.4 million and the range for the LRT Ridership Scenarios is \$24.3 to \$25.0 million, depending on the various combinations. Overall, BRT has 21% to 46% higher O&M costs as compared to LRT. The BRT O&M costs assume they will be operating in a 3-bus platoon to give the needed peak period capacity required for projected 2040 ridership. The higher ends of the BRT and LRT O&M cost ranges represent the options with the longer alignments and additional stations, such as Beltway Crossing Option 8A with the station at JBA. Vehicle replacement costs have not been included in the O&M estimate, but are included in Capital Costs.

Transit Travel Time

As stated previously in the Ridership Analysis discussion, 12 of the most representative mainline/beltway crossing /localized option/highway combinations were developed and tested in the SMRT Ridership Model. Six Ridership Scenarios were tested for each mode. Based on the modeling results, travel times are the primary drivers of ridership on the SMRT Project corridor and the alternatives with faster run times tend to have higher ridership. As shown in Chapter 4, transit times vary between 37 minutes (Extended BRT Run 2b) for the fastest Run to 46 minutes

(Run 5a-LRT); the BRT Ridership Scenarios tend to be somewhat faster than the LRT Ridership Scenarios. All of the Ridership Scenarios were tested using the same alignment south of Woodyard Road, which included Alternative 4/5 and Hospital Option 1, which directly serves the MSMHC.

Due to the increased congestion in the corridor and the dedicated transitway provided by the SMRT options, the transit travel time is much faster than the highway travel time. 2040 AM Peak “No-Build” and “6 and 8-Lane Build” highway conditions were analyzed to provide a comparison of the transit versus highway travel times. The analysis was modeled from Demarr Road to Branch Avenue (MD 5 at Auth Road). The highway travel time analysis revealed the following:

1. 2040 No-Build = 59.03 minutes
2. 2040 Build, 6 Lanes = 54.73 minutes
3. 2040 Build, 8 Lanes = 51.63 minutes

The analysis did not include additional drive time for the length from MD 5 (at Auth Road intersection) to the Branch Avenue Metrorail Station (2.2 minutes) or time to park (assume 5 minutes). Please see **Table 6-2** for the SMRT Corridor Transit Scenario travel times.

Traffic Operations Analysis

Of primary concern at this early stage of the SMRT Project, is whether a rapid transit alignment along the MD 5/US 301 corridor can co-exist with the roadway network without an excessive number of costly grade separations or severe degradation of traffic operations. Analysis of at-grade transit/roadway crossings was performed to make these assessments based on existing and 2040 traffic volumes, with existing signal timing (see Chapter 4, Section 4.c and **Appendix G**).

The SMRT Project corridor includes a number of coordinated (timed sequentially with adjacent intersections) and free (independently timed from any adjacent intersections) traffic signals. Most of the signals along the SMRT alignments have a phase parallel to the alignment of the SMRT that would allow vehicle movements concurrently with the LRT/BRT movement. In these cases, where the alignment is close enough to an existing traffic signal, the traffic signal for vehicles and the LRT/BRT can operate as one signal.

The signals with the worst existing level of service (LOS) were selected along the corridor for analysis. The results show that a concurrent phase for the LRT/BRT would be effective at most signals and also show little change in LOS between existing and 2040 volumes. However, a new phase would be required in order to accommodate the LRT/BRT crossing of MD 337 (Allentown Road). At this location, analysis determined under existing conditions there was no change in LOS (LOS C) and with 2040 volumes, the LOS changed to a LOS D.

For at-grade crossings at uncontrolled locations, the roadways with the highest ADT were selected for testing, because they would be most critical and may require signalization. Results show that none of the highest ADT crossing locations would fail if signalized for LRT/BRT crossings. However, it is recommended that the roundabout of Auth Road/Old Soper Road/Capital Gateway Drive be removed and replaced with a traffic signal if the LRT/BRT alignment selected crosses the southeast leg of the roundabout.

Detailed analysis of roadway operations for each SMRT Corridor Transit Scenario has not been performed. In general, the likely level of traffic operations impact is proportional to the number of at-grade crossings. At-grade roadway crossings range from 36 for Beltway Crossing Option 9, JBA Avoidance Option, Mainline Alternative 4 and Hospital Option 1 (Comparable Run 1a/1b) to 59 for Beltway Crossing Option 1, Mainline Alternative 5 and Hospital Option 1 (Run 3a/3b). Overall, Mainline Alternative 5 on the west side of MD 5, contains the highest number of at-grade crossings as compared to Alternative 4 on the east side of MD 5. Please see **Table 6-2** for the number of at-grade crossings for each SMRT Corridor Transit Scenario.

Economic Impact Analysis

In comparing the potential impact of LRT and BRT in the SMRT Project corridor:

1. Household income: Both systems will add significantly to regional income, with the BRT adding \$19.2 billion and LRT adding \$22.4 billion.
2. Employment: Both systems will add significantly to regional employment, with BRT adding 250,000 person years of work, and LRT adding 300,000 person years of work.
3. Property Value: Both systems will add about \$30 billion to property development and values in the corridor with the BRT adding \$27.4 billion and LRT adding \$31.6 billion.

Land Use/Master Plan Compatibility

Potential transit station locations support the counties' existing and future land uses by providing stations at key activity and employment centers throughout the corridor. Planning for growth focused within existing activity centers is central to achieving sustainable growth while promoting accessibility for a greater segment of the population, as well as achieving county health and environmental quality goals.

In Prince George's County, the station locations proposed have relied heavily upon the Subregion 5 Master Plan and the Central Branch Avenue Revitalization Sector Plan station recommendations. JBA and Prince George's County Joint Land Use Study (JLUS) supports development of a light rail/bus rapid transit system with access to JBA, a key employment center in the County. In Charles County, the Waldorf Urban Design Study (WUDS) proposes high density transit-oriented development (TOD) and details a series of station locations that have been adopted into the SMRT Study.

Many of the private development projects along the corridor have been proposed, studied and thoroughly vetted, without yet being fully implemented. The SMRT Project could serve as the impetus to give many projects a better chance of complete implementation. The SMRT Project corridor would be the spine around which future growth would occur.

See **Chapter 5** for detailed Master Plan and Land Use information and Chapter 4b/**Appendix B2** for discussions of location and land use.

Compatibility with other Current or Planned Highway Projects

The SMRT Study has incorporated or taken into account many of the related transportation studies and projects by MDOT/SHA Corridor into the planning design. However, there are a number of key issues that require additional study coordination, engineering and documentation as funding becomes available and the SMRT project progresses into the next round of development. The current SMRT design assumes that the following proposed improvements are in place when SMRT is deployed:

- Branch Avenue (MD 5) Corridor Transportation Study
- Branch Avenue (MD 5) Metrorail Access Project
- MD 5 at Brandywine Road (MD 373/MD 381)

Interchange Project

- US 301 Waldorf Area Project
- US 301 at MD 228 and MD 5 Business Planning Study
- MD 5/US 301 Mattawoman-Beantown Road

Two MDOT/SHA Studies that the SMRT Project are aware of but have not incorporated into the current design because proposed improvements were not known, are as follows:

- » Woodyard Road MD 223 Corridor Planning Study
- » MD 5 Candidate Safety Improvement Section Feasibility Study

Please see **Chapter 2** for more detailed information about Related Transportation Studies and Projects.

Compatibility with Staged Construction

Prince George's and Charles Counties recognize that a viable transit option is needed to efficiently move people in the corridor and are developing land use and development plans that prepare for the SMRT Project. The counties understand the need for an alternative to driving private vehicles.

Transit ridership forecasting models indicate high levels of daily boardings at the Branch Avenue Metrorail Station in Prince George's County and at the proposed Mattawoman, Downtown Waldorf and Smallwood Stations in Charles County. In addition, the Heavy Maintenance Facility is proposed to be located in the White Plains area. Options for staged construction will be investigated in subsequent phases of SMRT Project Development.

Right-of-Way Impacts

With resource locations identified on project mapping, alternatives and options were developed and have had impacts calculated and discussed with regulatory agencies. Further analysis and agency coordination will need to be performed during NEPA, based on the environmental inventory conducted for this study. Resources that may be cumulatively impacted by future projects when combined with other past, present, and reasonably foreseeable future projects may include wildlife habitat loss, noise impacts, economic impact, and direct/indirect loss of wetlands. All SMRT Corridor Transit Scenario for socioeconomic and cultural impacts include Hospital Option 1, Brandywine Crossing Shopping Center Option and Mattawoman-Beantown Option.

Depending on the SMRT Corridor Transit Scenario chosen, potential residences displaced range from 41 to 55. The lowest number of residences impacted are associated with Beltway Crossing Option 1 or Option 6 with Mainline Alternative 5 (Run 3a/3b) and the highest number of residences impacted is attributed to Beltway Crossing Option 3 with Mainline Alternative 4 (Comparable Run 1a/1b).

Potential commercial displacements range from 72 to 94. Beltway Crossing Option 7D with Mainline Alternative 4 (Run 5b-BRT) has the lowest number, whereas Beltway Crossing Option 1 with Mainline Alternative 5 (Run 3a/3b) has the highest number for the SMRT Study.

Overall, Beltway Crossing Option 7D with Mainline Alternative 4 (Run 5b-BRT) has the lowest number of potential residential and commercial displacements with 117 properties. Beltway Crossing Option 1 with Mainline Alternative 5 (Run 3a/3b) has the highest number of potential residential and commercial displacements with 135 properties.

Potential church/school/cemetery displacements vary only slightly from the east side of MD 5 to the west side of MD 5. All Mainline Alternative 4 SMRT Corridor Transit Scenarios impact six resources and both Mainline Alternative 5 Options impact seven facilities.

The Tinkers Creek Stream Valley Park is the only county parkland affected by the SMRT Project study. Beltway Crossing Option 1 or Option 6 with Mainline Alternative 5 (Run 3a/3b) impacts 0.13 acre of the park.

Depending on the SMRT Corridor Transit Scenario chosen, 2 to 3 Environmental Justice Communities are potentially affected by the SMRT Project. All Mainline Alternative 4 SMRT Corridor Transit Scenarios, with the exception of Beltway Crossing Option 8A (Run 4a/4b) impact 2 communities. Like all Mainline Alternative 5 Model Runs, Beltway Crossing Option 8A potentially impacts 3 communities.

Based on the conceptual level of design, 7 to 17 historic or potentially historic sites could be affected by the SMRT Corridor Transit Scenarios. Some of the potentially affected sites are eligible for listing, require further evaluation or have lost their eligibility. Beltway Crossing Option 5 with Mainline Alternative 4 (Comparable Run 1a/1b) impacts the lowest amount of potentially historic properties. Option 6 with Mainline Alternative 5 (Comparable Run 3a/3b) impacts 17 historic properties, the highest amount.

Potentially affected hazardous material sites vary from the east side of MD 5 to the west side of MD 5. All Mainline Alternative 4 SMRT Corridor Transit Scenarios impact 10 sites and both Mainline Alternative 5 Options impact 14 sites.

Geometrics

Application of Design Criteria

The SMRT Project employed a Design Criteria Manual (DCM) used for the MDOT/MTA Purple and Red Line Projects, which established the design criteria, drafting standards, and other guidance needed to complete the engineering and design work for the light rail projects.

Assumed Maximum Speeds

On a designated transitway for BRT and LRT modes, the maximum operating speed shall be determined by horizontal and vertical geometric design, but shall be no greater than 55 mph.

On a dedicated transitway, the overall speed limit shall not exceed a) posted speed limit on adjacent roadway, or b) 35 mph, or c) civil speed restrictions, or d) as determined by safety analysis or jurisdictional requirement.

Within the limits of maintenance facility yards, MDOT/MTA has set the maximum speed limit at 10 mph through switches, storage tracks, and shop approaches; 5 mph within shop buildings; and 20 mph in track leads to the mainline junction where possible.

Areas of Geometric Interest

In general, there are no significant horizontal or vertical alignment deficiencies that differentiate the various SMRT Corridor Transit Scenario from each other. Length of alignment, transit station areas, and areas with lower design speeds have been captured and analyzed in the travel time and ridership models.

Key points and notable areas where further geometric investigation and/or coordination may be required in the next round of design are as follows:

- Beltway Crossing Option 8A with Mainline Alternative 4, proposes an additional transit station at JBA creating the longest alignment at 19.4 miles.
- Beltway Crossing Option 7E with Mainline Alternative 4 LRT, has the highest projected transit run time, lowest ridership and second longest alignment at 19.2 miles.

- Beltway Crossing Options (from Branch Avenue Metrorail to Allentown Road)
 - » Beltway Crossing Options 1, 2 and Option 6 are tunnel crossing options under I-495 that utilize up to 6% vertical grades in the tunnel portion of the alignment. Tunnels make up 50% to 57% of the option alignment length.
 - » Beltway Crossing Options 3, 5, 8A and 9 are aerial crossing options over I-495. Aerial structure lengths range from 4% (Beltway Crossing Option 8A) to 28% (Beltway Crossing Option 5) of the option alignment length.
 - » Beltway Crossing Option alignment lengths range from 2.2 (Beltway Crossing Option 9) to 2.7 miles (Beltway Crossing Option 8A).
 - » Projected design speeds less than 35 mph for the crossing options range from 3% (Beltway Crossing Option 1 and Option 6) to 37% (Beltway Crossing Option 7E) of the option alignment length.
 - » Areas where SMRT design speeds are projected to be less than 35 mph include:
 - Allentown Road
 - Auth Road
 - Woods Way
 - Capital Gateway Drive
- Mainline Alternative 5 (west side of MD 5, Allentown Road to south of Woodyard Road) - The SMRT alignment runs adjacent to southbound MD 5 and several existing roadways that parallel MD 5. Replicating the alignment of the adjacent roadways results in several areas where the design speed drops below 25 mph outside of the transit station locations. Those locations include:
 - » Schultz Road at Coventry Way
 - » Schultz Road at Springbrook Lane
 - » Woody Terrace at Woodyard Road

These areas account for only 4% of the Alternative 5 alignment length:

- Hospital Options 1 through 4 – the proposed SMRT Hospital Options utilize 5% to 6% vertical grades and a 215' horizontal curve radius (25 mph+/-) in the vicinity of the Surratts Road/Hospital entrance/exit. The SMRT alignment assumes the MDOT/SHA-proposed Interchange Option A is as-built.
- Mainline Alternative 4/5 – the SMRT design accounts for the current MDOT/SHA interchange/Park and Ride under construction is this area. The SMRT alignment utilizes 225' horizontal curve radii (25 mph+/-) to minimize impact to existing wetlands.
- Brandywine Crossing Shopping Center Option – the SMRT design assumes lower speeds throughout the shopping center utilizing 150' horizontal curve radii (20 mph+/-) in several locations.

Table 6-2 Summary of Preliminary SMRT Corridor Transit Scenarios

SMRT Corridor Transit Scenario		RIDERSHIP					ENGINEERING			SOCIOECONOMIC/CULTURAL							NATURAL ENVIRONMENT				CAPITAL COSTS		O&M COSTS ⁷		
		Comparable Ridership Forecasting Model Scenarios	Daily Ridership - LRT	Daily Ridership - BRT	Transit Run Time - LRT (Minutes) ⁸	Transit Run Time - BRT (Minutes) ⁸	Length of Alignment (Miles) ¹	Length of Structures (LF) - Tunnel (T), Aerial (A)	At-Grade Roadway Crossings	Residential Properties ²	Business/Commercial Properties ²	Churches, Schools, Cemeteries	County Parks (Acres)	Environmental Justice Areas	Historic Sites	Hazardous Material Sites	Stream Crossings	Wetlands (Acres)	100-Year FEMA Floodplain (Acres) ³	Woodlands (Acres)	Potential FIDS Habitat (Acres)	Bus Rapid Transit (BRT) - Costs (\$millions)	Light Rail Transit (LRT) - Costs (\$millions)	BRT - Annual Operating and Maintenance Costs (\$millions)	LRT - Annual Operating and Maintenance Costs (\$millions)
	Alternative 4 w/Options (East side of MD 5)⁹																								
1	Beltway Crossing Option 2 (Tunnel under I-495); Hosp. Option 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	19.0	2,350 (A) 6,100 (T)	43	50	79	6	0	2	8	10	11	12.4	8.2	114.5	63.0	\$1,426	\$1,933	\$34.5	\$24.3
2	Beltway Crossing Option 3 (Aerial over I-495); Hosp. Option 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	19.0	4,580 (A)	39	55	78	6	0	2	8	10	11	12.5	8.4	117.7	63.0	\$1,103	\$1,617	\$34.5	\$24.3
3	Beltway Crossing Option 5 (Aerial over I-495); Hosp. Option 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	19.0	5,720 (A)	39	53	78	6	0	2	7	10	11	12.7	8.4	114.6	63.0	\$1,120	\$1,629	\$34.5	\$24.3
4	Beltway Crossing Option 7D (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	5b	N/A	24,800	N/A	41	19.0	10,840 (A)	42	45	72	6	0	2	10	10	11	10.4	7.4	104.7	63.0	\$1,119	N/A	\$35.6	N/A
5	Beltway Crossing Option 7E (MD 5 At-Grade under I-495); Hosp. Opt. 1 ⁵	5a, 5b	23,900	24,800	46	41	19.2	11,195 (A)	46	50	73	6	0	2	9	10	11	10.4	7.4	107.8	63.0	\$1,155	\$1,686	\$35.6	\$25.0
6	Beltway Crossing Option 8A (JBA Station and aerial over I-495); Hosp. Op. 1 ^{4 5}	4a, 4b	26,500	25,200	42	41	19.4	2,860 (A)	47	45	79	6	0	3	11	10	12	14.1	10.1	132.9	78.5	\$1,115	\$1,614	\$36.4	\$24.8
7	Beltway Crossing Option 9 (Aerial over I-495); Hosp. Option 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	18.9	3,700 (A)	38	51	78	6	0	2	8	10	11	12.7	8.4	121.0	63.0	\$1,081	\$1,585	\$34.5	\$24.3
8	JBA Cantilever Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Op. 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	18.9	10,215 (A)	37	51	78	6	0	2	8	10	11	12.0	8.0	118.2	63.0	\$1,141	\$1,658	\$34.5	\$24.3
9	JBA Avoidance Option w/Belt. Op. 9 (Aerial over I-495); Hosp. Opt. 1 ⁵	1a, 1b, 2b	27,900	27,300	39	38	18.9	13,780 (A)	36	51	76	6	0	2	8	10	11	11.3	7.3	117.2	63.0	\$1,201	\$1,728	\$34.5	\$24.3
	Alternative 5 w/Options (West side of MD 5)⁹																								
10	Beltway Crossing Option 1 (Tunnel under I-495); Hosp. Option 1 ⁵	3a, 3b	27,500	27,200	40	38	19.2	2,225 (A) 6,500 (T)	59	41	94	7	0.13	3	14	14	11	12.1	10.1	107.8	65.5	\$1,437	\$1,946	\$35.7	\$24.5
11	Option 6 (Tunnel under I-495); Hosp. Option 1 ⁵	3a, 3b	27,500	27,200	40	38	19.2	2,225 (A) 6,900 (T)	56	41	93	7	0.13	3	17	14	11	12.0	10.0	106.7	65.4	\$1,432	\$1,942	\$35.7	\$24.5

Notes:

¹ Length of Alignment as measured from Branch Avenue Metrorail Station to the proposed White Plains Station

² Property Impacts = potential displacements within Limit of Disturbance and assumed Station infrastructure envelope

³ The floodplain acreage includes county designated floodplain present in the Wesson Drive area

⁴ Beltway Crossing Option 8A impacts are based on an at-grade crossing of Allentown Rd. If Aerial Option selected, add 1,500 LF to Length of Structure total and subtract 2 crossings from the Intersection Crossings total

⁵ Options include Brandywine Crossing Shopping Center Option and Mattawoman Beantown Option

⁶ 2010 Corridor Preservation Study costs have been escalated to 2016 prices as a comparison

⁷ No BRT or LRT Vehicle Replacement Costs are included

⁸ White Plains to Branch Avenue @ Auth Road: No-Build Average Highway Time = 59 Minutes; Max-Build Average Highway Time = 52 Minutes

⁹ All Corridor Scenarios do not preclude widening of MD 5 one additional lane in each direction from I-95/I-495 to the US 301 split

 Legend for Comparison of Alternatives

BETTER	NEUTRAL	WORSE
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 Legend for I-495 Crossing Type

MD 5 AT-GRADE	TUNNEL	AERIAL
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7. PUBLIC INVOLVEMENT AND AGENCY COORDINATION



MDOT/MTA collaborated with Prince George's County, Charles County and other key stakeholders sharing a vision for improved transit in the SMRT Project corridor. Studies to evaluate transit serving southern Maryland began in the 1980s.

The 2010 Southern Maryland Transit Corridor Preservation study evaluated five alternatives, nine alignment options and six beltway crossing options; identified an alignment for use in county planning documents; and identified Bus Rapid Transit (BRT) and Light Rail Transit (LRT) as the technologies to analyze further.

This SMRT Study furthers the evaluation of transit in the SMRT Project corridor, and includes the following public outreach and agency coordination efforts:

- MDOT/MTA's SMRT Project website;
- Development of a Steering Committee and Technical Advisory Working Group (TAWG);
- Early and ongoing coordination with regulatory resource agencies;
- One-on-one meetings with key stakeholders;
- Two rounds of Public Open Houses in 2014-2015; and
- An Online Public Meeting held in January 2017.

Detailed information for each section below is included in **Appendix L**.

7a. SMRT Project Website



The project's website was launched early in the study, and is accessible by visiting <http://mta.maryland.gov/smart/>. This website serves as a hub for SMRT Study documents, presentations, maps, newsletters and upcoming event announcements. The project website allows visitors the opportunity to comment on the SMRT Study, to provide contact information (i.e., name, address, phone number, e-mail) to take an on-line survey using the SMRT Project Survey/Comment Form.

Those providing contact information can choose to be added to the SMRT Project's e-mail and/or postal list to receive meeting notices and project updates; they can also opt to not be placed on either list. The website also encourages members of the community, business and government groups or organizations to contact the SMRT Project team to arrange a presentation by sending an email request to SMRT@mta.maryland.gov.

The SMRT Project Survey/Comment Form was developed as a way to gather the public's ideas, opinions and questions on Travel Preferences, Stations, Alternative Alignments Beltway Crossings and Hospital Options.

Questions posed included the following:

- Travel Preferences:
 - » What travel options should be available in this corridor (BRT, LRT, Bicycle, Pedestrian Trails, Personal Vehicle)? Which would you most likely to use to travel and why?
- Stations:
 - » If you will use rapid transit, at which station would you be most likely to board? Why?
- Alternative Alignment:
 - » Which Alternative Alignment (Alternative 4 of 5) do you prefer? Why?
- Beltway Crossings and Hospital Options:
 - » Please check which beltway and hospital options you prefer.

7b. Steering Committee Members and Meetings

Mike Helta, MDOT/MTA

Jackie Seneschal, MDOT/MTA

Jason Groth, Charles County PGM

Gary V. Hodge, Regional Policy
Advisors (Charles County)

Tom Masog, M-NCPPC (PG)

Victor Weissberg, DPW&T (PG)

Meeting Date	Meeting Topics Discussed	
June 27, 2013	- Project Status/Overview - Intended outcome of next funding phase - Project timeline - CTP tour of the counties in September - Charles County requested cost estimate for a project Record of Decision	- Waldorf Urban Redevelopment Corridor (WURC) Plan - September 2013 - FTA Guidance - Large scoping meeting, Spring 2014 - Outreach including briefings to Elected Officials (EOs)
July 31, 2013	- Update on CTP and Tour Meetings - Counties funding concerns - BRT or LRT modes - Corridor context and ongoing studies	- Support for selecting a Recommended Alternative - Models available for Alternatives Analysis
August 29, 2013	- Project Status Update - Modeling methods - Ridership modeling options - Counties requested coordination: SMRT transit study and MD 5 improvements	- CTP Tours: - Charles County: September - Prince George's: November
September 30, 2013	- Project Status Update - Related transit studies - Update on growth policy in Charles Co.	- Branch Avenue TOD - Upcoming briefings with EOs
October 23, 2013	- Charles County Growth and Corridor Preservation Plan - Prince George's County right-of-way reservation requirements	- Identified Stakeholders for future meetings - MD 5 and US 301 Studies - Environmental Review Process
December 18, 2013	- Planned and proposed highway improvements and transit alternatives - Constrained Long Range Plan - FTA Process options - Montgomery County Corridor Cities Transitway (CCT) Tour	- Branch Avenue TOD - WURC kickoff - Charles County Comprehensive Plan and growth modeling
January 30, 2014	- Project Status Update - Potential funding sources - Ridership Model consistency - Briefings to Prince George's and Charles counties in early 2014.	Purpose and Need
March 12, 2014	- Project Status Updates - Coordination with MDOT/SHA - Ridership	Spring 2014 Public Open Houses

Meeting Date	Meeting Topics Discussed	
March 27, 2014	- Spring 2014 Public Open Houses - SMRT Project logo - CCT Overview and Tour	- Outreach to disadvantaged communities - Project Status Updates
April 30, 2014	- Project Status Updates - Beltway Crossing options - Spring 2014 Public Open Houses - Meetings with JBA, Southern Maryland Hospital, and MDOT/SHA - Branch Avenue Metro Alternatives Study - BRT v LRT	- Prince George's County Council acknowledged that Branch Avenue Metrorail Station is the next new downtown in the General Plan - Priority Funding Areas - Charles County growth and Master Plan alignment and Waldorf Redevelopment
May 12, 2014	- Update from Steering Committee - Spring 2015 Public Open Houses - BRT vs LRT - Branch Avenue Metro Alternatives Study	- Corridor context: - Designated PFA boundaries - CSX rail alignment - Downtown Waldorf Plan/ MD 925
October 29, 2014	- Purpose and Need - MDOT BRT Feasibility Guide - Southern MD Hospital briefing - MDOT/SHA MD 5 Study - Technical committee agenda	- Updates from MDOT/MTA and counties - INRX data to calibrate travel demand forecasting - Ridership briefing
December 14, 2015	- Project Status Updates - Stakeholder meetings - feedback - Recommendation Letters, Fall 2016 CTP - Bus on Shoulder	- Corridor context: - Joint Base Andrews access - Branch Avenue Metrorail Station - One Town Center at Camp Springs – expedited M-NCPPC review
April 1, 2015	- Project Status Updates - Vision and Challenges Draft Document - Economic Analysis - MDOT/SHA Access management study MD 5/US 301 to County line - Website Update	- Public Open Houses – June - Corridor Tour - May - Counties support for the project in CTP tour letters

7c. Technical Advisory Working Group Members and Meetings

MDOT/MTA convened a Technical Advisory Working Group (TAWG) composed of local government, state agencies, and consultants that meet monthly to recommend next

steps and alternatives to be removed from consideration based on technical information. Members of the TAWG include:

- Kari Snyder, MDOT
- Glenn Saffran, MDOT/MTA
- Jackie Seneschal, PB
- Dan Reagle, MDOT/MTA
- Michael Helta, MDOT/MTA
- Kevin Quinn, MDOT/MTA
- Jason Groth, Charles County PGM
- Gary V. Hodge, Regional Policy Advisors (Charles County)
- Victor Weissberg, Prince George's County DPW&T
- Dan Janousek, M-NCPPC, Prince George's County Planning
- Tom Masog, M-NCPPC, Prince George's County Planning
- Jonathan Parker, WMATA
- Dusan Vuksan, Metropolitan Washington Council of Governments (COG-TPB)
- Kenya Lucas, MDOT/SHA
- Tessa Young, MDOT/SHA
- Scott Hansen, MDP
- Ken Choi, MDP
- Paul Holland, JBA
- David Humphreys, JBA
- Dalia Leven, AECOM
- Jim Bunch, SWA
- Paul Silberman, SWA
- Mark Lotz, WTB
- Jennifer Kasperek, WTB
- Alex Metcalf, TEMS
- Crystal Saunders Hancock, PB

Meeting Date	Meeting Topics Discussed
#1 - July 30, 2014	Project background Public Meeting outcomes Branch Avenue Metro Station access Alternatives 1 – 5; pro and con discussion, more analysis needed
#2 - August 27, 2014	Purpose and Need Transit networks: MD 5 corridor Evaluate alternatives: Branch Avenue and MD 925 (Old Washington Road) Station locations
#3 - September 24, 2014	Purpose and Need MDOT/SHA Projects in the corridor Preliminary engineering for beltway crossing Future land use/development at Station Locations (dwelling units and jobs/acre) JBA area right-of-way preservation strategies; develop a JBA avoidance option for MD 5 median
#4 - October 29, 2014	MDOT BRT Transit Guide Ridership modeling and forecasting process Transit Service Policies and Operations parameters and assumptions for BRT and LRT Southern Maryland Hospital (MSMHC) Opportunity to review ongoing engineering for the Beltway Crossing options
#5 - December 4, 2014	Project Vision and Challenges Alternatives Eliminated documents MDOT/SHA projects coordination Transit Service Policies and Operations for BRT and LRT Ridership modeling and forecasting process MSMHC improvements and transit Limited right-of-way along JBA; develop other Beltway options US ACE requested overview of resources meeting Outreach to Elected Officials, JBA and MDOT/SHA

Meeting Date	Meeting Topics Discussed
January 28, 2015 Rider-ship Workshop	Determine final ridership inputs and/or policy issues for the modeling effort: Model forecasting methodology and model validation, MWCOG demographic forecasts and findings from the No-Build highway and transit alternatives; Capacity assumptions Transit Service Policies and Operations MDOT/SHA potential projects along the corridor SMRT Transit Alternatives and Options Measures of effectiveness and enhanced land use conditions
#6 - February 25, 2015	Potential Beltway Crossings Presentation Station Locations and Typology Ridership Workshop (January 28, 2015) follow-up Planning for a corridor tour
#7 –April 1, 2015	Beltway Crossings Station Locations and Typology Summary of Impacts handout
#8 –May 6, 2015	Economic Analysis Ridership modeling results (Round 1) Beltway Crossings Public Open House Materials
#9 - May 27, 2015	Bus tour of the corridor from Branch Avenue Metro HOV, Suitland to White Plains; reviewed all pro-posed station locations Reviewed existing MDOT/SHA projects along the corridor Public Open Houses: June 11, June 16 and June 18
#10 - August 26, 2015	Public Open House Comment Summary Alignment Concerns and Recommendations Visions and Challenges Document (provide comments by Sept 11, 2015) Elected Officials and Stakeholder Briefings – September/October Website update Round 1 Ridership Modeling Results Corridor Station Access Needs Update Elimination and Retention of SMRT Alternatives and Options memorandum
#11 – January 27, 2016	Project Update Overview of the Stakeholder Meetings Visions and Challenges Document Travel Forecasting Overview Mattawoman-Beantown Road Interchange Round 3 Public Meetings - Fall of 2016 Monthly coordination meetings with MDOT/SHA Complete Final Report December 2016 Round 2 Ridership Model Runs in progress Coordinating agency field meeting: Beltway Option 8A forested/wetland areas
#12 - March 23, 2016	Review of Alternatives Under Consideration Round 2 Travel Forecasting Results Environmental Review and Prince George’s County right-of-way Meeting Distribute general project limits of disturbance to counties; can include in staff development reviews Environmental Inventory
#13 –April 27, 2016	Preliminary Economic Analysis Results At-Grade Crossing Policy Environmental Inventory Report Draft Final Report Corridor Vision Document

#14 –June 22, 2016

Prince George’s County – Branch Avenue Metrorail Station to Woodyard Road: Beltway Crossing Options, Alignment, Stations, Grade Crossings/Traffic Controls
Prince George’s County – Surratts Road to County Line: Alignment, Stations, Grade Crossings/Traffic Controls
Charles County – County Line to Project End: Alignment, Stations, Grade Crossings/Traffic Controls, Maintenance Facility
 Summary Table

7d. Resource Agency Coordination

Resource agencies have regulatory authority and technical expertise on impacts and mitigation for water resources, forests, rare, threatened and endangered species, historic and archaeological resources. State and federal regulators are responsible for review and permitting state projects.

The role of local environmental agencies is limited; however each County has representatives on the steering

committee and the technical committee, which keep local agencies apprised of and resource concerns.

As members of the TAWG, participating resource agencies are invited to monthly meetings, receive TAWG meeting summaries and are invited to participate in MDOT/SHA’s Interagency Review Meetings when SMRT is on the agenda.

Resource Agency Representatives

MDE, Nontidal Wetlands Division, Regional Chief, Jeff Thompson
MDE, Nontidal Wetlands Division, Charles County, Lisa Dossman
MDE, Antidegradation Review, Angel Valdez
USACE, Baltimore District, Maryland State Highway Liaison, Jack Dinne
USACE, Baltimore District, Prince George’s County Steve Harmon
USACE, Baltimore District, Charles County, Erica Anuszewski-Schmidt
US EPA, Kevin Magerr
US FWS, Raymond Li
Maryland DNR, Project Review Division, Greg Golden
MDP (state growth policies), Scott Hanson

Date	Agency	Meeting or Correspondence
May 28, 2008 June 24, 2008 May 29, 2014 March 22, 2016	U.S. Fish and Wildlife Service (USFWS), Chesapeake Bay Field Office	Written replies to MDOT/MTA information requests Written replies to MDOT/MTA information requests Online Certification letter online request, Official Species List
July 10, 2008 June 02, 2014	National Oceanic and Atmospheric Administration (NOAA), Resource Protection Division - Fisheries	Written reply to MDOT/MTA information request Written reply to MDOT/MTA information request
January 22, 2009 July 2, 2014	DNR Environmental Review - Wildlife and Heritage Service	Written replies to MDOT/MTA information requests Written replies to MDOT/MTA information requests

Date	Agency	Meeting or Correspondence
April 16, 2014	Project history and 2010 Study assumptions Alternatives Analysis to assist counties with preserving right-of-way corridor—not NEPA Obtain public input on 2010 alts and options (meetings June 2014) Tech Committee will be developed Environmental impacts assessed using GIS desktop, more in depth for cultural resources	Interagency Review Meeting: DNR Project Review Division US FWS, CBFO USFWS FHWA
August 1, 2014	Maryland Department of Natural Resources (DNR) Environmental Review - Fisheries	Written reply to MDOT/MTA information request
November 19, 2014	Project overview of recent and planned activities U.S. Army Corps of Engineers (USACE) asked about LRT from Branch Avenue (past studies found cost too high)	Interagency Review Meeting
April 8, 2015	USACE and Maryland Department of the Environment (MDE) Nontidal Wetlands Division	Agency Early Coordination Meeting: discussed project impacts; watershed approach, the crossing Mattawoman Creek (abundant regulated resources and the ‘tons of projects’ already being planned in that area), Tier II (water quality Antidegradation Review) and tribal coordination
July 31, 2015 May 19, 2016	MDE Maryland’s Antidegradation Program	Email correspondence, Tier II review process Email correspondence, agency provided information to update the Environmental Inventory
February 17, 2016	Prince George’s County Planning Department	Discussed resources within a wooded area crossed by the Beltway Option 8A alignment. Area lies within a county forest mitigation bank and within a county owned floodplain easement. Impacts to resources can be mitigated, MDOT/MTA can buy credits from this bank or a different bank. There is no parkland within the county owned easement/property
March 23, 2016	All agencies on the TAWG: DNR, MDE, MDP, MHT, Prince George’s County Planning (M-NCPPC), Charles County Community Planning, US EPA, USFWS	Environmental Inventory report presented to TAWG, request for comments, especially resource agencies. Final document was revised as per comments received by TAWG
June 9, 2016	MDE, Nontidal Wetlands Division US ACE and DNR Project Review Division were invited.	Field Review of area within Beltway Option 8A, the only option that provides direct access to Joint Base Andrews. Discussed resource permitting for an alignment, any “fatal flaws,” and types of mitigation. Agencies not in attendance received summary and photos
July 15, 2016	DNR Project Review Division	Formal comments on the Environmental Inventory report

7e. Key Stakeholders

At the start of the project, the SMRT Project team conducted briefings with Key Stakeholders in 2013 to explain the goals of this follow-up study to provide transit service to southern Maryland.

Results informed both the Public Outreach Plan and the agenda for the Open House in 2014. MDOT/MTA held meetings in 2014 to inform the project needs and held a second round of Open Houses in 2015.

Date	Agency	Topics Discussed
November 16, 2015	Brandywine Crossing Shopping Center	Displayed an at-grade alignment that would bisect the parking lots of the shopping center, two station location options. MDOT/MTA will need to set up separate meetings with owners of large properties within the center. Parking garages would not be favored by tenants because of front-age view. Given the long project timeline, the center could be revamped to be TOD friendly. Suggested a business owner forum with owners and tenants to discuss options. BRT vs LRT
February 11, 2014	Charles County Commissioners	Review SMRT alternative/option alignments and discuss stations, bus service, potential development and infrastructure improvement needs for stations within the county. Discussed MDOT/SHA's projects and potential express bus service along the MD 5/US 301 corridor
June 22, 2014 October 23, 2015	Charles County Government	Review of Alternative/Option alignments Charles County employment and housing forecast MDOT/SHA's MD 5/US 301 Study Reevaluation (NEPA) and US 301/MD 228/MD 5 Business project (NEPA) have public meetings Spring 2016 Station locations Right-of-way preservation for major projects
May 30, 2014 May 18, 2015 October 6, 2016	Joint Base Andrews	JBA transportation demand Right-of-way along MD 5 adjacent to JBA property JBA prefers Beltway Option 8A including a station along Allentown Road and the JBA Avoidance Option along MD 5 Station locations at JBA, Camp Springs and Coventry Way
November 2013	Meeting with Elected Officials	MDOT/MTA project update meetings with Prince George's County and Charles County elected officials.
April 24, 2013 (Travel forecasting) November 13, 2013 December 11, 2013 March 5, 2014	Maryland Department of Transportation / Maryland State Highway Administration	MDOT/MTA introduced the SMRT Study (pre-NEPA). Project goals included: Selecting a preferred technology (i.e., Light rail transit – LRT or Bus rapid transit - BRT) Evaluating environmental impacts Coordinating with MDOT/SHA's ongoing projects in the corridor

Date	Agency	Topics Discussed
October 9, 2014 November 17, 2015	MedStar Southern Maryland Hospital Center	Review the Alternative/Option alignments and stations, bus service, potential development and infrastructure improvement requirements for the stations at and/or near the MSMHC facility. Update by MDOT/SHA on MD 5 projects Option 4 - MSMHC avoidance Station locations near Surratts Road Concerns about catenary conflicts with helicopter landings The Bus route stops (near MSMHC)
January 19, 2013 January 15, 2014 October 13, 2015	Prince George's County Government	SMRT Study introductions Prince George's County Council Committee on Transportation, Housing and the Environment briefing Station Locations Park and Ride Lots and Bus Service Right of Way Preservation Long range transit plan Results of meetings with JBA and WMATA Other options to be developed Connectivity to future alignments between regional activity centers
January 30, 2014	Prince George's County Government Transportation, Housing and Environment Committee	Local Plan updates 2010 Corridor Preservation Study Outreach Plan Evaluation Criteria BRT and LRT Technical studies Public Open Houses spring 2014
October 7, 2015	Washington Metropolitan Area Transit Authority	2010 Corridor Preservation Study Metro Station build out plans BRT and LRT Right-of-way Access constraints

7f. Public Outreach

Public Open Houses were held in 2014 and 2015 in both Prince George's and Charles counties, at centralized and accessible locations. MDOT/MTA project staff and consultants were available at the Open Houses to discuss the project and answer questions. Handouts such as project Fact Sheets, newsletters and maps, as well as large display boards showing the SMRT Project corridor and alternatives/options under consideration, were available at the Open Houses and are available on the project website. Written comments are encouraged to be submitted at the open houses or by filling out a survey/comment form on the project website (mta.maryland.gov/smrt).

Spring June 2014 Open Houses

In preparation for the series of SMRT Open Houses, the SMRT Project team conducted field reviews and researched available existing data (including other transportation projects, census data, Title I elementary schools) to identify environmental justice (EJ) communities (e.g., low-income and minority populations) within the study area and immediate project corridor. Flyers announcing the Open Houses were developed and distributed containing information in English as well as Spanish, Russian and Korean. Locations were made accessible for people with disabilities



and MDOT/MTA was available to make arrangements for special assistance or additional accommodations; printed material in an alternate format or translated; hearing impaired persons; and persons requesting an interpreter. These efforts were made to ensure EJ and disadvantaged persons within the study area were informed and afforded the opportunity to provide comments on the project and process. For the 2014 Open Houses, approximately 17,000 flyers and 220 door hangers announcing the Open Houses were distributed to residences (including senior centers and mobile home parks), religious facilities, community

facilities, local businesses and schools within the EJ communities identified. Goals of the Spring 2014 Open Houses were to:

- Provide information to the public on the 2010 Corridor Preservation Study
- Acquaint property owners, residents and business owners along the proposed alignments with the 2010 Study's findings
- Gauge public interest and solicit concerns with respect to transit and to the specific alignments evaluated in the 2010 Corridor Preservation Study
- Educate the public about the characteristics of light rail transit and bus rapid transit and inform the public of the MDOT/MTA SMRT Study
- Solicit comments to assist MDOT/MTA in defining the need for, purpose of and scope of a high-capacity rapid transit system along the SMRT 18.7-mile study corridor



June 10, 2014	Surrattsville High School Clinton, MD	33 attendees
June 18, 2014	Waldorf Jaycees Waldorf, MD	95 attendees
June 19, 2014	Thurgood Marshall Middle School Temple Hills, MD	18 attendees

Spring 2015 Open Houses

Between Spring 2014 and Spring 2015, project staff and technical teams worked to refine the alignment and station locations in order to move the study forward. All alternatives and options considered included transit options for both Light Rail Transit (LRT) and Bus Rapid Transit (BRT). Advertising for the 2015 Open Houses included posting announcements in six newspapers,

sending e-mail blasts to the project mailing list, posting flyers in commuter buses, project website updates, social media resources (Facebook), sending notifications to 52 elected officials, a press release from the Charles County public information office. Flyers and door hangers were distributed to throughout EJ communities as they were in preparation for the 2014 Open Houses. Goals of the Spring 2015 Open Houses were to:

- Provide updates that occurred in the SMRT Study since the Spring 2014 Open Houses
- Obtain feedback on alignments and options under consideration, characteristics of transit modes being considered and visions and challenges along the corridor

June 11, 2015	June 11, 2015, Waldorf Jaycees Waldorf, MD	106 attendees
June 16, 2015	Crossland High School, Temple Hills, MD	16 attendees
June 18, 2015	Surrattsville High School Clinton, MD	41 attendees

Winter 2017 Online Public Meeting

MTA released The Southern Maryland Rapid Transit Alternatives Report Draft in December 2016, which documented the analysis completed as part of the study. Advertising for the 2017 Online Public Meeting included posting announcements in three news publications and locations throughout the SMRT Project corridor sending multiple e-mail blasts to the project mailing list, posting flyers on TheBus, VanGo and Branch Avenue bus shelters and throughout the community, seat drops on commuter buses, project website updates, social media resources (Facebook, Twitter), sending notifications to elected officials, a press release from the Charles County public information office.

MTA conducted the Online Public Meeting on January 9, 2017 from 6:30 to 7:45 PM using a webinar format that included a presentation and an interactive question and answer session. Both Prince George's and Charles counties held simultaneous Watch Parties where technical staff were on hand to answer questions from the public about the project and meeting content. Materials from the event included: PowerPoint presentation, meeting transcript and questions and answers, are available on the project website. Goals of the 2017 Winter Online Public Meeting were to:

- Provide updates that occurred in the SMRT Study since the Spring 2015 Open Houses;
- Request feedback on refined alignments and options under consideration as well as technology as highlighted in the 2016 draft Southern Maryland Rapid Transit Alternatives Report

<http://www.smrtmaryland.com/smrt/public-involvement/previous-meetings/january-2017-online-public-meeting>

January 9, 2017 - Online Public Meeting

87 registered	64 attendees	47 comments received
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Get Connected

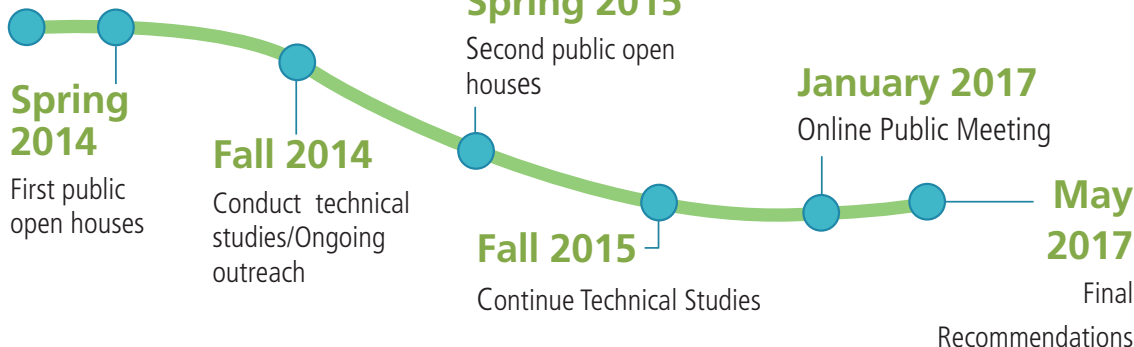
Your comments and suggestions are very important to us.

Please provide your ideas, opinions and questions, sign up for project updates or request a presentation by:

- Visiting our project website:
mta.maryland.gov/smrt
- Sending an email to:
smrt@mta.maryland.gov
- Mailing information to:
Southern Maryland Rapid Transit Study SMRT Project Manager
Project Development
6 St. Paul Street, 9th Floor
Baltimore MD 21202

Winter 2013

Initiate alternatives and environmental analysis



Recommended Alternative

MTA recommends Alternative 4, along the east side of MD 5 and US 301 in Prince George's County, and along the west side of the Pope's Creek Railroad in Charles County, as the alignment for SMRT. The recommended crossing of the Capital Beltway is Beltway Option 8A, which provides a station directly serving JBA near the existing pedestrian gate. The northern terminus of the alignment for the Recommended Alternative is the Branch Avenue Metrorail Station platform on what is currently the bus transfer side of the station. The alignment then proceeds in a southeasterly direction adjacent to the existing Metrorail maintenance yard and runs parallel to Wesson Drive, then Bridgeport Drive to cross over the beltway about 2,000 feet east of the Auth Road bridge over the beltway. The alignment then runs on the south side of Allentown Road, turning south to run adjacent to the Allentown Road exit ramp from northbound MD 5, and across Old Alexandria Ferry Road and Coventry Road at-grade. It then proceeds over Malcolm Road and Woodyard Road on aerial structures.

South of Woodyard Road, the alignment runs adjacent to the location of the future ramps for the MDOT/SHA-proposed Surratts Road and Burch Hill Road interchanges. Then the alignment veers slightly away from MD 5 to accommodate the Brandywine Interchange and Park and Ride lot, which are currently under construction. Continuing south along the east side of MD 5, the alignment is adjacent to the ramps at the proposed MD 373 interchange, then follows a 500-foot easterly shift into the central portion of the Brandywine Crossing Shopping Center parking lot. South of the shopping center, the alignment merges adjacent to MD 5/US 301, running parallel to the ramps at the SHA-proposed McKendree Road interchange. North of Mattawoman – Beantown Road, the alignment diverges from MD 5/US 301, running adjacent to the CSX rail line on a new structure crossing Mattawoman Creek (using the Mattawoman – Beantown Option alignment). The preferred alignment continues south over Mattawoman – Beantown Road and Mattawoman Drive before crossing Substation Road at-grade and continuing south parallel to the CSX rail line through the Waldorf area. The southern limit is near DeMarr Road in Charles County.

The Recommended Alternative provides direct access along the east side of the MD 5/US 301 corridor in

Prince George's County to all of the key activity centers/destinations including the JBA Pedestrian Gate, MSMHC, Brandywine Crossing Shopping Center and the Waldorf Urban Redevelopment Corridor. This route is, on average, the lowest-cost option of those considered and is preferred by both Prince George's and Charles counties, as well as JBA.

Beltway Option 8A is the only option that includes a station directly serving JBA, near the main gate, near employment centers. This route has a slightly longer travel time, slightly lower ridership, higher natural environmental impacts (e.g., streams, wetlands, woodlands, etc.) and higher residential displacements when compared with others. JBA has expressed a strong preference for this option.

Recommended Technology

Bus Rapid Transit (BRT) is the recommended technology for this corridor. It will use rubber-tire vehicles and include:

- Specifically designed branded vehicles
- Cross platform, multiple door access
- Off-vehicle fare collection
- Low floor vehicles with level boarding
- High-frequency, all day service
- Transit Signal Priority at traffic signals (or grade separation)
- Travel speeds which match or exceed that of the adjacent roadway

The SMRT BRT route will operate on a roadway physically separated from the highway, allowing the transit service to bypass the projected traffic congestion. The vehicles will have a 90 passenger per bus capacity (60 seats/30 standees).

Projected BRT ridership is similar to LRT ridership but BRT travel time is approximately one minute faster over the length of the corridor. Both BRT and LRT are proposed to help spur economic development along the SMRT Project corridor. Perhaps most importantly, BRT has a capital cost of \$500 million less than LRT. While the annual operating costs for BRT are higher (between \$34-\$37 million per year for BRT vs. \$24-25 million for LRT) based on the number of drivers and vehicles, the difference is not sufficient to overcome the considerable difference in construction costs. As transit technologies evolve, it is conceivable that changes in light rail construction requirements or

the emergence of automated vehicles could reduce the cost differential between BRT and LRT options or a hybrid technology may emerge. In any event, the development of a dedicated transitway would insulate the transit service from the projected traffic congestion of the adjacent highway facility.

- Integrating the SMRT alignment and stations into the MedStar Southern Maryland Hospital Center campus and into the Brandywine Crossing Shopping Center
- Crossing of the Mattawoman Creek
- Coordinating with CSX along their right-of-way in Charles County

Additional Studies

Throughout this study, the SMRT Project team has identified several challenging areas that need additional technical studies during subsequent phases of project development. These include:

- Minimizing and mitigating the environmental effects,
- Addressing right-of-way impacts to JBA along Allentown Road and MD 5

Summary of Recommended Alternative

Table 8-1 below provides a summary of the costs and characteristics of the recommended alternative.

Table 8-1. Cost and Characteristics of SMRT Recommended Alternative Branch Avenue Metrorail Station to White Plains	Bus Rapid Transit (BRT)
Total Capital Cost (2016\$)	\$1.10B
Annual Operating Cost (2016\$)	\$34-\$37M
Ridership (2040 Boardings)	25,200
Travel Time (minutes)	41
Employment (30-year impact, person years of work)	250,000
Income (30-year impact, 2015\$)	\$19B
Property Value (2015\$)	\$27B

ACRONYMS

A		J	
ADT	Average Daily Traffic	JBA	Joint Base Andrews
AICUZ	Air Installation Compatible Use Zones	JLUS	Joint Land Use Study
B		L	
BMP	Best Management Practice	LOD	Limit of Disturbance
BRT	Bus Rapid Transit	LOS	Level of Service
C		LRT	Light Rail Transit
CCT	Corridor Cities Transitway	M	
CLRP	Constrained Long Range Plan	MCTP	Maryland Comprehensive Transit Plan
CO2	Carbon dioxide	MDE	Maryland Department of the Environment
COG	Council of Governments	MDOT/SHA	Maryland Department of Transportation's State Highway Administration
CSIS	Candidate Safety Improvements Section	MDOT/MTA	Maryland Department of Transportation's Maryland Transit Administration
CTP	Consolidated Transportation Program	MDNR	Maryland Department of Natural Resources
D		MDP	Maryland Department of Planning
DCM	Design Criteria Manual	MHT	Maryland Historical Trust
DFIRMS	Digital Flood Insurance Rate Maps	M-NCPPC	Maryland-National Capital Park and Planning Commission
DPW&T	Department of Public Works and Transportation (Prince George's County)	MPH	miles per hour
E		MSMHC	MedStar Southern Maryland Hospital Center
EIR	Environmental Inventory Report	MUTCD	Manual on Uniform Traffic Control Devices
EJ	Environmental Justice	MWCOG	Metropolitan Washington Council of Governments
EO	Executive Order	N	
F		NHS	National Highway System
FEMA	Federal Emergency Management Agency	NEPA	National Environmental Policy Act
FHWA	Federal Highway Administration	NOAA	National Oceanic and Atmospheric Administration
FIDS	Forest Interior Dwelling Species	NRE	National Register Eligible
FRA	Federal Railroad Administration	NRHP	National Register of Historic Places
FTA	Federal Transit Administration	NTD	National Transit Database
G		O	
GHG	Green House Gas emissions	O&M	Operations and Maintenance
GIS	Geographic Information System	P	
H		PFA	Priority Funding Area
H&H	Hydrologic and Hydraulic	PIDs	Priority Investment Districts
HOV	High Occupancy Vehicle		
HUD	US Department of Housing and Urban Development		

	R
RTE	Rare, Threatened and Endangered
	S
SCC	Standard Cost Categories
SMA	Sectional Map Amendment
SMRT	Southern Maryland Rapid Transit
SVP	Stream Valley Park
	T
TAWG	Technical Advisory Working Group
T.B.	T.B. refers to a place near the MD 5/ US 301 interchange
TAZ	Traffic Analysis Zone
TCRP	Transit Cooperative Research Program
TMDL	Total Maximum Daily Load
TOD	Transit Oriented Development
TSM	Transportation Systems Management
TSP	Transit Signal Priority
	U
USACE	U.S. Army Corps of Engineers
US DOT	U.S. Department of Transportation
US EPA	U.S. Environmental Protection Agency
US FWS	U.S. Fish and Wildlife Service
	V
VOT	Value of Time
	W
WHS	Wildlife and Heritage Service (DNR)
WMATA	Washington Metropolitan Area Transit Authority
WRR	Watershed Resources Registry
WUDS	Waldorf Urban Design Study
WURC	Waldorf Urban Redevelopment Corridor
WSSC	Washington Suburban Sanitary Commission
WSSC	Wetlands of Special State Concern

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