

2. PREFERRED PURPLE LINE MODE

This section of the staff memo reviews the issues related to the preferred mode of the Purple Line raised by MPAG members, in testimony at the MTA hearings, by other interested citizens and stakeholders, elected officials and staff. The staff’s analysis is supplemented by other technical sources and input from the MTA Project Team, MPAG members, or other interested parties.

The staff recommends light rail as the preferred mode for the Purple Line.

Vehicle Capacity

In late October, staff asked the MTA to provide estimates for the peak directional line load (ridership) and the assumptions regarding mode capacities used in the AA/DEIS.

The table below presents this information:

TABLE 7 – Peak Load Point, Ridership, and Capacity

Alternative	Location	Direction	Peak Hour Directional Line Load	Peak Hour Capacity ¹³
Low Investment BRT	Rt. 1/UM East to College Park Metro	Eastbound - PM	1,087	2,100
Med Investment BRT	SSTC ¹⁴ to 16 th Street	Eastbound - PM	1,652	2,100
High Investment BRT	SSTC to 16 th Street	Eastbound - PM	1,858	2,100
Low Investment LRT	SSTC to 16 th Street	Eastbound - PM	2,147	2,800
Medium Investment LRT	SSTC to 16 th Street	Eastbound - PM	2,239	2,800
High Investment LRT	SSTC to 16 th Street	Eastbound - PM	2,533	2,800

The AA/DEIS notes that the “TSM and BRT vehicle fleets could be a combination of articulated or standard buses.”¹⁵

Directional line capacity is dependent on the service frequency and the bus or train’s capacity, among other things. The peak hour capacity of 2,100 shown in Table 7 for the BRT alternatives assumes that additional BRT vehicles are used during the busiest hour in the afternoon to accommodate the demand. It also assumes that each BRT vehicle can accommodate 140 passengers.

¹³ The MTA assumptions for Peak Hour Capacity include the following: For BRT – 10 vehicles per hour times 140 people per vehicle plus 5 trippers per hour times 140 people per vehicle. “Trippers” are extra buses placed in operation for only the period of time needed to accommodate the demand – in this case it is theoretically the busiest consecutive 15 minutes during the peak period. For LRT – the assumption is 10 trains per hour with each train consisting of 2 cars, each car carrying 140 people.

¹⁴ SSTC is the Silver Spring Transit Center

¹⁵ See Subsection 2.6.5, page 2-31.

There are numerous articles and professional references on transit capacity. The Transportation Research Board's *Transit Capacity and Quality of Service Manual* (2nd Edition) suggests a good range for BRT vehicle capacity is 100 to 120 for a high floor vehicle.¹⁶

Another good reference for comparing LRT and BRT is a presentation by Jay Evans Consulting in 2005 at the Institute of Transportation Engineers annual meeting.¹⁷ The presentation includes an objective look at the issues of capacity and costs. BRT vehicle capacity is estimated to range from 110 to 120, including more than one-third as standees. Mr. Evans concludes the presentation by noting:

"No rapid transit mode is singly superior in all contexts. Consideration of 'right sizing' should be paramount in decision making."

Fifteen BRT vehicles an hour would accommodate 1,800 passengers if you assume 120 passengers per BRT vehicle (lower than the MTA estimate presented in the above table). Ten LRT trains an hour would accommodate 2,700 passengers an hour (per the MTA estimate) if you assume two cars per train and each car accommodating 135 passengers.¹⁸ Under those assumptions, the BRT vehicles would accommodate the estimated peak hour directional line load on two of the three alternatives.

The staff is concerned that BRT may not provide enough capacity to serve expected demand, especially given the Purple Line's connections with the Metrorail system, the forecasted peak hour passenger demand, and the fact that the forecasting model does not capture other external factors such as the risk that fuel costs rise faster than inflation.

If capacity were to be a problem, the introduction of additional BRT vehicles to accommodate directional line loads above 2,000 could be expected to adversely impact signal priority and pedestrian crossing phases—a key consideration at a number of locations along the alignment.¹⁹ There are three primary reasons for this concern, as discussed with MTA staff at the December 8 Planning Board worksession (and exemplified by the query "why do buses come in threes?"):

- any BRT option must operate in mixed traffic for several blocks to execute the "turnaround" required at the Bethesda terminus, so the ability to maintain schedules on very short headways is unrealistic.
- Individual station boarding and alighting demands become more unpredictable as headways are reduced, so that buses will not serve equal demands.
- The typical traffic signal cycle length (generally up to 150 seconds in peak periods) means that should signal priority treatments fail, an individual BRT vehicle could fall one "headway" behind schedule.

¹⁶ See *Transit Capacity and Quality of Service Manual* – 2nd Edition (Exhibit 4-17)

¹⁷ See the following link for the slide show: http://www.ite.org/meetcon/2005AM/Evans_Tues.pdf

¹⁸ A 90 foot light rail vehicle is estimated to have a capacity equivalent to 1.5 passengers per foot length of the car, or 135 passengers (Source: *Transit Capacity and Quality of Service Manual* – 2nd Edition – page 5-29).

¹⁹ See *Transportation Research Record: Journal of the Transportation Research Board*, No. 1927, 2006, pages 11-21.

Staff finds that the capacity advantage of LRT is one deciding factor in developing a recommendation for a preferred mode.

Vehicle Emissions and Greenhouse Gas Impacts

The AA/DEIS finds that the difference in emission levels among the various alternatives is insignificant.²⁰ This finding is consistent with other technical comparisons of BRT and LRT emissions. Transportation Research Record 1927 provides a summary comparison of the variety of BRT and LRT technologies and concludes that LRT is superior to BRT in that LRT produces lower regional or urban emissions levels.²¹ However, the combined consideration of energy sources and greenhouse gas emissions has generated substantial discussion that requires further review, particularly in the selection of appropriate LRT vehicle technology. Additional analysis of the alternative LRT vehicle energy and emissions characteristics should be included in the FEIS. Therefore, at the moment, **staff finds that vehicle emission and greenhouse gas levels should not be a deciding factor in developing a recommendation for a preferred mode.**

Vehicle Noise and Vibration

Potential noise and vibration impacts were assessed using criteria established by the Federal Transit Administration (FTA). The assumption was that BRT service would be operated using 60-foot articulated buses and the LRT trains would consist of trains with two 90-foot articulated cars.

In general, there is moderate noise impact associated with the BRT alternatives at the following locations in the County:

- Leonard Drive
- 16th Street – Between East West Highway and Spring Street
- Wayne Avenue – Between Cedar Street and Cloverleaf Road
- Wayne Avenue – Between Dartmouth Avenue and Dale Drive
- Wayne Avenue – Between Mansfield Road and Sligo Creek Parkway
- Arliss Street – Between Flower Avenue and Walden Road
- Residences Near Lyttonsville Operations and Maintenance Facility

The impacts from the BRT alternatives are expected to average one to three dBA above the FTA impact limits. Noise mitigation for the BRT line operations is anticipated to be four-foot wall type barriers.

Noise mitigation for LRT line operations will take the form of vehicle skirts on all light rail vehicles and right-of-way walls on either side of the transitway within the entire length of the

²⁰ See page 4-48 of the AA/DEIS.

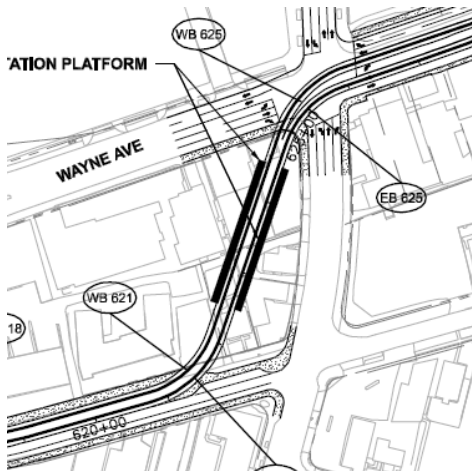
²¹ See Transportation Research Record: Journal of the Transportation Research Board, No. 1927, 2006, pages 31-37, for a relatively recent article comparing the emission levels of BRT and LRT vehicles for CO, NOx, and VOC: <http://www.actfortransit.org/docs/2008JulLRTvsBRTemissions.pdf>

Georgetown Branch right-of-way. No noise impacts are anticipated from LRT line operations as a result of these mitigation measures.

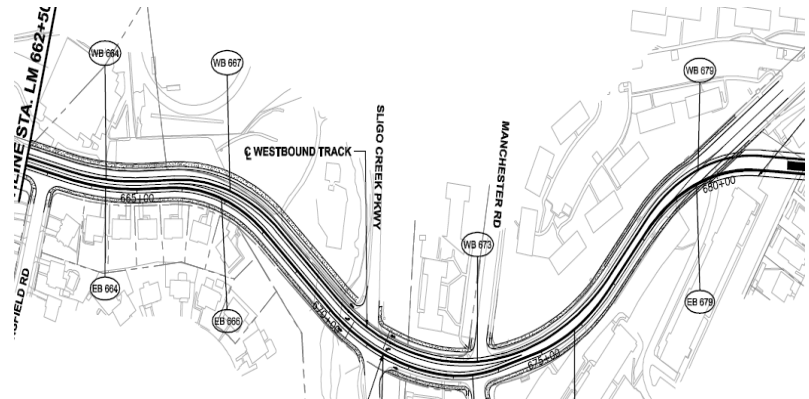
The potential for wheel squeal noise associated with the LRT operations exists at between five to eight locations in the County, depending on the alternative. The locations are primarily within 300 feet of Wayne Avenue.²²

The specific segments susceptible to wheel squeal are shown below.

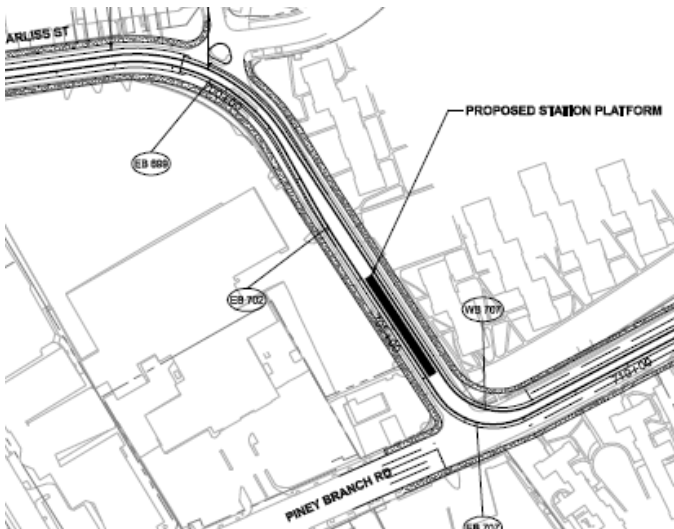
Wayne Avenue and Fenton Street



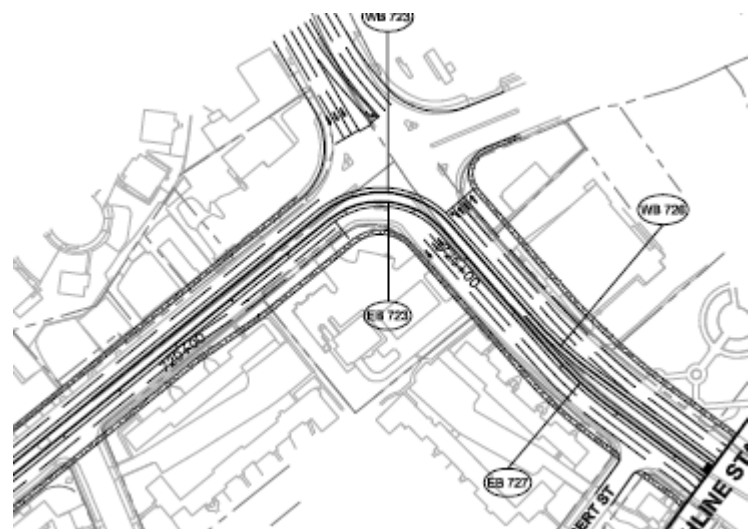
Wayne Avenue – From Mansfield Road East to Tunnel



Arliss Street – From the Tunnel Through the Turn onto Piney Branch Road



Turning from Piney Branch onto University Boulevard



²² See pages 4-54, 4-55 and 4-56 of the AA/DEIS – along with Figure 4.8-1.

Mitigation options for wheel squeal noise include²³:

- Using water to lubricate wheels and/or rails
- Optimizing track and wheel profiles to minimize flanging and riding on restraining rail
- Installing resilient or damped wheels.

Vibration impacts for the BRT alternatives would occur at the edge of Columbia Country Club under the Medium and High Investment Alternatives.

The LRT alternatives are expected to produce vibration impacts along the Georgetown Branch right-of-way at three locations:

- East-West Highway
- Edgevale Court
- Boundary of Columbia Country Club

Also, for all three alternatives, within the Georgetown Branch right-of-way, structures located within 40 feet of the proposed LRT centerline are expected to experience vibration levels at or above the FTA impact threshold for Category 2 land uses.²⁴

The AA/DEIS indicates the preferred mitigation for ground borne vibration is the proper maintenance of wheels and rails and that with maintenance, the impacts would cease.²⁵

The staff finds the noise and vibration analysis in the AA/DEIS is consistent with established FTA procedures and criteria. The proposed and potential mitigation techniques for line operations are reasonable for the noise elements that have been investigated. Site-specific mitigation techniques, however, have not yet been identified.

Staff finds that noise impacts should be a consideration in developing a recommendation for a preferred mode, and that the site-specific locations where wheel squeal has been identified for LRT is a lower overall impact than the noise levels associated with BRT. Mitigation of wheel squeal should be included in the FEIS.

Master Plan Conformance and Urban Design

Adopted Plans that include the Purple Line in some form include:

Georgetown Branch Master Plan Amendment, January 1990

This Plan designates the Georgetown Branch right-of-way as suitable for use as the Silver Spring and Bethesda Trolley and the Capital Crescent Trail between Silver Spring and Bethesda. The

²³ See presentation by David A. Towers P.E. at the following link:
<https://www.commentmgr.com/projects/swne/docs/RailTransitNoiseVibration.pdf>

²⁴ A category 2 land use includes residences and buildings where people normally sleep.

²⁵ See page 4-56 and 4-57 of the AA/DEIS.

plan includes a single track (as opposed to a double track) over certain segments of the alignment.²⁶

Bethesda - Chevy Chase Master Plan, April 1990

This Plan reconfirms a light rail and trail combination on the Georgetown Branch alignment between the Silver Spring and Bethesda CBDs as described in the *Georgetown Branch Master Plan Amendment*.

Bethesda Central Business District Sector Plan, July 1994

This Plan reconfirms the connection of light rail service to the Silver Spring CBD using the Georgetown Branch right-of-way, with a terminal located near the Metrorail south entrance in the Bethesda CBD.

Silver Spring Central Business District Sector Plan, March 2000

This Plan reconfirms the Georgetown Branch Transitway as part of the design for the new SSTC. The Plan doesn't preclude consideration of a Purple Line north or east of the SSTC but does call for the Sector Plan to be revisited for any changes to right-of-way or easement acquisition, land use, design, and zoning recommendations, if they would have regional benefits.²⁷ This is important with respect to the Functional Master Plan since one of its purposes is to provide specific policy guidance on a Purple Line alignment east of the SSTC. This policy guidance is expected to be adopted in concurrence with the State and federal decision-making schedule and will therefore be in place to guide land use planning efforts and transportation decisions during implementation.

East Silver Spring Master Plan, December 2000 and Takoma Park Master Plan, December 2000

Both of these plans include recommendations to provide rail transit stops along University Boulevard, New Hampshire Avenue, and Piney Branch Road if a rail transit system is approved along University Boulevard. Maps in both plans depict an alternative rail alignment connecting the SSTC with a Takoma/Langley Transit Center.²⁸

Staff finds that master plan conformance should be a consideration when considering the preferred mode for the Purple Line. The existing applicable plans recommend light rail.

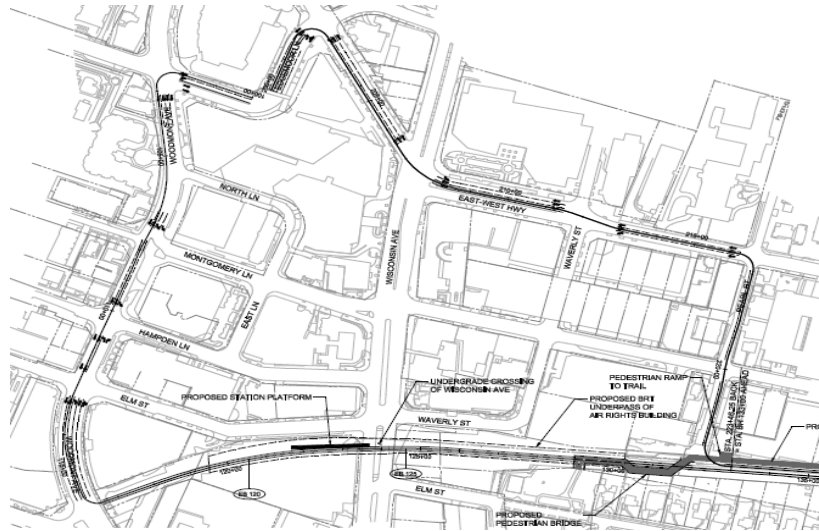
²⁶ Additional detail on the extent of the single track configuration is presented later in this staff memo – in the section on the consideration of issues related to the alignment of the Purple Line.

²⁷ See *Silver Spring CBD Sector Plan*, February 2000, page 100, for full discussion.

²⁸ See *East Silver Spring Master Plan*, December 2000, page 83, and *Takoma Park Master Plan*, December 2000, page 103.

surface via a switchback ramp located just west of the tunnel.

Second, all of the Medium and High BRT alternatives provide for an at-grade trail within the tunnel and therefore there is no ramp as noted above under the High Investment LRT Alternative. The BRT vehicles in the Medium Investment and High Investment Alternatives enter the plaza area from Woodmont Avenue and continue eastbound through the plaza area to the station platform located in the tunnel (see drawing below). The BRT vehicle travel pattern at this location is one way (eastbound) only. The vehicles would move through the area every six minutes during weekday peak periods and every ten minutes mid-day.



Finally, all of the LRT alternatives include “tail-tracks” that would extend west from the tunnel area into the plaza area for an undetermined distance. The image below is provided by the MTA. Some stakeholders have suggested that the tail tracks are an area where light maintenance activities could be carried out. Tail tracks would be used periodically to store a train before it was returned to Lyttonsville or placed into service at the beginning of peak period service.



Woodmont East is located in the northeast quadrant of Woodmont Avenue and Bethesda Avenue and is the western terminus of the Purple Line. Other aspects of Woodmont East of note include the following:

- It is where the Interim Capital Crescent Georgetown Branch Trail meets the completed Capital Crescent trail that continues south to Georgetown.
- It is across from an approved planned mixed use joint development project on the existing County Parking Lot 31 site.
- With the completion of the Bethesda Row mixed use project, it has for many become a significant activity center that is active both day and night.

Consideration of a preferred mode for the Purple Line in the context of urban design and Woodmont East should take into account the following³¹:

- The Low BRT Alternative along Jones Bridge Road does not extend south to Woodmont East and is therefore the only option that avoids Woodmont East and the impact of having the transitway in the plaza and tunnel.
- The Low BRT Alternative along Jones Bridge Road is the only option where the trail is not completed between Jones Mill Road and Woodmont East.
- The Low BRT Alternative along Jones Bridge Road is the only option that would not provide for direct pedestrian connection to Woodmont East.
- The Medium and High BRT Alternatives are the only alternatives on the Georgetown Branch right-of-way that feature both the transitway and trail to continue through the tunnel at grade.
- The Medium and High BRT Alternatives are the only alternatives that involve Purple Line vehicles moving through the plaza area from one end to the other.
- The LRT Alternatives are the only alternatives where Purple Line vehicles could be parked in the plaza area – even if infrequently and for very short periods of time.
- The Low and Medium LRT Alternatives do not provide for a trail through the tunnel.
- The High LRT alternative includes a trail that continues through the tunnel above the trail in a confined space.

A summary of the considerations related to urban design, Woodmont East, and the mode of the Purple Line is presented below:

³¹ There is admittedly some overlap between mode and alignment when discussing Woodmont East (and other areas or issues as well). We have chosen to include the discussion at this point in the report because the different alignments at this end of the Purple Line are largely based on the mode under consideration. That is not the case for most other areas (not all) along the alignment.

TABLE 8 – Summary of Woodmont East Urban Design Issues

Alternative	Maintains Status Quo At Woodmont East and Avoids Impacts To Trail	Improves Trail Connectivity To/From Woodmont East and Points East and South	Accommodates Improved Trail In Tunnel Without Grade Changes ³²	Avoids Transit Vehicle In Plaza On Regular Basis	Reinforces Street Activation In Area
Low BRT	Yes	No	No	Yes	No
Medium BRT	No	Yes	Yes	No	Yes
High BRT	No	Yes	Yes	No	Yes
Low LRT	No	Yes	No	Yes	Yes
Medium LRT	No	Yes	No	Yes	Yes
High LRT	No	Yes	No	Yes	Yes

After reviewing the issues in the context of mode, the staff finds there are advantages and disadvantages with either mode (and the associated alignments as well). Any conclusion as to the “best” mode would depend on the weight given the considerations we have focused on or other factors not considered. **Staff finds that the urban design considerations do not establish a basis for favoring either LRT or BRT at the Woodmont East plaza site.**³³

Proposed Library Site In Silver Spring

Both the Low and Medium Investment BRT and LRT alternatives include a stop at the proposed library site in Silver Spring on the southwest quadrant of the intersection of Wayne Avenue and Fenton Street.



A rendering of how the Purple Line and the library might appear is depicted to the right. The plan calls for the transitway to bisect the corner of the site. One example of a similar treatment exists today on the campus of Portland State University where the Portland Streetcar alignment runs between academic buildings as shown in the adjacent photo.³⁴ **Staff finds that urban design considerations do not establish a basis for favoring either LRT or BRT at the Silver Spring library site.**³⁵



³² The trail connection through the tunnel is not depicted in Concept Plan drawings BM-05 and BH-05 for the Medium and High BRT alternatives.. The staff has confirmed with the MTA project team that this connection is included in these alternatives.

³³ It should be noted that the Vision Division staff does not support BRT operating through the plaza.

³⁴ While similar in concept, there are differences as well. The Portland vehicle is a streetcar and is smaller than the Purple Line vehicles. Also, there is a single track in the photo and the Purple Line would have a double track or two-way transitway.

³⁵ The library site is a key consideration when considering alignment, however and that discussion is presented later in the staff memo.

University Boulevard and Takoma/Langley Transit Center

There are different concepts for how the Purple Line would operate along University Boulevard and connect with the Takoma/Langley Transit Center. The differences are important because the area (like Woodmont East and the proposed location of the Silver Spring Library) are in areas with high volumes of pedestrian activity.

The BRT Alternatives have the transitway in either shared (Low Investment) or dedicated (Medium and High Investment) curb or outside lanes along University Boulevard. The LRT Alternatives envision the alignment in the median of University Boulevard – at grade in the case of the Low and Medium Investment Alternatives and elevated in the case of the High Investment Alternative. The drawings below depict the different approaches.

Low & Medium Investment BRT Alternatives



Low & Medium Investment LRT Alternative



High Investment LRT Alternative³⁶



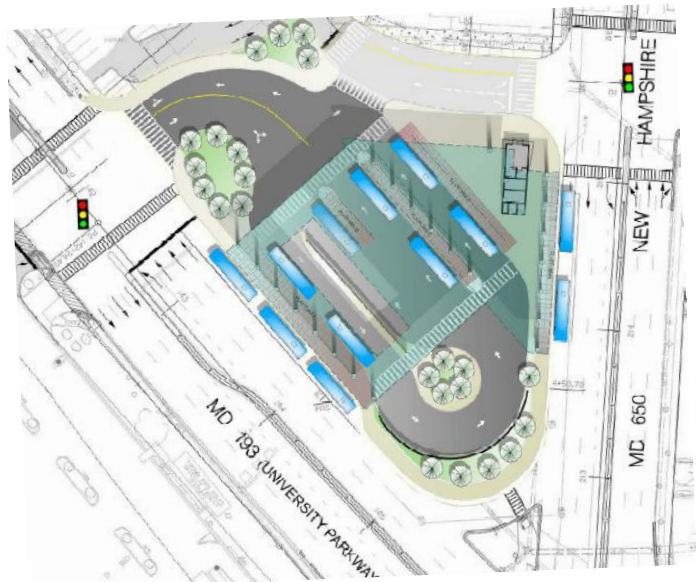
The most important urban design considerations in this area are as follows.

³⁶ High Investment BRT is described in one place in the narrative of the AA/DEIS as being in the median of University Avenue (see page 3-12) and in another (page 2-16 and 2-20) as being in dedicated (outside) lanes (as shown on page 2-14 but in the shared configuration as part of the Low Investment BRT Alternative). The plan drawings (drawing number BH-19 in the Conceptual Plans Technical Report) indicate the station platforms would be on the outside lanes and on an aerial structure over University Boulevard. As of this writing, the staff finds the plan drawings are the accurate representation of the concept plan for the High Investment BRT at this location.

- pedestrian connectivity
- pedestrian safety
- impacts on street activity along University Boulevard and New Hampshire Avenue
- access to the Purple Line and the proposed new Transit Center .

Recent improvements to this intersection include the installation of a fence in the median of both University Boulevard and New Hampshire Avenue to channel pedestrian flow toward crosswalks as well as improved sidewalk connectivity. Overall design of future improvements should continue to place an emphasis on reinforcing and controlling pedestrian flow across both state highways, to and from the Purple Line platform, and to and from the Transit Center.

Note in the drawings above for the surface alignments that the location of the crosswalk conflicts with the station platform for the LRT alternatives. A concept plan (without the Purple Line) of the Transit Center is shown on the right depicting crosswalks at the entrance to the Transit Center. The MTA Project Team has noted that the plan drawings (LL-19 and LM19) for the LRT surface alternatives also depict a conflict with eastbound buses on University Boulevard that would be turning into the Transit Center. This issue is being examined and it is possible the platform in the median will be shifted slightly toward the intersection with New Hampshire Avenue. Shifting the platform toward New Hampshire Avenue and eliminating the conflict with the crosswalk are examples of the type of modifications that acknowledge the need to give priority to pedestrian flow and safety in this area.



The AA/DEIS plan drawings for this area indicate where sidewalks are to be relocated as a result of the construction of the Purple Line. A comparison of the plans suggests that some sidewalk connectivity may be lost under the light rail alternatives. An example of this can be seen when examining the area on University Boulevard between Gilbert Street and Merrimac Drive. Segments that do not appear to have sidewalks include an area on the south side of University Boulevard immediately west of Carroll Avenue and the north side of University Boulevard west (and east) of Merrimac Drive.³⁷ The staff has reviewed this issue with the MTA project team and they have indicated that there will be no net loss of sidewalk segments along University Boulevard resulting from the construction of the Purple Line. We will continue to review this with the overall objective of insuring that the plans reflect no loss of connectivity and a sidewalk width of at least eight feet – consistent with the County standard and Master Plan

³⁷ See drawings BM-18 and LM-18 of the plan drawings in the Conceptual Plans Technical Report for comparison.

recommendations for shared use paths on both sides of University Boulevard that also include a (minimum) five foot planted buffer be located between the roadway and the sidewalk.³⁸

Pedestrian access and mobility was also recently examined by a study funded under the COG's Transportation/Land Use Connections Program. This study recommended that light rail be designated as the preferred mode of the Purple Line noting the following:

*"It is preferable that the Purple Line be light rail rather than Bus Rapid Transit. Light rail is more predictable for pedestrians seeking to cross the travel way and creates less noise and pollution which is especially important for those on foot. If the Purple Line is Bus Rapid Transit, special effort will be needed to ensure pedestrian access, mobility and comfort, given the vital link between pedestrians and transit. The Sector Plan process will look into this in working with MTA to develop recommendations for the Purple Line."*³⁹

The AA/DEIS does not indicate any material difference between the modes with respect to noise in this area nor any material difference with respect to pollution overall. As noted above, the plan drawings in the AA/DEIS seem to indicate that sidewalk connectivity may be more of an issue with the median alignment of Light Rail than the BRT alignment that operates in the outside lane.⁴⁰ We do know from the sections posted on the project web site that the median alignment requires on average an additional ten feet of right-of-way in this area.

Finally, there is the issue of the mode and the potential for economic revitalization. Mayor Bruce Williams of the City of Takoma Park has forwarded a letter to Chairman Hanson expressing the City's support for light rail and noting that light rail is:

"critical to joint economic revitalization efforts in the Takoma/Langley commercial district BRT would not give the strong economic shot in the arm" ...

In addition to the City of Takoma Park, Prince George's County Council Chairman Samuel H. Dean also submitted testimony at a recent MTA Purple Line public hearing in favor of light rail. Mr. Dean's testimony included the following comments about Langley Park:

"..This priority development and redevelopment area of the County offers some of the most valuable TOD opportunities once it is confirmed that the Purple Line will be built. And will be built as light rail, which provides the demonstrable public sector commitment that the development community often looks for before investing in first tier suburban communities such as ours."

³⁸ The state standard width for a sidewalk in this area is five feet.

³⁹ See item number 8, pages 16 and 17, Takoma/Langley Crossroads Pedestrian Access and Mobility Study, July 2007, COG.

⁴⁰ It should be noted that the Study was completed over a year in advance of the release of the AA/DEIS and therefore the report authors did not have access to the AA/DEIS findings related to noise, pollution, or potential issues related to sidewalk connectivity.

There are a number of studies that have examined the impact transit has on property values including a 2007 study conducted by the University of Waterloo.⁴¹ The study included a literature review that compared past analysis of the impact of both BRT and LRT systems. The results are summarized in the accompanying charts. As noted in the charts, there is no discernable difference between the two modes.

TABLE 9 – Representative BRT Benefits

BRT System	Land Development Benefits
Adelaide Guided Busway	Tea Tree Gully area is becoming urban village.
Bogotá TransMilenio	For every 5 minutes of additional walking time to a BRT station, the rental price of a property decreases between 6.8% and 9.3% after controlling for structural characteristics and neighborhood attributes
Boston Silver Line (rebuilt Washington Street)	\$700+ million in new investment within two to three blocks of BRT line
Brisbane South East Busway	Up to 20% gain in property values near busway. Property values in areas within 6 miles of station grew two to three times faster than those at greater distances. Higher increase in median home values around busway than other suburban areas.
Ottawa Transitway System	\$1 billion (Canadian) in new construction at Transitway Stations.
Pittsburgh East Busway	59 new developments within 1,500 feet of stations. \$302 million in land development benefits of which \$275 million was new construction. 80% clustered at stations.
Pittsburgh West Busway	Land development focused on six park-and-ride lots.

SOURCE: The Value of Accessibility to Bogotá’s Bus Rapid Transit System (4) and TCRP Report 90 (5)

A similar research effort, *Measuring the Value Proposition for Transit Investment in the Washington Metropolitan Area*, was presented to the Transportation Planning Board this spring.⁴² This report’s primary focus is an examination of the shortcomings of reliance upon the FTA’s cost per rider index as a means of selecting projects (or alternatives) for funding. The report includes a qualitative assessment of some of the area’s planned projects and for the Purple Line specifically notes with respect to economic development that:

TABLE 10 – Representative LRT Benefits

Light Rail Transit/Trolley Service		
Dueker and Bianco, 1999	Population Census’ median house value in Portland between 1980 and 1990	Premium of \$2,300 for properties within 0.06 km of a MAX station
Lewis-Workman and Brod, 1997	Cadastral information for nearly all properties (4,170) within 1.6 km of three MAX stations in Portland	Premium of \$75 per 0.03 km closer to the station
Forrest et al., 1995	795 house sales in Manchester (UK) during 1990	Premium ranging from 2.1% to 8.1% depending on distance to station
Cervero and Duncan, 2002c	1,495 sales of properties in multi-family housing in San Diego in 2000	Premium for multi-family units ranging from 2% to 6%
Landis et al., 1995	134 single-family sales in San Diego during 1990	Premium of \$272 for every 0.1 km closer to station
Dabinett, 1998	Sheffield (UK) Supertram	No evidence of appreciable effects
Al-Mosaind et al., 1993	235 single-family home sales in Portland during 1988	Premium of \$663 per 0.03 km closer to station

NOTE: Results apply to area and properties studied only. Refer to each source study for details.

SOURCE: The Value of Accessibility to Bogotá’s Bus Rapid Transit System (4)

“(the) alignment through major centers could be expected to diminish the risk of East-West sprawl and create economic value and financing potential” and “high trip generation community along this East-West alignment could generate substantial improvements in general mobility and low income mobility.”

⁴¹ Presentation entitled “ Land Use Impacts of New Bus and Subway Services”, August 2007 TRB Conference, Jeffery Casello and Clarence Woudsma, University of Waterloo

⁴² For complete working paper see the following link: <http://www.mwcog.org/uploads/committee-documents/bF5fv11Z20080425144722.pdf>. The report was prepared by HDR/HLB Decision Economics.

With respect to comparing bus and rail the report notes:

“Bus investments can outperform rail alternatives in terms of absolute rate of return, but rail investment can generate significantly greater absolute levels of economic benefit and net benefit.”

Finally, the Takoma/Langley Sector Plan joint planning process now underway with Prince George’s County and the City of Takoma Park has included an examination of whether LRT or BRT is the preferred mode for the Purple Line. While not a final decision, there is consensus among the staff (and some public officials as noted above) that LRT would better serve the vision of a more compact, pedestrian friendly Crossroads area.

A summary of the comparison of BRT and LRT in the context of urban design (including the potential for economic development) would therefore include the following:

- LRT relative to BRT could make sidewalk connectivity more of a challenge in the Takoma / Langley area based on the extra space required for the median location for LRT compared to the curb lane design treatment for BRT considered in the AA/DEIS.
- A recent and fairly broad based literature survey comparing the impact of BRT and LRT on property values does not seem to suggest one mode is inherently better.
- Based upon one recent analysis of a region-wide improvements in the Cincinnati area, BRT may offer a greater return per dollar invested but LRT’s total and net benefit far exceed that of BRT.
- Takoma Park and Prince George’s County have formally endorsed light rail – both citing economic development as a reason. The on-going Sector Planning effort will likely reach a similar conclusion.

Staff finds that the urban design and economic development considerations we have examined for the Takoma/Langley area favor LRT but that it should not be a deciding factor for the entire alignment.⁴³

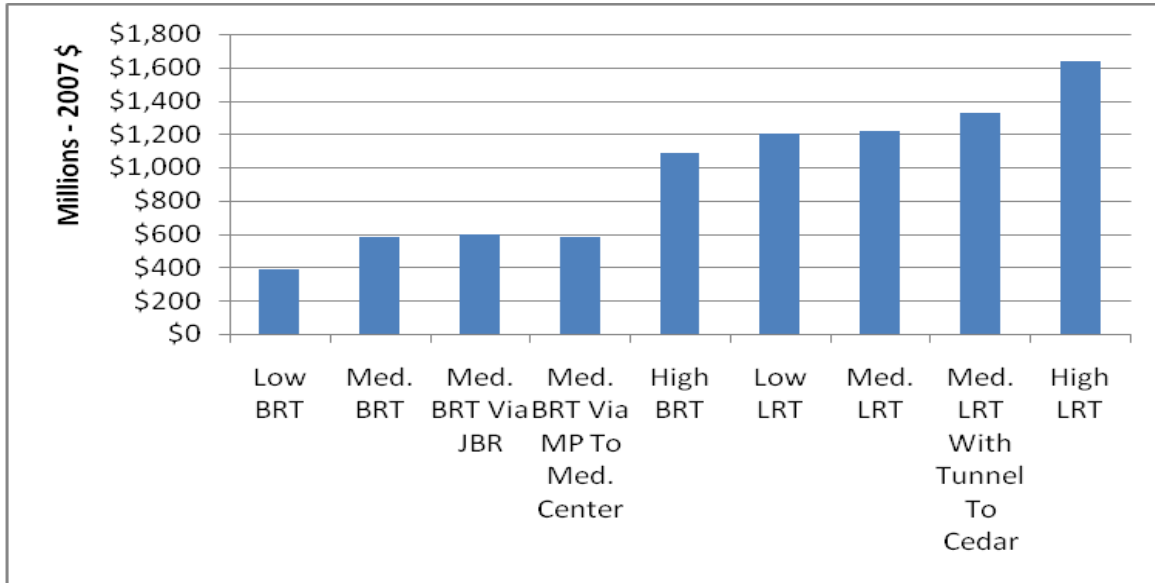
Cost, Cost Effectiveness, and Ridership

Cost, cost effectiveness, and ridership estimates in the AA/DEIS were developed by the MTA using methodology that is both specified and reviewed by the FTA.

Estimated capital costs vary significantly by mode as noted in the graph below:

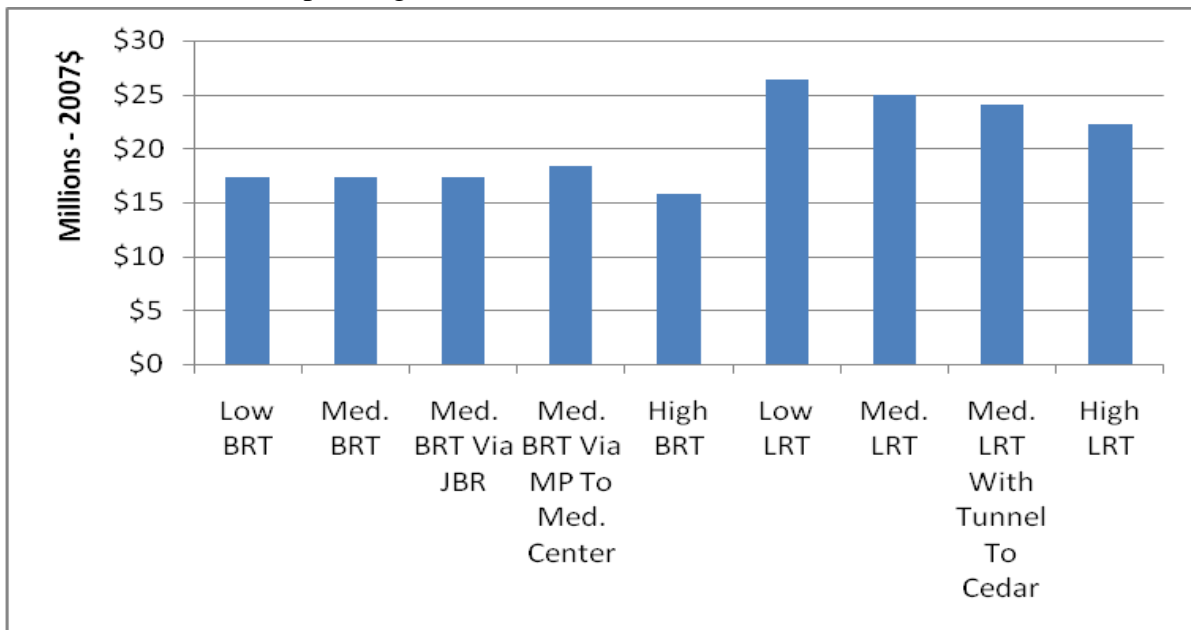
⁴³ It is important to note when considering the relative advantages and disadvantages of BRT and LRT in the context of economic development in particular, our assumption is that the BRT level and quality of service is the same as for the LRT system. Once that assumption is acknowledged, available objective studies we were able to locate do not lead the staff to conclude that one mode is preferable to another. It is the level and quality of transit service, the commitment to pedestrian access and safety reflected in the design of the surrounding public realm near the station areas, and the extent the transit service offers the potential user a real alternative to trips by auto that help create a place and set the stage for economic development and revitalization.

FIGURE 7 – Capital Costs



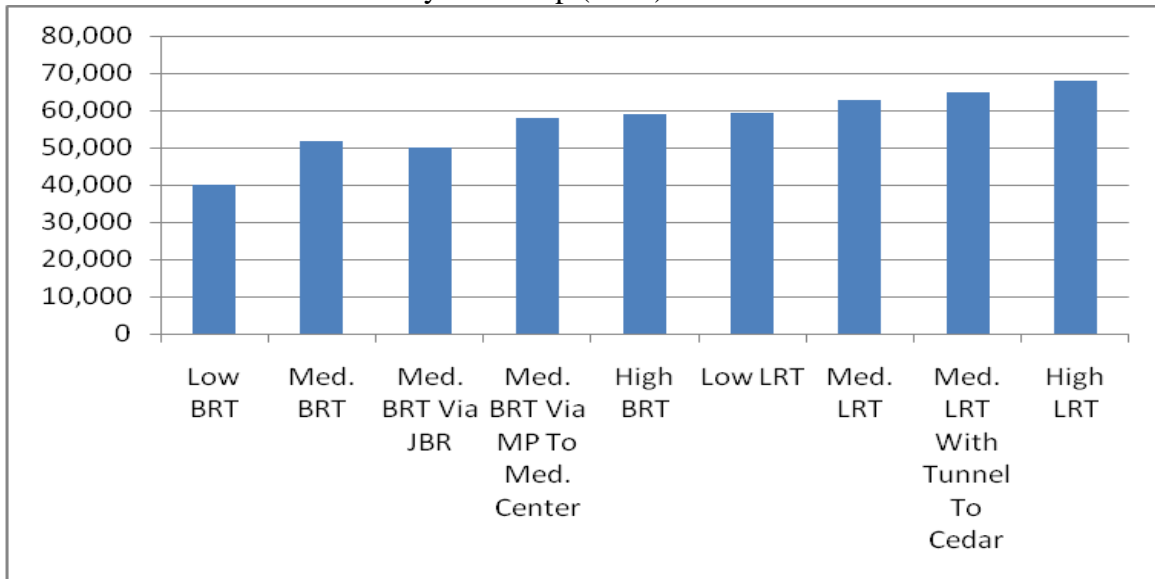
Estimated annual operating costs also vary by mode but the variance is not quite as large as the capital costs:

FIGURE 8 – Annual Operating Costs



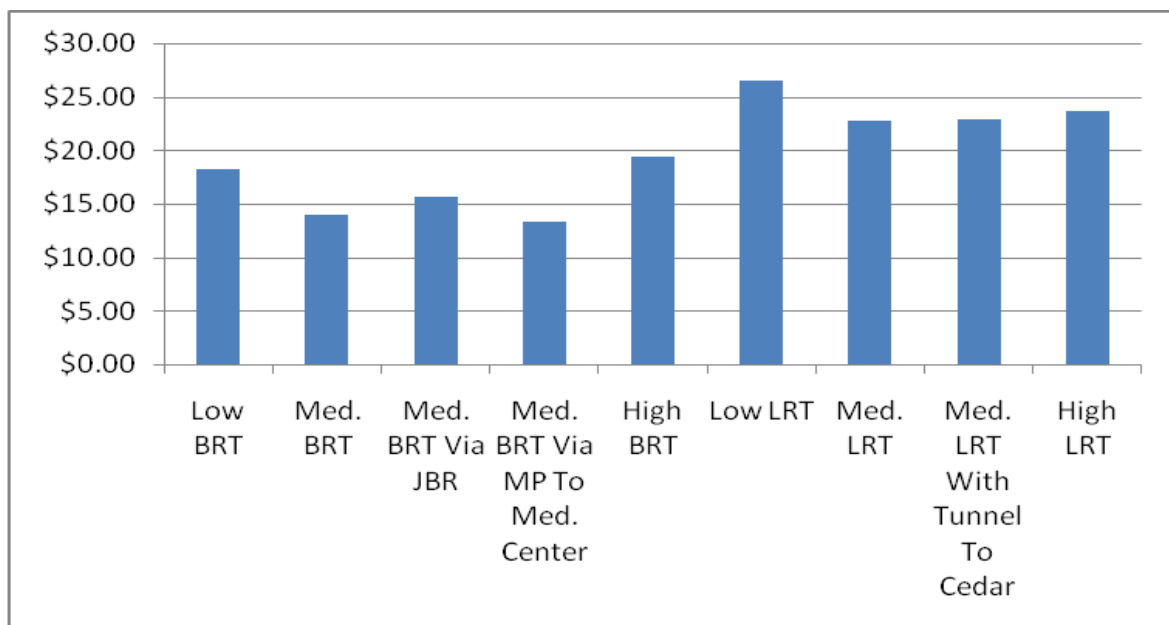
Estimated average weekday ridership in 2030 does not vary as much by mode:

FIGURE 9 – Estimated Weekday Ridership (2030)



Finally, the FTA measure of cost effectiveness, the “annualized cost per hour of user benefit”, varies (one mode relative to the other) in a range somewhat similar to that of the annual operating costs⁴⁴:

FIGURE 10 – Cost Effectiveness



⁴⁴ The cost effectiveness rating for the Low LRT alternative exceeds the FTA threshold and therefore would not attain a rating sufficient to secure funding under the FTA’s New Start funding program.

As noted in the graphs, LRT alternatives cost more and generate more riders, although not in proportion to the difference in the estimated capital and operating costs. Proponents of BRT often cite this relationship as a reason to select BRT over LRT. LRT proponents often counter with the argument that the future (beyond 2030) cost per passenger will favor LRT for the Purple Line because the additional passengers can be accommodated without adding more buses.

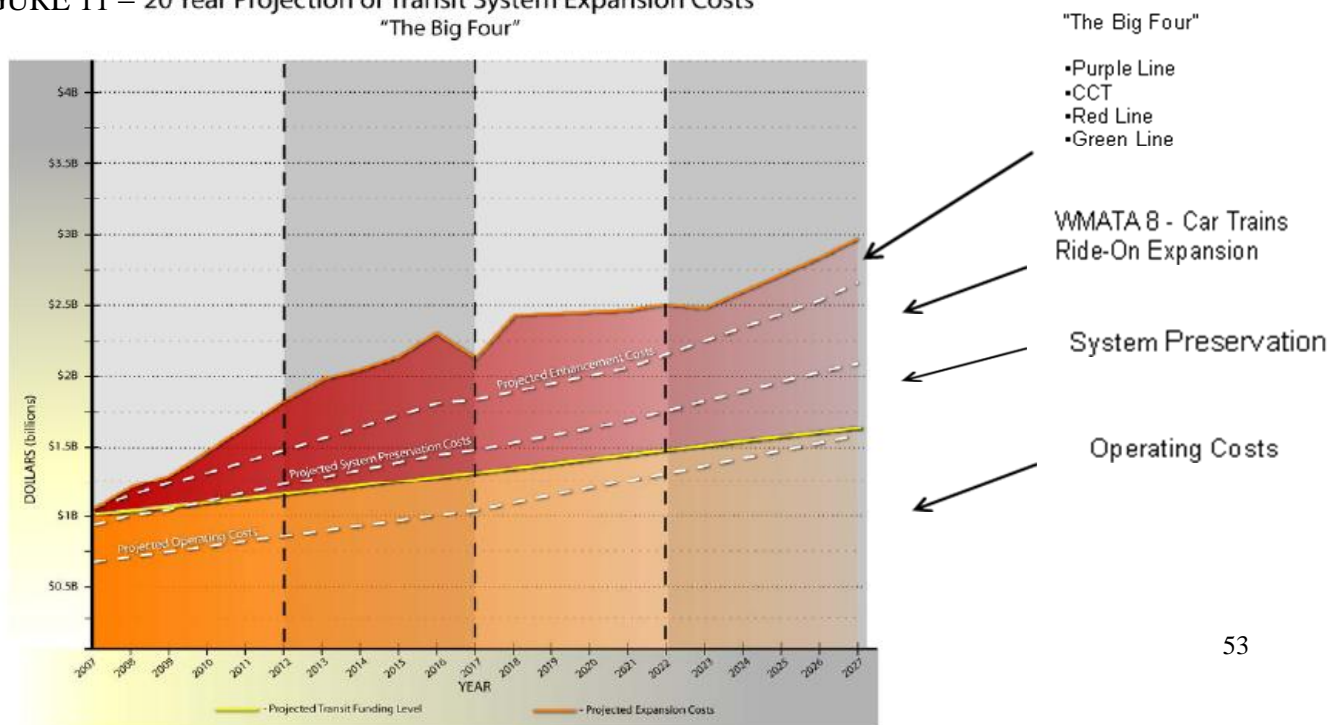
As previously noted, there is considerable discussion on how, and to what extent, the cost profile required under the FTA New Starts program should be used to select the mode. One reason is that the secondary economic benefits attributable to either mode are simply not captured in the current process for evaluating projects. Complicating the issue in Maryland is the fact that the MTA currently has three active planning projects underway (the Purple Line in Montgomery and Prince George’s County, the Corridor Cities Transitway in Montgomery County, and the Red Line in Baltimore). Some advocate selecting BRT for the Purple Line because doing otherwise could potentially jeopardize funding for the Corridor Cities Transitway.

The staff recognizes that serious consideration needs to be given to the cost implications of any recommendation on the selection of the mode for the Purple Line. The overriding fact that we think needs to be considered at this point, however, is that a decision should first be based upon the following goals:

- what is best for the community
- what mode best meets the goals of the County within costs that are reasonably thought to be potentially available.

There are many issues related to infrastructure funding at the local, state, and federal level. Some of the issues are as fundamental as to whether the current funding programs at the federal and state level need to be completely restructured to better insure long term funding for transit. A 2007 Study commissioned by the Maryland General Assembly provided some insight to the size of the challenge as depicted in the chart below:

FIGURE 11 – 20 Year Projection of Transit System Expansion Costs
“The Big Four”



As shown in the chart, the projected funding level under the current program structure will cover only the operating costs of the state’s transit systems. Critical other needs such as purchasing replacement buses and train cars (system preservation) and system expansion are not expected to be covered by the projected transit funding level after about 2012.⁴⁵

The chart also depicts the proportion of the state funds that the New Starts projects comprise. In the overall program – both in the near term and later – the three New Starts projects represent around 25% of the total during the years that they would require the highest level of funding relative to the other program activities (operating costs, system preservation, and expansion).

Staff finds that cost –and cost effectiveness ratings favor BRT but should not be a deciding factor in determining whether the Purple Line should be BRT or LRT.

Public Testimony

Staff characterizes the public testimony as generally more favorable to LRT as compared to BRT for those citizens speaking in favor of a public transitway. This is a trend notable in many study corridors where the two modes are presented as alternatives; light rail is generally perceived as being more comfortable and providing a more permanent investment in a community. In the Purple Line corridor, staff notes that many of the stakeholders testifying in favor of BRT over LRT cite the preservation of the Capital Crescent Trail among the reasons. Staff suggests that while concerns regarding impacts to the Capital Crescent Trail are valid, they are related to the choice of alignment, not mode.

Representatives of the Prince George’s County Executive Branch and County Council have already expressed a preference for LRT in testimony to MTA. Both counties will need to concur on the Purple Line mode to present a convincing case to state and federal officials that the project should move forward.

Staff finds that the public and elected official testimony that generally favors LRT over BRT should be considered, but not be the deciding factor in determining the Purple Line mode.

Summary of Analysis of the Preferred Mode For The Purple Line

Our examination of what we find to be the key issues related to the selection of the mode for the Purple Line leads us to conclude that the preferred mode should be light rail.

There are three primary reasons for our recommendation:

- The first is that the ridership estimates indicate that the peak hour directional line load in the design year (2030) could approach 2,000 passengers per hour. A BRT system could

⁴⁵ The chart does not reflect recent announcements by the state related to anticipated reductions in the level of funds available in the Transportation Trust Fund resulting from the current economic environment. In addition, the chart list one New Starts project (the “Green Line” in Baltimore) that has effectively been placed “on hold” by the state with respect to the funding of planning, engineering, or construction activity.

have difficulty accommodating that ridership without resorting to more frequent service that could introduce operational instability.

- There are uncertainties in any forecast. LRT provides a margin for error if the forecast for 2030 is conservative and additional capacity to accommodate the incremental ridership growth beyond 2030.
- LRT is consistent with our adopted Master Plans, and generally supported by current public testimony.