A People's Alternative to BaltimoreLink

Prepared for the Amalgamated Transit Union

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1. Executive Summary

The cancellation of the Baltimore Red Line Light Rail Transit (LRT) in 2015 reduced transit investments to the City of Baltimore in the 2016 – 2019 capital plan by $654 million. Approximately $800 million was removed from the Red Line, while $141 million in new funds were dedicated to Baltimore's bus system under the BaltimoreLink program.

BaltimoreLink adds new express bus routes, rationalizes the existing bus network, purchases new buses, and provides approximately $45 million in capital funding. Recently added to this was $10 million in TIGER grant funds to improve North Avenue.

This proposal, developed on behalf of the Amalgamated Transit Union (ATU) in consultation with affected communities, union members, experts, and public officials, takes the modest changes of BaltimoreLink to the next level, bringing real benefits to the citizens of Baltimore. It recommends $287 million in additional, carefully targeted Bus Rapid Transit (BRT) investments that would turn BaltimoreLink into something transformative for the City of Baltimore.

BRT infrastructure is recommended on roads where it will reduce the most delay for the most passengers, and where the roads are best able to accommodate BRT infrastructure (Figure 1 below).

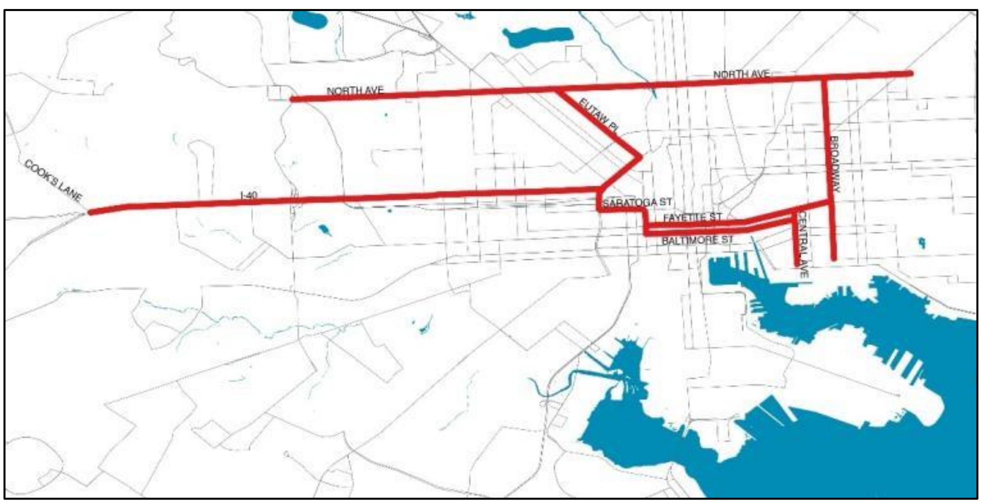

Figure 1: Highest potential BRT corridors in Baltimore

This proposal achieves some of the benefits of the West Baltimore portion of the Red Line LRT, while spreading them to more transit passengers. The greatest benefits would be achieved from dedicated BRT through downtown on Baltimore and Fayette Streets, while upgrading planned improvements on

North Avenue to full BRT has the greatest preliminary political support. It also recommends a number of other corridors where full BRT treatments are feasible and would bring substantial benefits.

Table 1 below presents the estimated costs for each segment of recommended BRT infrastructure.

SEGMENT	MILES	BRT COST (millions)
Former Red Line (Cooks Lane to MLK)	3.98	$ 79.6
North Ave	4.2	$ 84
Downtown links	2.6	$ 52
Fayette, N. President St to Broadway	0.68	$ 13.6
Broadway, Fells Point to North Ave	1.96	$ 39.2
Eutaw Pl, north to MLK	0.93	$ 18.6
Total Estimated Cost	14.35	$ 287

Table 1: Estimated costs of proposed BRT sections

This proposal recommends that nine of the CityLink routes operate on the BRT infrastructure. CityLink routes Brown, Blue, Gold, Navy, Orange, Purple, and Red, with modifications, would all use the BRT infrastructure for part of their routes, and would operate in mixed traffic for part of their routes (Figure 2 below). This proposal also suggests upgrading existing Routes 19 and 91 to BRT routes rather than cancelling them.

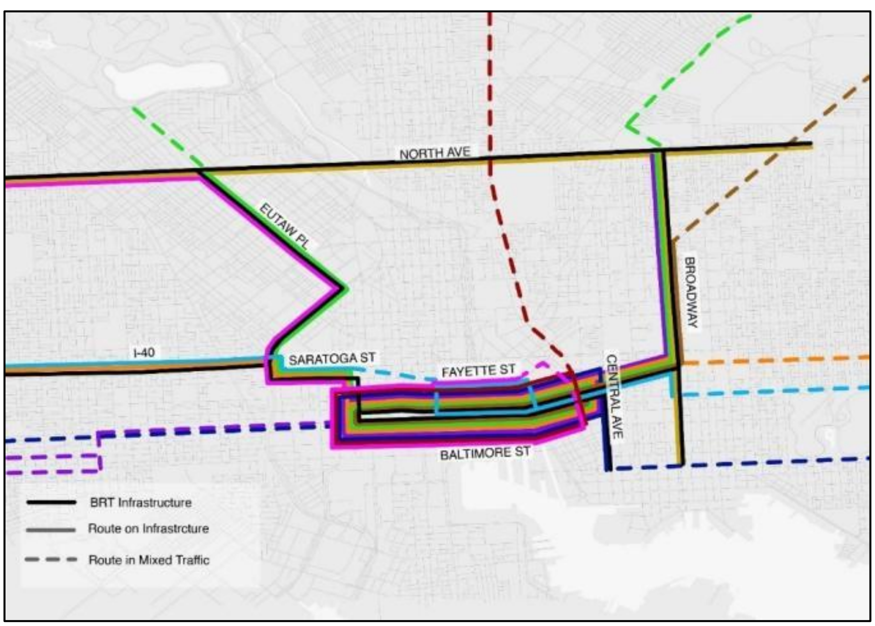

Figure 2: CityLink routes that would use the proposed BRT infrastructure

In this way, the modest benefits of the CityLink program would not only be retained but dramatically increased by far faster, more reliable BRT services. This proposal would bring immediate benefits to 154,000 daily bus passengers, including passengers from most of the major bus routes in Baltimore. Such a modest investment bringing so many benefits would be highly competitive for Federal Small Starts funding.

This proposal is also a good opportunity to revitalize Baltimore's significantly challenged neighborhoods. Figure 3, below, shows the intersection of the BRT infrastructure recommended in this report and abandoned homes and 2013 homicides around Baltimore. BRT stations can become nodes of safety and security in neighborhoods where waiting for a bus is not always safe and comfortable. BRT station areas can become nodes of revitalization, where families can find affordable housing near new jobs.

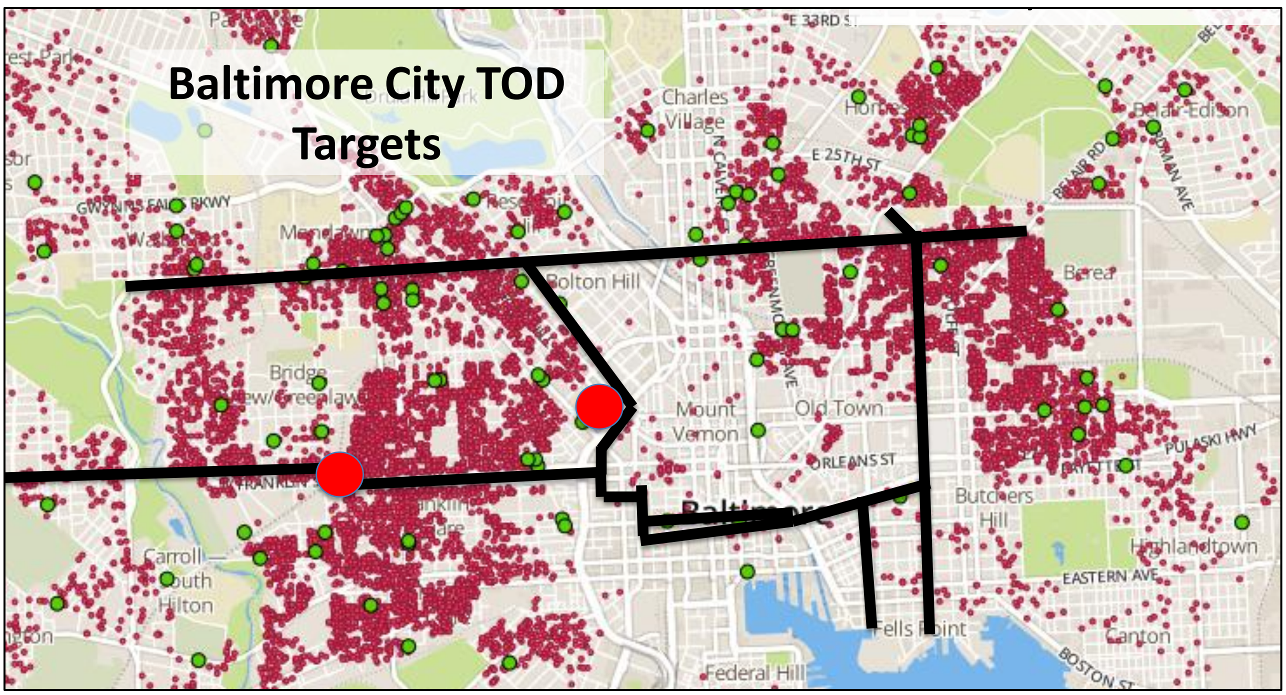

Figure 3: Recommended BRT corridors, abandoned homes (small red circles), TOD sites (large red circles), and homicides, 2013 (green circles)

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2. Introduction

Like many other formerly industrial US cities, Baltimore has continued to lose population since its peak in 1950, when it had 949,708 residents. Today, after decades of suburbanization and the loss of its steel industry, the population has stabilized at around 622,000 residents. Since 1970, Baltimore lost over 80,000 well-paying jobs, and ninety percent of Baltimore's manufacturing jobs have disappeared. This history left Baltimore with some of the lowest incomes and highest unemployment in the U.S. Baltimore's median household income, at $41,819, is almost $10,000 below the national average. Only 61% of people over the age of 16 are active in the labor force. [1] Among African American men, only 50% of those of working age are currently employed. With declining incomes, many people cannot afford to maintain home ownership. Almost 20% of the city's residential buildings – roughly 16,000 units – is classified as vacant (Figure 1), yet almost 30,000 Baltimore residents go without shelter for at least part of the year.[2]

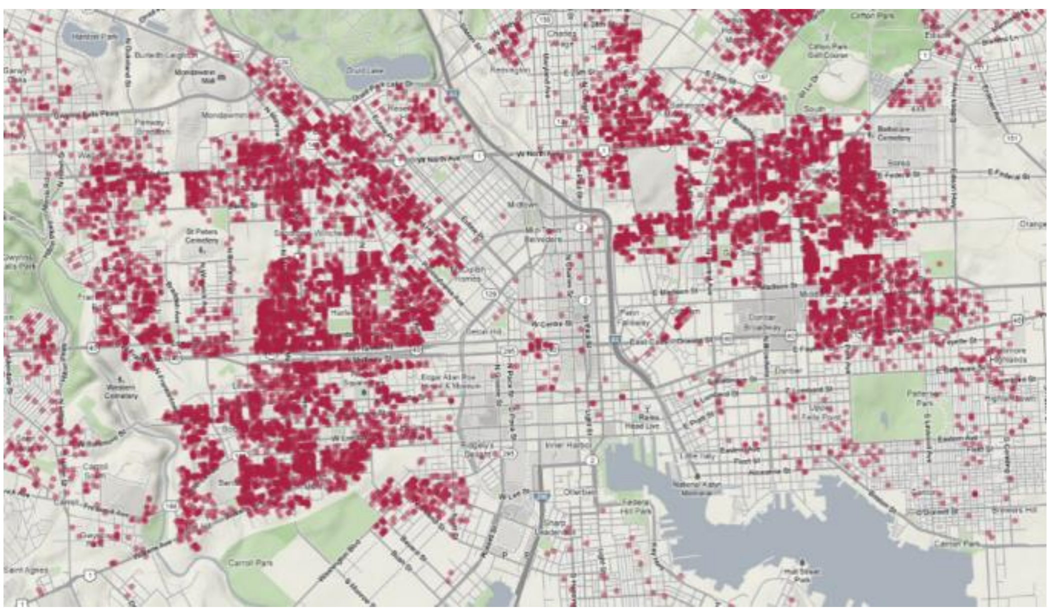

Figure 4: Abandoned properties in Baltimore City

These abandoned units are heavily concentrated to the immediate west and northeast of Downtown Baltimore.

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1 . U.S. Census Bureau; American Community Survey, 2014 American Community Survey 5-Year Estimates.

2 . Levine, M. 2015. "The Failure of Economic Development in Baltimore - and Milwaukee". *Milwaukee, Wisconsin Journal Sentinel*

Neighborhoods with significant abandonment have become synonymous with violent crime and drug dealing. Baltimore had 344 homicides in 2015 (Figure 5) – more than in New York City had in 2014, a city with greater than 10 times the population.

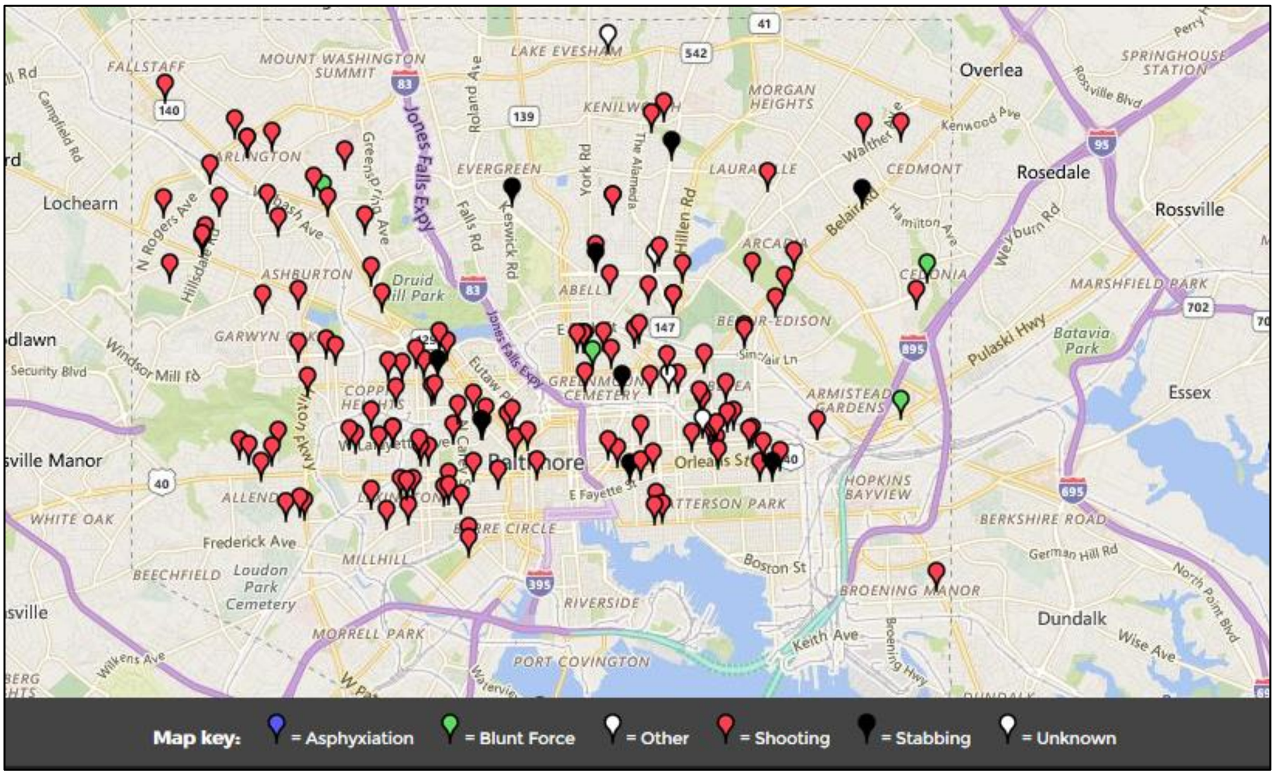

Figure 5: Homicides and other violent crimes, Baltimore, 2013

These incidences of violent crime are concentrated in roughly the same neighborhoods as housing abandonment. Much of this violent crime is associated with the drug trade, which in Baltimore is comparable in size to the tourism industry, around $1 billion annually.

Poverty in Baltimore is concentrated in these same neighborhoods to the immediate east and west of Downtown (Figure 6).

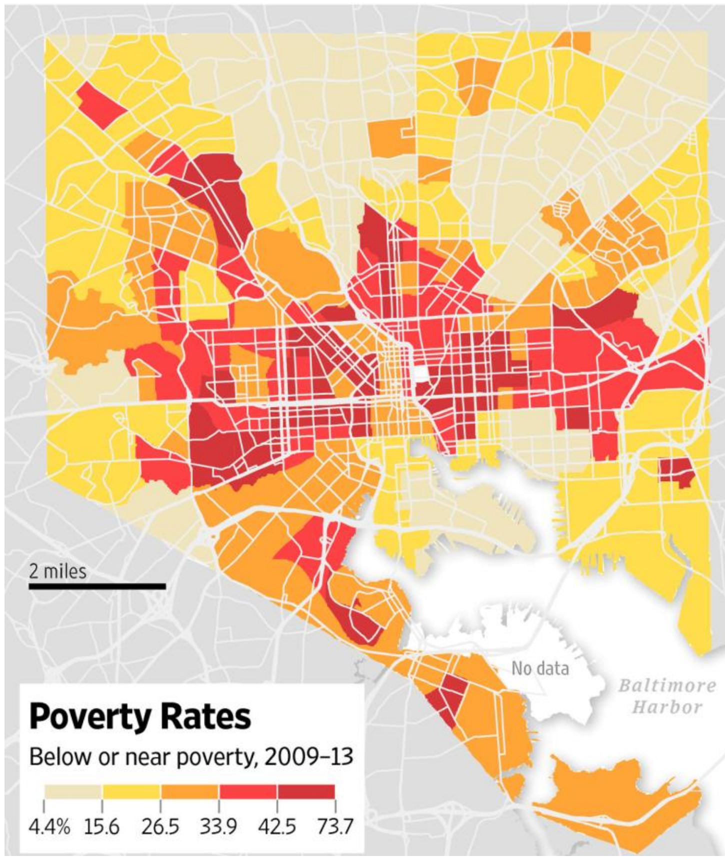

Figure 6: Concentrations of poverty, Baltimore, 2009 - 2013

The Baltimore economy has shifted heavily since the 1970s, from one dominated by manufacturing to one dominated by health and education services. Today, of Baltimore's 360,000 jobs, 114,000 are in health and education, 74,000 are government workers, 44,000 are professional service workers, 40,000 are in transportation and trade; only 11,000 are in manufacturing.[3] With this transition to services, the location of jobs has also shifted. Unlike cities such as Houston where employment has disbursed out of downtown, in Baltimore employment has become even more concentrated downtown in the last decades. Over 60% of the jobs are located in downtown Baltimore, and the areas around the JHU Homewood Campus and Medical School are also important.[4] Thus, more people than ever need to go downtown to reach their jobs. Figure 7 shows the density of jobs in Baltimore, illustrating that employment is most heavily concentrated downtown.

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[3] Bureau of Labor Statistics, Mid-Atlantic Information Office, "Baltimore Area Employment, March 2016"

[4] Levy, P. & Gilchrist. Downtown Rebirth: Documenting the Live-Work Dynamic in 21st Century Cities. International Downtown Association.

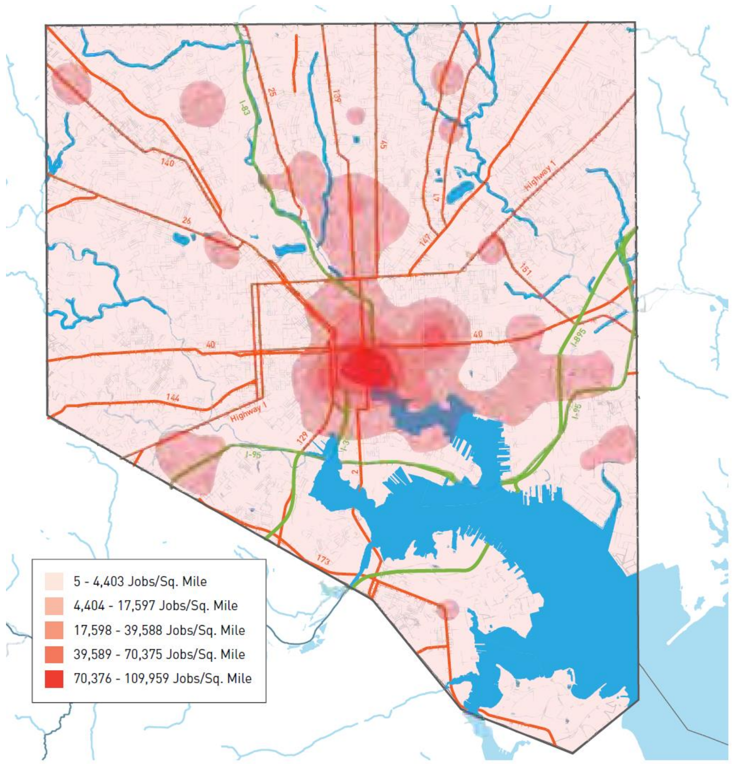

Figure 7: Employment density map for Baltimore.

A new transit investment plan therefore needs to support the City of Baltimore's efforts to attract employment and investment into the city. To do this, transit services to downtown Baltimore must be improved, while safe and attractive connections particularly to the blighted east side and west side of Baltimore need to be enhanced to make these areas more attractive for young families.

2.1 Public transit

In the summer of 2015, newly elected Governor Hogan announced the cancellation of the Red Line Light Rail Transit (LRT) system. This resulted in a direct loss to the citizens of Baltimore of $654 million in capital funds. Approximately $800 million had been set aside by former Governor O'Malley for the period from 2016 to 2019 for the Red Line LRT, which has been replaced with an approximately $135.9 million increase in funding for bus services in the Baltimore metropolitan area for a program called BaltimoreLink.

BaltimoreLink, which is in many ways the continuation of the Bus Network Improvement Project (BNIP) initiated under Governor O'Malley, primarily adds new express buses and rationalizes the existing bus network, but it also includes $45 million in funding for capital improvements, the specifics of which have yet to be disclosed. In August 2016, the MTA announced that a further $10 million in TIGER grants would be sought for upgrading North Avenue.

In May 2016, the International Amalgamated Transit Union (ATU) contracted BRT Planning International, LLC (BRTPlan), to assist the Baltimore ATU Local 1300 in developing a new and exciting concept for BRT investments in Baltimore, in the context of BaltimoreLink. BRTPlan is a socially responsible company headed by the former leadership of the Institute for Transportation and Development Policy, (ITDP), a global leader in Bus Rapid Transit system design.

The following paper provides a plan for potential BRT investments in Baltimore that builds on and significantly increases the benefits of the BaltimoreLink proposals.

The paper was prepared by Dr. Walter Hook, Annie Weinstock, and Sahra Mirbabaee of BRTPlan, with inputs from Todd Brogan and Elana Kessler of ATU International, President David McClure of Local 1300, and other stakeholders.

3. Evaluation of existing bus transit in Baltimore

Investments in BRT infrastructure bring the most benefits where they increase the bus speeds for the most people at the least cost. BRT investments are therefore best targeted at improving bus speeds on the highest demand routes and in the locations where bus speeds are the slowest.

Baltimore recently completed an extensive study of its existing bus system under its Bus Network Improvement Project[5]. Table 2 below shows the top 20 bus routes in Baltimore by ridership and ranked by demand.

RANK	DAILY PAX	ROUTE	TYPE
1	20305	15	Radial
2	20278	23	Radial
3	17790	40	Quickbus
4	17291	8	Radial
5	15846	13	Crosstown
6	15543	10	Radial
7	14509	36	Radial
8	14077	20	Radial
9	13944	22	Crosstown
10	13788	3	Radial
11	13556	54	Radial
12	13230	5	Radial
13	13068	35	Radial
14	12725	19	Radial
15	12155	44	Crosstown
16	10652	91	Radial
17	9512	77	Crosstown
18	9375	48	Quickbus
19	8399	52	Feeder
20	7789	33	Crosstown
Source: BNIP, 2012			

Table 2: Top 20 bus routes by Demand

[5] *Bus Network Improvement Project*, 2014. Maryland Department of Transportation, Maryland Transit Authority.

By US standards, these are very high bus volumes. By means of comparison, the Cleveland HealthLine BRT, ranked ‘silver’ under the BRT Standard, is carrying around 15,000 daily passengers and the silver-standard Hartford-New Britain CTfastrak BRT is carrying a similar number. BRT serving any of the top 10 bus routes in Baltimore would have an equal number of passengers, ensuring that the project would perform well under a Federal Transit Authority cost effectiveness analysis.

If these bus routes are moving at high speeds, however, there is no immediate need for BRT investments. As a second screening, existing bus speeds were evaluated on each section of the routes. In Figure 8 below, these top 20 bus routes were mapped and the speeds on each section of road were color-coded.

Figure 8: Average AM peak hour (8am – 9am) bus speeds on the top 20 Baltimore bus routes by ridership

Bus speeds were slowest on Baltimore, Fayette, Eutaw, Lombard, and Pratt Streets downtown, as well as on Madison, and Gay Streets, North, Pennsylvania, Eastern, and Edmonson Avenues, and on Belair Road.

Slow bus speeds are generally caused by the following factors:

- Traffic congestion;
- Passenger boarding and alighting delay;
- Fixed bus stop delay (the time slowing down, stopping, opening and closing doors, and pulling back into the road); and
- Intersection delay.

3.1 Traffic congestion

Figure 9: Traffic congestion, downtown Baltimore

Traffic congestion is a problem during rush hour in Baltimore, but due to the relatively weak employment and the general shrinkage of the Baltimore population, traffic congestion is only moderate by national standards. Dedicated lanes for buses are most important in these areas of congestion.

The most congested travel time in Baltimore is between 5pm and 6pm in the afternoon. As shown in Figure 10 below, there is significant congestion downtown, on the approaches to the highways outbound, and on Martin Luther King, Jr. Boulevard. There is moderate congestion on most important east-west and north-south arterials, and almost no congestion on Route 40 until it reaches the West Baltimore MARC station. There is no significant congestion west of Cooks Lane.

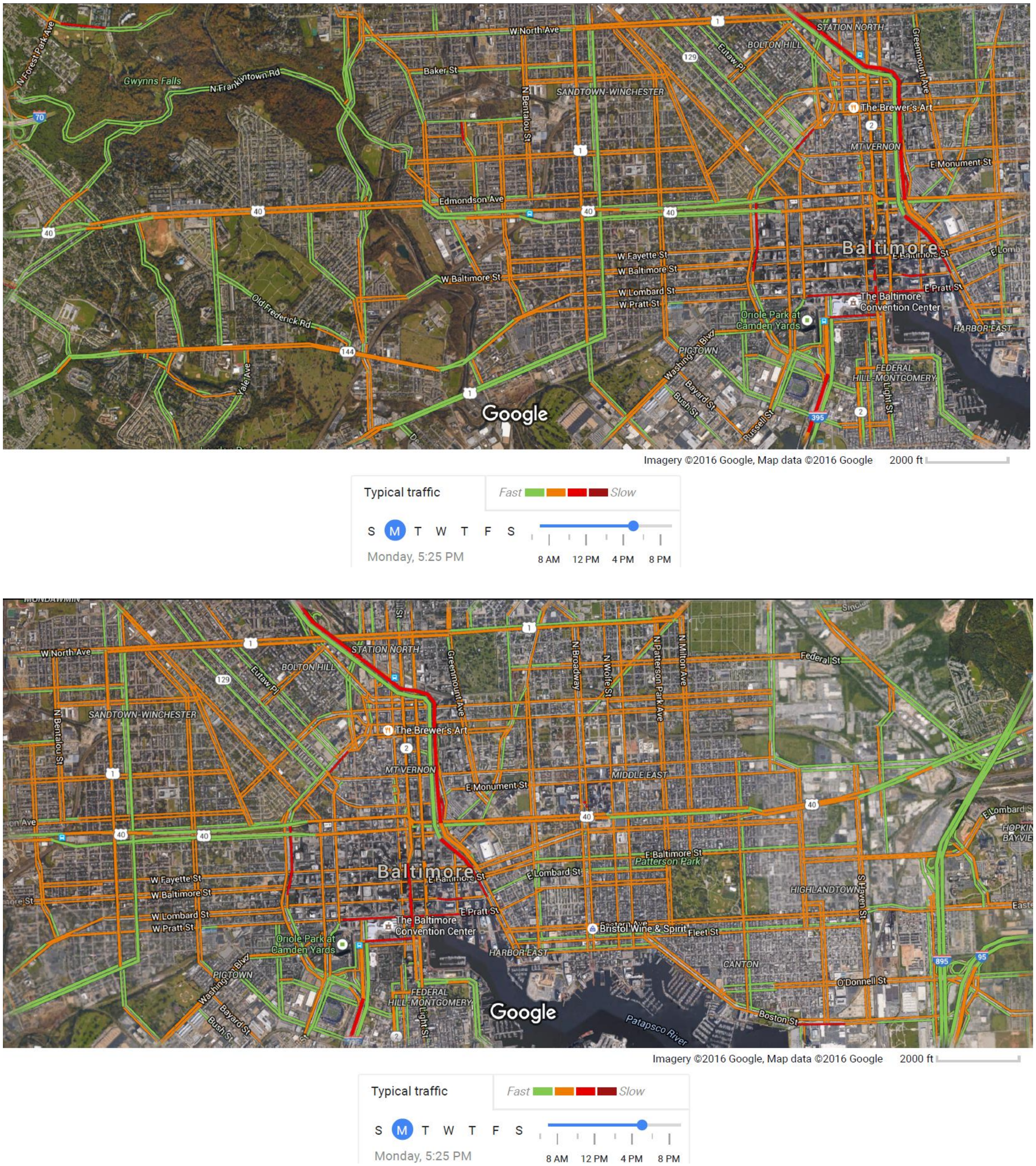

Figure 10: PM peak hour (5pm – 6pm) traffic speeds, West Baltimore (top) and East Baltimore (bottom)

3.2. Boarding delay

The main cause of slow bus speeds in Baltimore is the very long period of time that it takes for passengers – many of them senior citizens or people with disabilities – to board the bus. This delay occurs because passengers can only enter through a single door (the front door), and then must climb up some steps and then must pay the driver.

Figure 11: Causes of boarding and alighting delay in Baltimore

This process takes time for an able-bodied person, and for a senior citizen or a person with a disability, it takes a very long time. Analysis indicates that in Baltimore this process can take more than 4 seconds per passenger on average, and in the case of passengers in a wheelchair can take about 110 seconds per passenger. If many senior citizens or persons with disabilities are boarding at a single station, this results in very long delays.

Figure 12: Passengers waiting to board Route 91 at Eutaw Street and Lexington Market.

BRT stations solve this problem by allowing passengers to pre-pay before entering a BRT station, as they do at the metro stations, and then to enter the bus at-level with the bus floor so there is no need for a wheelchair lift or for the bus to kneel. Because passengers have pre-paid, they can enter through all the bus doors at once. All these improvements can drop boarding and alighting delay to 0.3 seconds per passenger in the best conditions, dramatically reducing bus delay at stations.

BRT stations should be built where the most passengers are getting on and off buses. The more passengers that are boarding and alighting at any given stop, the more delay there will be. Therefore, BRT stations which offer off-board fare collection and at-level boarding are the most important in locations where there are many people boarding and alighting.

Figure 13 below is a map of daily bus boardings and alightings at all bus stops throughout Baltimore. Unsurprisingly, Downtown Baltimore has the highest concentration of bus boardings and alightings.

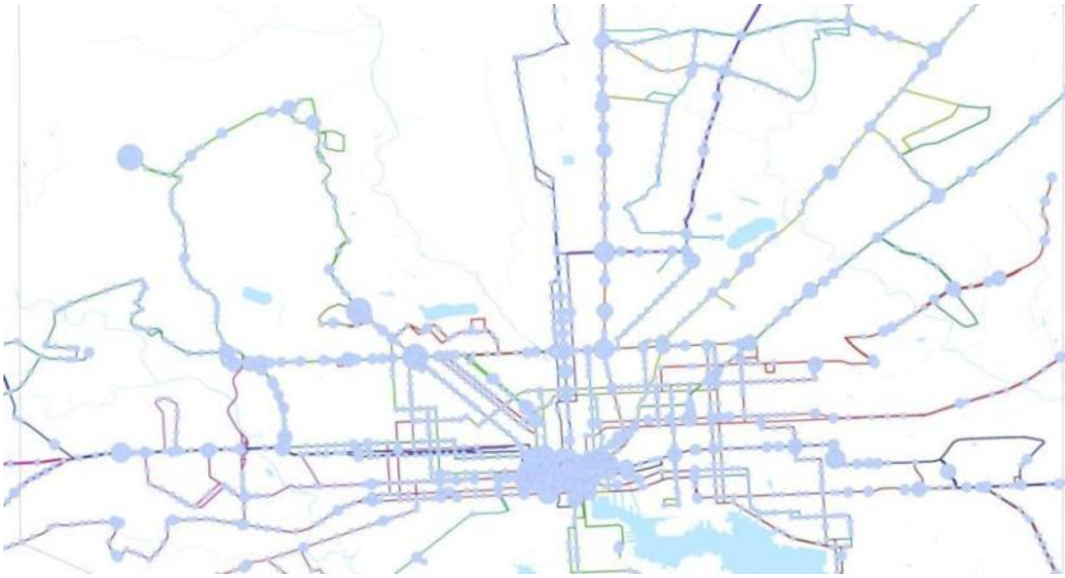

Figure 13: Daily boarding and alighting volumes, bus stops, Baltimore

A close-up of downtown Baltimore reveals that the boarding and alighting activity is heavily concentrated on Baltimore Street, Fayette Street, and Eutaw Street.

Figure 14: Daily boarding and alighting volumes, bus stops, Baltimore, downtown

It is in these locations that the greatest benefits could be achieved from BRT stations with at-level boarding and off-board fare collection.

3.3. BRT and Baltimore's future transit needs.

Baltimore City's transit investments should be responsive not only to the needs of today's transit passengers but also to future bus passengers. Baltimore has had a fairly decentralized growth strategy, with each neighborhood articulating its own development and revitalization goals. The Red Line, it was hoped, would help attract investors to transit-oriented development (TOD) efforts, where both market-rate and affordable housing could be developed. Many of these targets, however, were on the outskirts of Baltimore and in Baltimore County, and would have pulled investment to the edges of Baltimore rather than bringing investment back into the urban core. However, the West Baltimore MARC station was a major target for TOD investment. Another major investment that is likely to stimulate jobs is at State Center, which is already served by the Metro and light rail. Private sector-led development continues apace along the waterfront. Discussions are also moving forward to bring more investment to the Pennsylvania Station area.

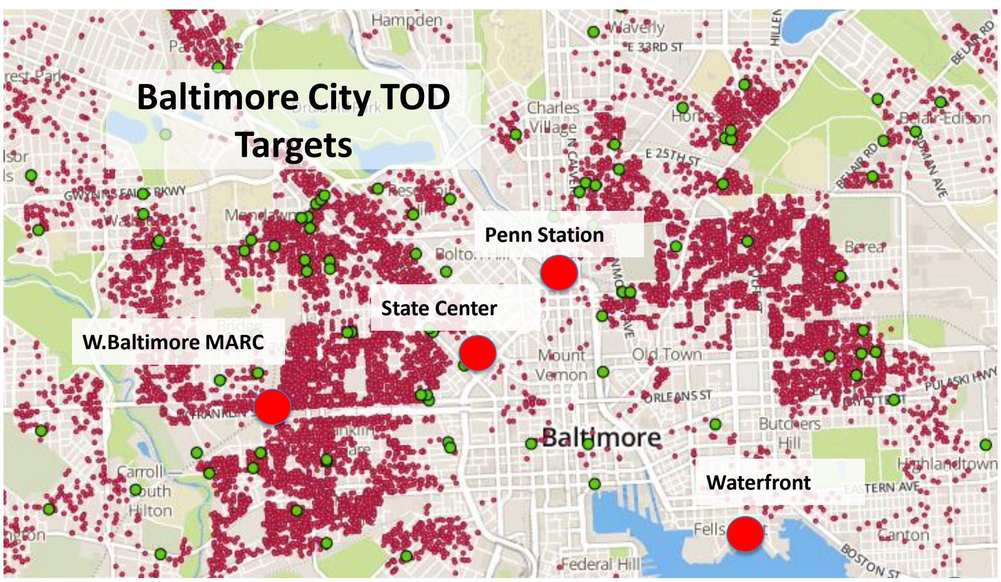

Figure 15: Abandoned homes (small red dots), homicides in 2013 (green dots), and planned transit oriented development

Most importantly, better and safer access to the 16,000 abandoned homes would help attract families willing to rebuild these homes. As was demonstrated from Cleveland to Johannesburg, BRT can help to revitalize neighborhoods in distress by improving access to these neighborhoods but also by creating nodes of safety. People often do not like to wait at bus stops for fear of being accosted. Enclosed BRT stations with turnstiles, paid access, and security guards or cameras provide a safe haven for riders. With better security and better infrastructure, people are more willing to invest in their neighborhood.

4. Where BRT makes sense in Baltimore

Following an initial screening to determine where the highest ridership and slowest travel time bus links are, a second screening was done to analyze the character and width of the roads. BRT may be built on any road if there is enough political will, enough benefit, and enough money, but some roads are easier to build BRT on than others. Removing on-street parking spaces is always a fight, digging under or building over areas is extremely expensive, and one-way streets bring special design considerations. Very narrow streets can become transit malls or can restrict vehicle access in order to prioritize transit, but this is easier if there are parallel streets on both sides of the street. The median of a highway can become a BRT corridor, but only if there are not many stops along it.

When these factors are taken together, BRT infrastructure would be most beneficial at the least cost on the corridors illustrated in red in Figure 16 below.

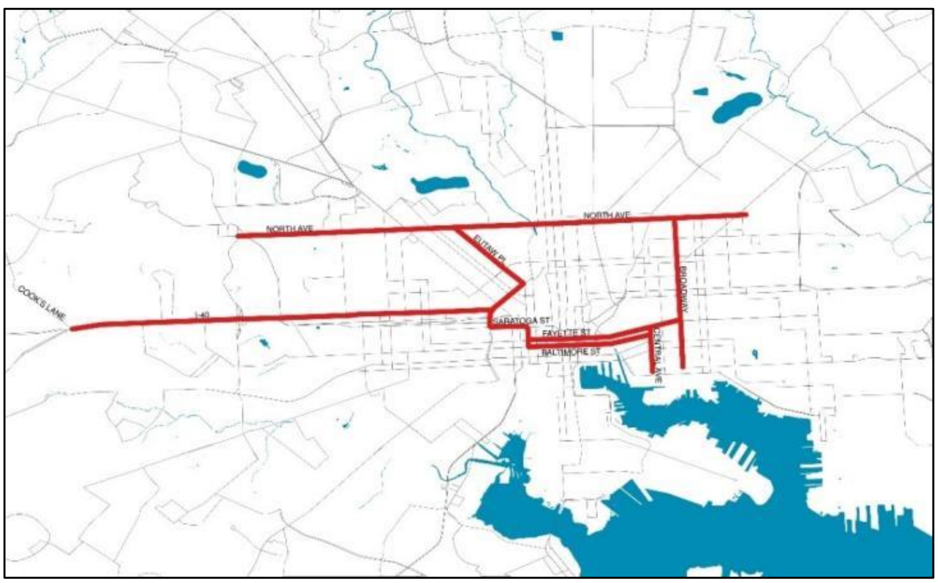

Figure 16: Recommended locations for BRT infrastructure

This proposal envisions BRT infrastructure in the following locations:

- **North Avenue:** A new east-west BRT corridor would be built on North Avenue, following popular bus routes and stimulating revitalization in the corridor.
- **Downtown Baltimore:** When it approaches downtown, the BRT infrastructure would turn onto Saratoga (following Route 15), then turn onto to Eutaw (where there are the heavy boarding volumes pictured in Figure 12: Passengers waiting to board Route 91 at Eutaw Street and Lexington Marketfrom Route 91). From Eutaw the BRT infrastructure would connect to Fayette

and Baltimore Streets in one-way pairs. This routing is a slight modification of the original surface BRT and LRT alternatives considered as part of the Red Line studies. On the eastern side of downtown, the BRT would continue east on Fayette Street.

- **West Baltimore:** This proposal includes putting BRT infrastructure on much of the western portion of the former Red Line alignment. Going from west to east, full BRT infrastructure would start on Edmonson Avenue at Cooks Lane. While the Red Line planned a tunnel at Cooks Lane and further west, there was insufficient traffic congestion or demand this far west to warrant BRT infrastructure. The BRT infrastructure would continue on Edmonson Avenue, using the same I-40 routing as the Red Line BRT and LRT alternatives (Red Line Alternatives 3A & 4A).
- **South Central Avenue and Broadway:** A BRT spur on South Central Avenue which is scheduled for reconstruction and serves the new developments at Inner Harbor East, and a second North-South BRT corridor on Broadway, would improve connections between Inner Harbor East, Fells Point, the Medical School, Hartford Road and Belair Road. This proposal suggests abandoning for now the proposed Red Line alignment further east, as there are no obvious surface roads capable of handling BRT infrastructure without significant loss of parking (a major political liability in the area) and the tunnel option adds $1.7 billion to the project cost. There is currently neither the congestion nor the ridership to justify such a major investment.
- **Eutaw Place and Martin Luther King (MLK), Jr. Boulevard:** Eutaw Place and MLK Boulevard provide a direct BRT connection between West Baltimore, new developments at State Center, and North Avenue.

When this BRT infrastructure is overlaid on the top 20 bus routes and where they move the slowest, it shows that BRT routes using the infrastructure would benefit most on North Avenue and in Downtown Baltimore. It also would provide a faster north south trip on Broadway and on MLK to Eutaw Place. Finally, it would provide a moderately faster east west trip out Edmonson Avenue.

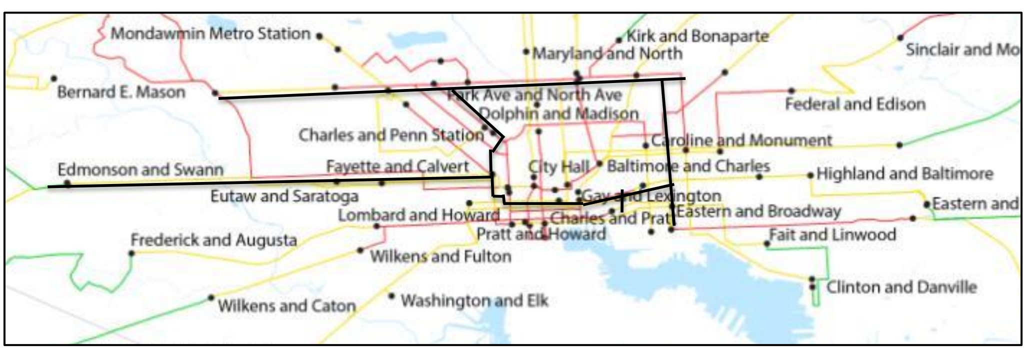

Figure 17: Recommended BRT Infrastructure overlaid on top 20 bus routes and current bus delay

When the same BRT infrastructure is overlaid on the high volume bus stops (Figure 18), it shows that new BRT stations would reduce boarding and alighting delay at many of them.

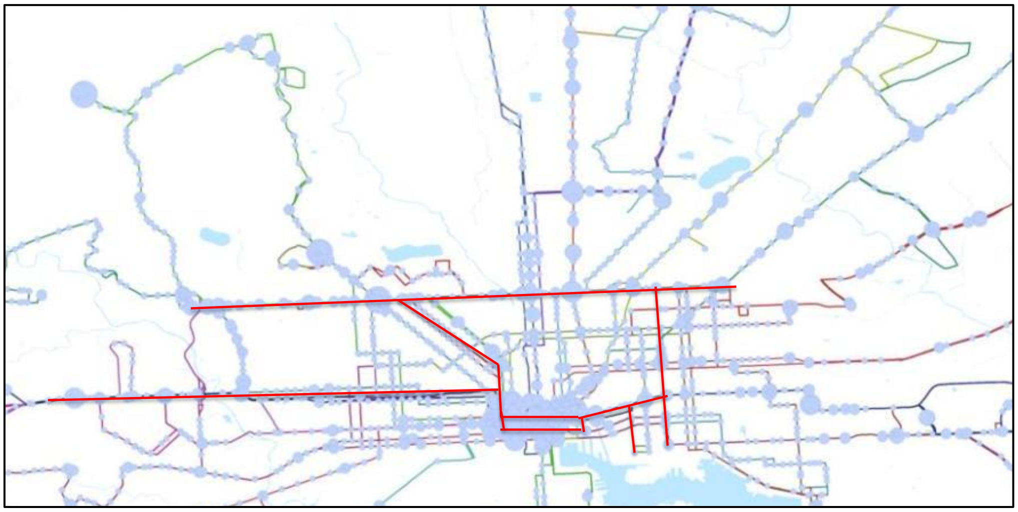

Figure 18: Roads where BRT infrastructure would have the most benefit (in red) overlaid on the top 20 bus routes and daily boardings at each stop.

A close-up of boarding delays on downtown streets the benefits of the recommended BRT infrastructure is shown in Figure 19 below:

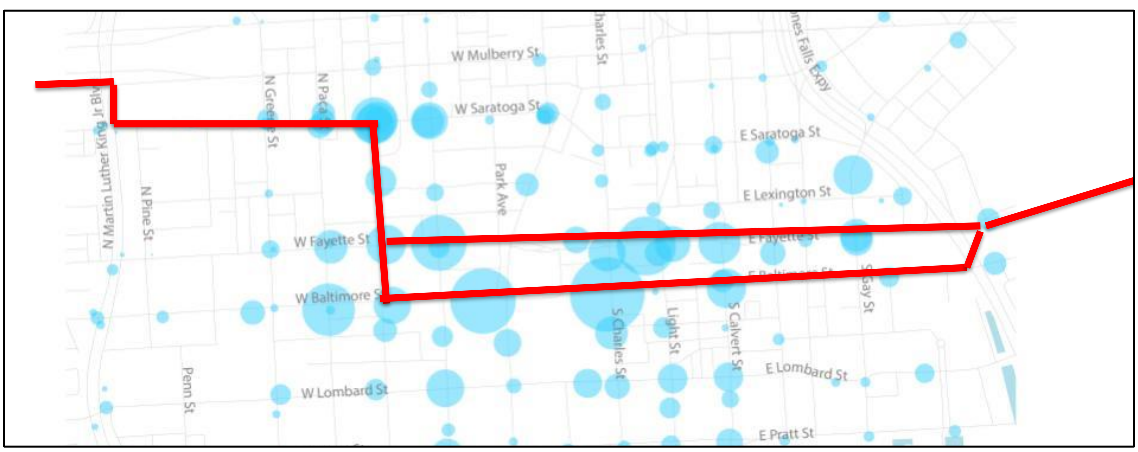

Figure 19: BRT infrastructure and boarding and alighting volumes, downtown stations

When this BRT infrastructure is overlaid on employment density maps (Figure 20), it shows excellent connectivity to and between critical employment locations.

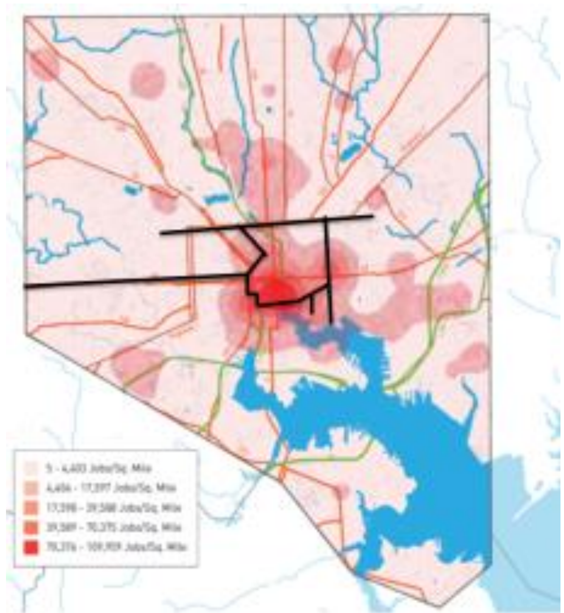

Figure 20: BRT infrastructure and concentrations of employment

When overlaid on current urban areas of abandonment and crime (Figure 21), it shows that BRT stations could provide safe havens for transit passengers in critical locations along North Avenue, Broadway, and along I-40 and Edmonson Avenue, hopefully helping to encourage families to invest in the rehabilitation of these properties.

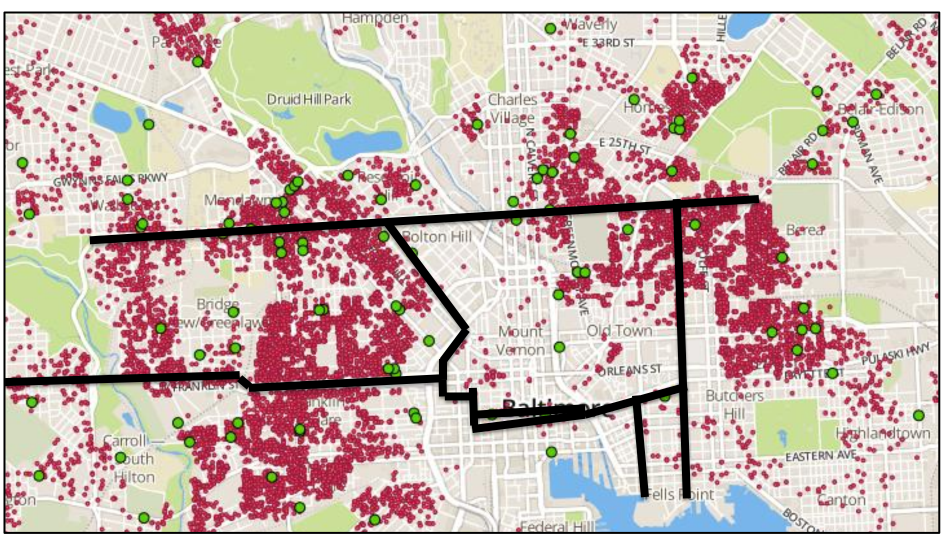

Figure 21: BRT infrastructure, abandoned properties (red), and homicides (green)

The BRT infrastructure would also serve those low income neighborhoods that are most dependent on transit to reach their jobs, and suffer the slowest commuting times.

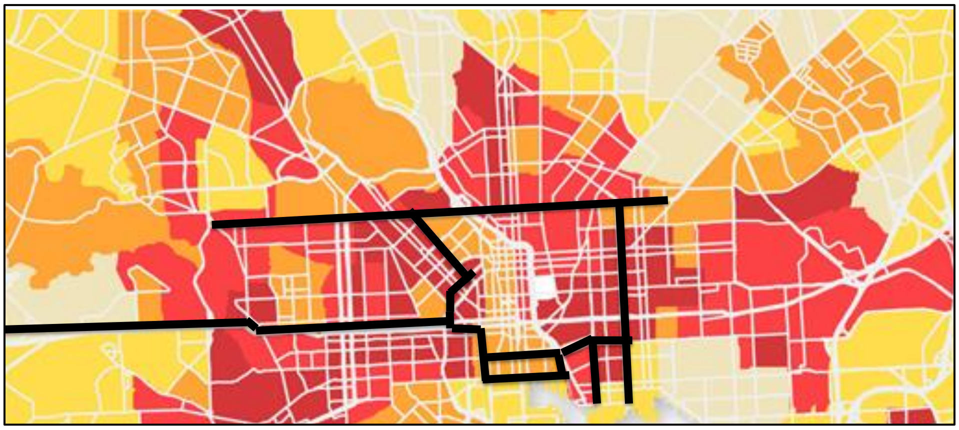

Figure 22: BRT infrastructure and low income population (deeper red is higher rates of poverty)

5. Critical BRT elements

According to leading international experts,

> "Bus Rapid Transit (BRT) is a bus-based rapid transit system that can achieve high capacity and speed at relatively low cost by combining dedicated bus lanes, off-board fare collection, platform level boarding, bus priority at intersections, and other quality-of-service elements, such as real-time information technology and strong branding. Special vehicles and iconic full-featured stations can help make a good BRT system great."[6]

Figure 23: Five key elements essential for BRT   Source: ITDP.org

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[6] *BRT Standard*, 2016. Institute for Transportation and Development Policy

While there are many bus corridor improvements being implemented across the United States that are called Bus Rapid Transit, many of them do not have the key features critical to improving bus performance in most real world conditions. Many mediocre bus improvements have been branded as "BRT" in order to make them eligible for Federal funding.

In order to help the public better identify 'real' BRT, in 2010, a committee was convened by the Institute for Transportation and Development Policy comprised of the world's leading BRT experts[7] to determine the common elements of the best BRT systems. The result of this effort, first codified in 2012, most recently updated in 2016, is *The BRT Standard*.

Any bus corridor improvement must have most of the basic BRT elements, as illustrated in Figure 23 above to qualify as 'basic' BRT. However, the highest quality BRT systems also have a host of other elements: passing lanes at stations that allow express buses to pass local buses, integrated bike lanes on the BRT corridor, bike parking and bike sharing at BRT stations, ultra-clean buses, and other elements listed in the *BRT Standard.*

According to the criteria set in *The BRT Standard*, there are only eight cities in the United States with BRT today. They are:

- Cleveland – HealthLine (Silver BRT)
- Hartford - New Britain- CTfastrak (Silver BRT)
- Las Vegas – SDX (Bronze)
- Los Angeles – Orange Line (Bronze BRT)
- San Bernardino – sbX (Bronze BRT)
- Eugene – EmX Green Line (Bronze BRT)
- Pittsburgh – South Busway (Basic BRT), MLK, Jr. East Busway (Bronze BRT)
- Seattle – Downtown Seattle Transit Tunnel and SODO Busway (Bronze BRT)

[7] Members of *The BRT Standard Technical Committee* include: Walter Hook, BRTPlan; Ulisses Navarro, ITDP, Manfred Breithaupt, GIZ (retired), Wagner Colombini Martins, Logit Consultoria; Carlos Pardo, Despacio; Dario Hidalgo, EMBARQ, Paulo Custodio; Consultant; Gerhard Menckhoff, World Bank (retired); Scott Rutherford, University of Washington; Pedro Szasz, Consultant; and Lloyd Wright, Asian Development Bank.

5.1 Dedicated right of way

Figure 24: Dedicated bus lane in the middle of an urban arterial, Cleveland HealthLine BRT

For a bus corridor improvement to be considered true BRT, it has to have a dedicated right-of-way of at least 1.9 miles (3 kilometers). This dedicated right-of-way should provide a congestion-free ride where traffic congestion is the worst, usually downtown and on congested urban arterials. Dedicated bus lanes usually just convert an existing lane of traffic into an exclusive bus lane. Where there are already very many buses using a road, a dedicated bus lane is not going to make traffic congestion any worse because the regularly stopping buses are already claiming a lane of traffic. This sort of converted lane is very inexpensive to build. Cleveland's HealthLine cost only $7.1 million per mile to build. Cleveland's HealthLine passed through some of the most blighted areas in Cleveland, and helped to kindle an urban renaissance, attracting more than $6 billion in private development that meant better jobs for Cleveland's residents.

Ideally, this dedicated bus lane should be in the central median of the roadway rather than in the curb lane. In the curb lane, the bus is more likely to be obstructed by turning vehicles, delivery vehicles, construction in adjacent buildings, bicyclists, and face other delays. Curb-aligned bus lanes are almost never ideal except on some one-way streets. A central median-aligned bus lane is feasible on North Avenue, on Edmonson Avenue west of the West Baltimore MARC station, on Fayette Street, on South Central Avenue, and on MLK Blvd.

Figure 25: The Eugene Emerald Express BRT

If there is a large underutilized median, it can often be used for the stations, and sometimes for bus lanes. On Broadway and Eutaw Place there are green linear parks in the median. While the surface streets alongside the linear park should be converted to bus lanes, BRT stations of high architectural merit could be placed in critical locations in the green areas of these boulevards.

Sometimes right-of-way is available in the median of a highway. Seattle, Denver, Los Angeles and other cities have bus facilities located in the medians of highways.

Figure 26 Busway in the median of a highway, Los Angeles

This location for a BRT corridor allows the BRT to avoid intersection delay at all the cross streets, but it makes it difficult for passengers to access the station. Figure 27 below is an image from Peru similar to what is envisioned for the Carey Street station of the Baltimore BRT on Route 40.

Figure 27: BRT in a submerged highway, Lima, Peru. Suggested for Route 40, Baltimore

Major one-way streets in downtown areas create special design issues as they are often the most important sections of a BRT system and are also often the most difficult to design. Chicago recently implemented the Loop Link on downtown one-way streets.

Figure 28: New Loop Link busway, downtown Chicago. Possible model for Fayette and Baltimore

While still smoothing out startup issues, the Loop Link is a good example of a downtown BRT link with dedicated right of way. However, a passing lane would also be required at stations in downtown Baltimore in order to accommodate projected demand.

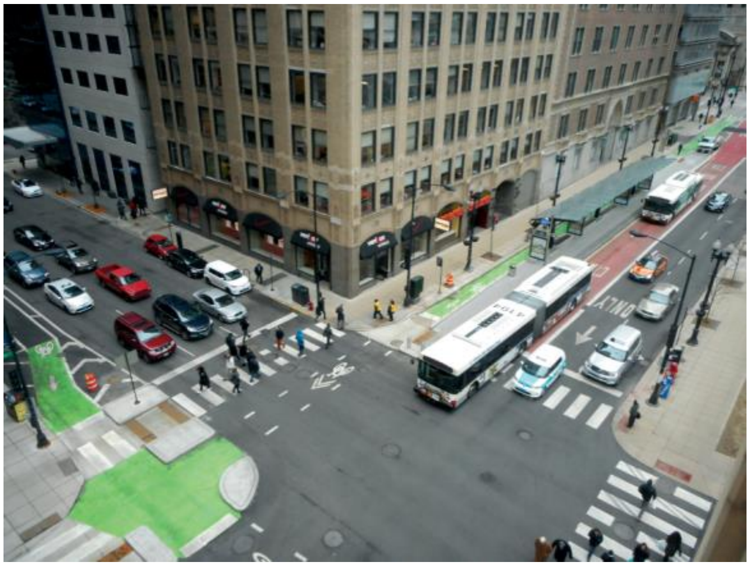


Figure 29: New Loop Link BRT segment, downtown Chicago. Possible model for Fayette and Baltimore

5.2 At-level boarding and off-board fare collection

BRT stations where passengers pay to enter the station, and enter the bus at-level with the station platform without having to go up or down steps, is the next most important BRT element. There are two ways of doing this: one way is to have passengers pass through a turnstile at the entrance of the BRT station. This is called a 'gate-controlled' payment system.

Figure 30: Gate controlled BRT system, Mexico City BRT

The other method is to have passengers purchase a ticket at the BRT station without a prepaid fare zone. In this method, an inspector checks tickets periodically – usually onboard the bus – to make sure people have paid. This approach is more typical in the United States. Both approaches have the same salutary effect of allowing passengers to board all doors at once without having to climb up or down steps but the method of gate-controlled off-board fare collection is less costly to implement when many routes are using the BRT infrastructure. For this reason, and because Baltimore would realize the greatest benefits by building BRT infrastructure to serve many routes, gate-controlled BRT stations are recommended for Baltimore.

Figure 31: At-level boarding and off-board fare collection on the HealthLine BRT in Cleveland

Figure 32: Gate controlled BRT Station, Jakarta, Indonesia

Figure 33: At-level boarding and off board fare collection on the Las Vegas BRT

5.3 Bus priority at intersections

Any surface rapid transit system will have to contend with the same traffic signals as the rest of the traffic. While signals can be avoided by locating the BRT on a highway, elevating it or tunneling it, these options are generally very expensive. While a short section of highway routing on Route 40 is recommended for the Baltimore BRT, for the most part the BRT will operate on surface streets, and that means dealing with traffic signals.

Usually, BRT systems ban left turns for mixed traffic across the busway, as allowing this movement will cause additional delay to the BRT vehicles going straight. In very low volume BRT systems, traffic signals are given a signal that a BRT bus is coming and the signal is told to remain green for extra time or turn green early (known as Transit Signal Priority). This brings some modest travel time benefit if there are not many buses. On more heavily-used bus corridors like Fayette and Baltimore Streets in downtown Baltimore, the bus volumes are so high during the peak period that most buses would not benefit. Therefore, it is preferable to ban turning movements across the BRT corridors in downtown Baltimore over transit signal priority measures which will bring marginal benefits.

Figure 34. Median BRT on an urban arterial in Las Vegas. Most left turns across the busway have been banned.

Baltimore's main arterials employ a 'green wave' which means that signals turn green in progression so that the majority of traffic does not get stopped. Currently, the green wave is timed to normal traffic speeds and favors the streets with higher traffic. In Baltimore, therefore, other than the short section of Route 40 that avoids the signals, we recommend adjusting the green wave on the downtown BRT corridors to align with BRT speeds.

6. Issues with the Baltimore LRT to avoid with BRT

In Baltimore, many people have experienced the light rail (known as the Blue Line), and many note that it moves even slower than, for example, the Route 19 bus through downtown. They have asked why a surface BRT would perform any better.

The main problem is that the very long trains have a hard time dealing with the very short blocks downtown.

Figure 35: Blue Line LRT, Baltimore, stopped at a traffic signal

If an LRT vehicle is finished boarding passengers but a green traffic light is nearing its end, the signaling system will not allow the LRT vehicle to leave the station. If it did, due to the length of the vehicle, it could end up blocking the intersection after the signal turns red. BRT does not have this problem because buses are shorter. The Route 19 bus on the same corridor, after it finishes boarding passengers at a bus stop, pulls forward to the traffic signal. As soon as the light changes, it can immediately clear the intersection. As a result, buses are much less likely to miss a traffic signal phase. This is the main reason why the Blue Line LRT currently travels below 9 mph downtown during the peak hour, whereas the Route 19 on the same stretch of road travels around 12 mph during the peak hour.

The Blue Line LRT also does not have signal priority or even a green-wave: the signals are timed primarily to serve the much heavier east-west cross town traffic. As there are many bus routes on the east-west roads, giving signal priority or a green-wave to the LRT would cause major delays to east-west bus passengers as well as to regular traffic.

Figure 36: Left turns for mixed traffic are allowed across the Blue Line LRT tracks.
BRT systems should restrict turns across the busway where possible.

Additionally, many intersections allow left turns across the light rail tracks so the light rail vehicle must wait while left turning vehicles cross in front of the Blue Line. Mixed traffic, meanwhile, is allowed to go forward since it does not conflict with left turning vehicles. This is another reason the Route 19 bus moves faster downtown than the Blue Line. Turns across the BRT should be avoided as much as possible.

The archaic vehicles also have steep steps that make boarding slow. Steps increase the boarding time by about 1 second per passenger (which adds up over the course of a trip). If a passenger is senior citizen or person with a disability, the delay is much more substantial.

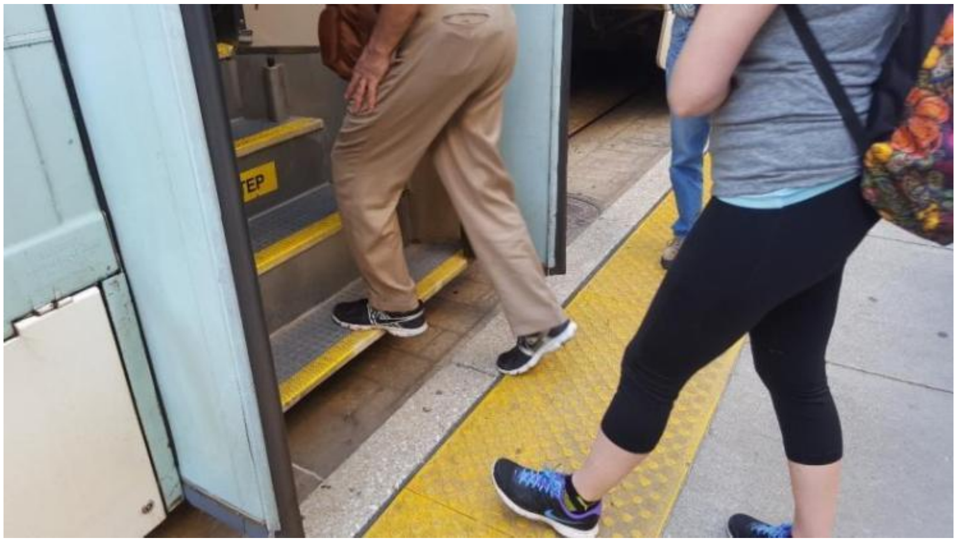


Figure 37: Stairs to enter Baltimore light rail vehicles further delay the system.

This compares unfavorably with the Charlotte LYNX LRT (Figure 35 below), for instance, which has modern trains with low floors level with the boarding platform. These are also attributes of BRT systems.

Figure 38: At-level boarding and off-board fare collection on the Charlotte LYNX light rail

Another reason the speeds are so slow on the light rail is that the tracks are old and damaged so they face speed restrictions of 30 mph along much of the downtown parts of the corridor. In order to repair the light rail tracks, the service would have to be shut down so it is difficult and expensive to upgrade the tracks, with workers often working overnight to avoid service disruption. With a BRT, if a part of the road must be repaired, the bus can simply bypass the roadwork.

Figure 39: Speed restriction to 30 mph on the Baltimore Blue Line light rail.

Both the large size of the vehicles and the length of the route also make for infrequent, irregular services. The headways on the light rail are about 8 minutes during the peak, but due to frequently unreliable service, this often leads to waits of 15 minutes. Buses, being smaller and less expensive to procure and operate, can generally provide a more frequent service at the same operating cost.

Figure 40. Unreliable service on the Blue Line LRT, with vehicles bunching, leads to extended waiting times.

While this section described the differences between Baltimore's light rail and its buses, this in no way implies that the speeds of Baltimore's buses are sufficient or that rail is uniquely slow. BRT also solves most of the delays faced by standard bus service as well.

7. Detailed infrastructure proposal

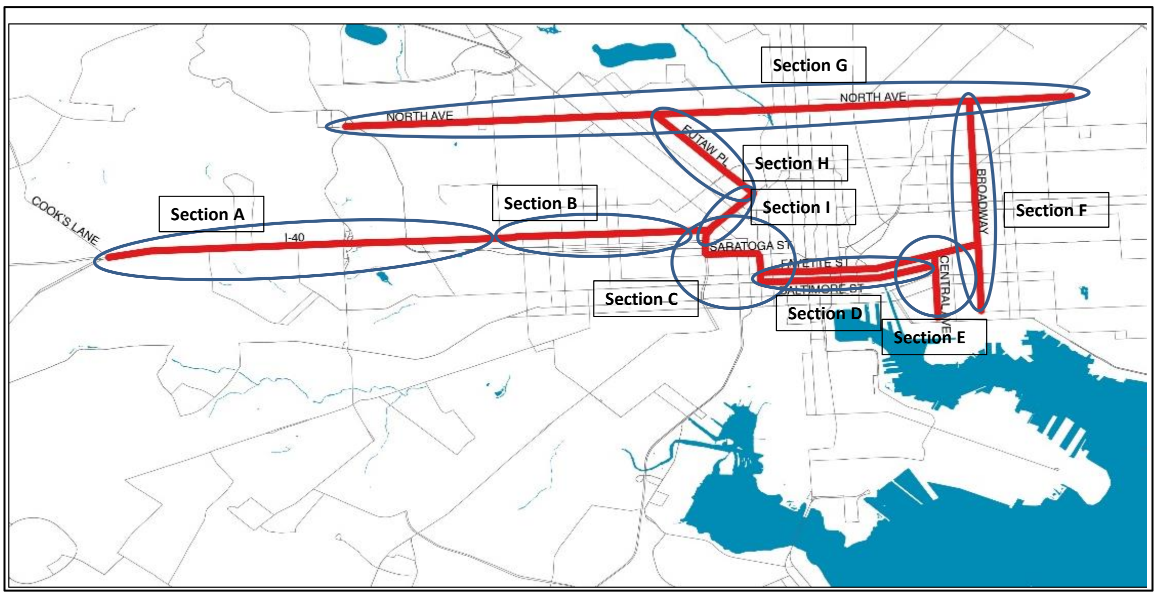


Figure 41. Section by section analysis of Baltimore BRT

The corridors shown above in Figure 41 Figure 1can be divided into 9 sections based on different road cross sections.

In general, there are enormous time savings advantages of putting BRT in the central median of the roadway. The space currently used for medians and left-turn lanes can generally be used for the station. If a single station in the central median is shared by both directions of the busway, then only a single station needs to be built, lowering costs. This also facilitates free transfers from one route to another. However, it requires procuring buses that have doors on both the left side of the bus and the right side of the bus. Such buses are used in the Cleveland, San Bernardino, and Eugene BRTs in the United States and are in general use in BRTs internationally. In the sections to follow, this is generally the recommendation as road space is at a premium in most of the sections recommended for BRT.

7.1. Sections A and G: Edmonson Avenue and North Avenue

Sections A and G – Edmonson Avenue and North Avenue – have similar cross sections and both are classic pre-BRT cross sections. Both have good widths and under-utilized central medians where stations can be built. Edmonson Avenue and North Avenue vary in width from about 90 feet to about 120 feet building wall to building wall, with a minimum width of about 75 feet curb to curb. BRT stations create the main pinch-points but can generally be located on blocks where extra width is available.

Figure 42: North Avenue has a classic pre-BRT configuration for much of its length, and width varies from block to block

One of the narrower sections of North Avenue is shown in the photo above. Stations would generally occupy the space between the two sets of yellow dividing lines. If left-side boarding buses are procured, a single station can be used in both directions as shown in Figure 43 below.

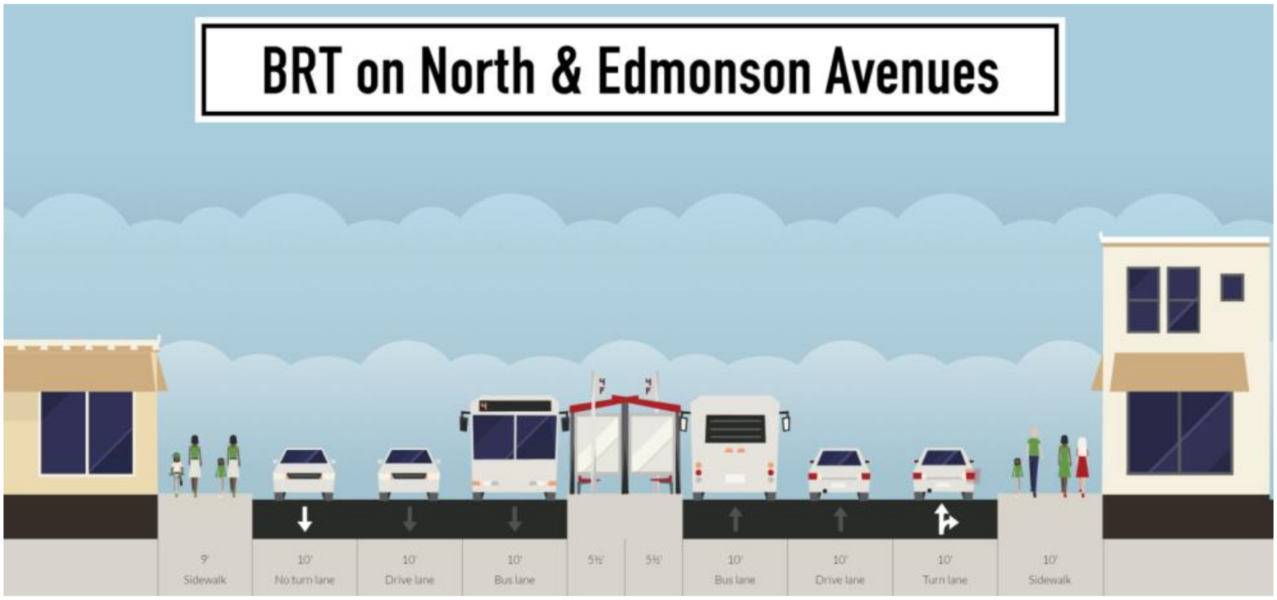


Figure 43: Standard BRT cross section applicable to North Avenue and Edmonson Avenue sections

If it proves difficult to procure buses with doors on the left, then a station can be built for each direction of travel, still retaining the central median alignment, as shown in Figure 44 below.

Figure 44: Alternative cross section for North and Edmonson Avenues that accommodates buses with doors only on the right

At stations, a minimum of 11 feet is needed for the station, 10 feet for a bus lane when adjacent to the BRT station, and 10 feet for each mixed traffic lane. Two mixed traffic lanes per direction are provided where possible on arterials with significant traffic volume so that a broken down vehicle, or turning vehicles do not fully obstruct the roadway.

7.2. Section B: West Route 40

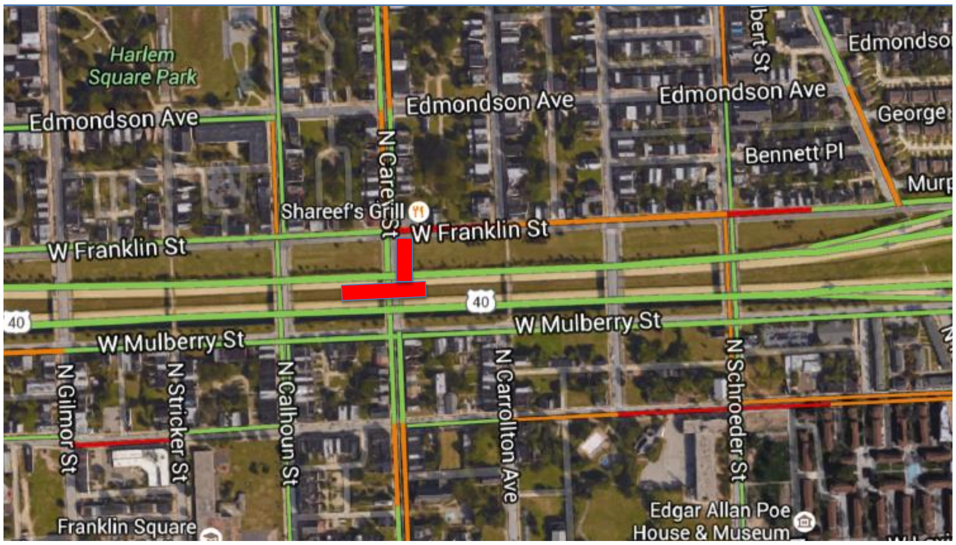


Figure 45: Congestion levels on Rt.40 in West Baltimore, and possible location of a BRT station at North Carey St

On Route 40 west, the most beneficial alignment for BRT infrastructure would be in the median of the Route 40 highway, as was also proposed in the Red Line study for both LRT and BRT alternatives. The time savings gained from using the submerged highway, rather than the surface streets above (West Mulberry and West Franklin) is due to the elimination of intersection delay. High-capacity transit on this stretch of road, which in the Red Line LRT proposal cost at least $250 million to construct, would cost almost nothing in the BRT proposal, as the central lanes of the Route 40 highway could simply be striped for BRT-only use, whereas the LRT would have required heavy construction to retrofit the highway with tracks. Currently, Route QB40 uses the Route 40 highway and travels at highway speeds.

Like the Red Line proposal, a station along this segment of the corridor at Carey Street would provide an anchor for neighborhood revitalization on both sides of Route 40. This station, which would best be designed with an escalator and elevator to connect to the surface streets and the roadway below, would likely cost in the $20 to $40 million range. Currently, BaltimoreLink does not include a route that runs north-south on Carey Street, so a route would need to be added to connect to this station.

7.3. Section C: Route 40 to Downtown

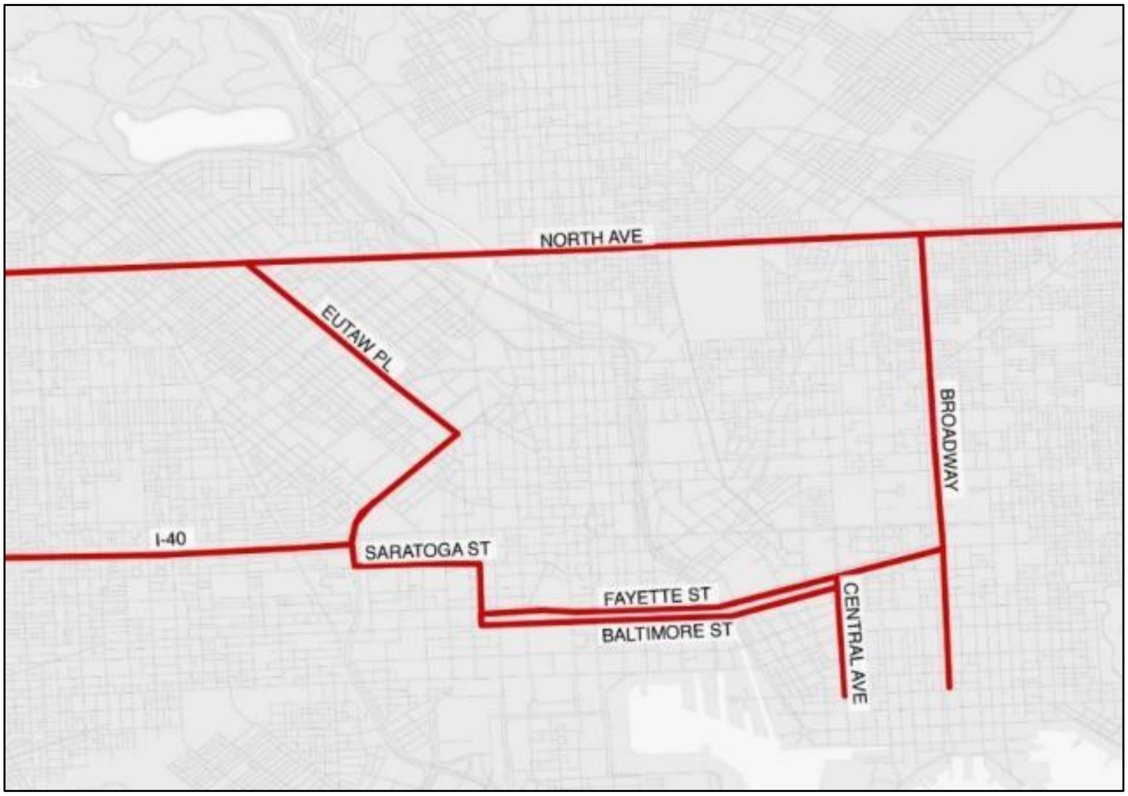


Figure 46: Detail of downtown BRT infrastructure proposal

There are multiple options to connect Route 40 west to downtown Baltimore. The surface proposal for the Red Line BRT and LRT options (3.A. and 4.A) ran the BRT or LRT between the two highway access ramps into the median of MLK Boulevard, and then onto Fayette and Baltimore from MLK Boulevard by the University of Maryland Medical Center. Fayette and Baltimore are both quite narrow next to the Medical Center and there are hospital access needs on these streets. The Red Line routing also misses the passengers at Lexington Market. In this report a BRT routing is proposed that uses the central median of Route 40 as with the Red Line proposal, but uses MLK Boulevard only briefly and immediately turns onto Saratoga Street, with another link going northbound on MLK Boulevard (Figure 47). This proximity would allow this movement in a single signal phase, minimizing disruption to traffic on MLK Boulevard, which can be widened only on that block.

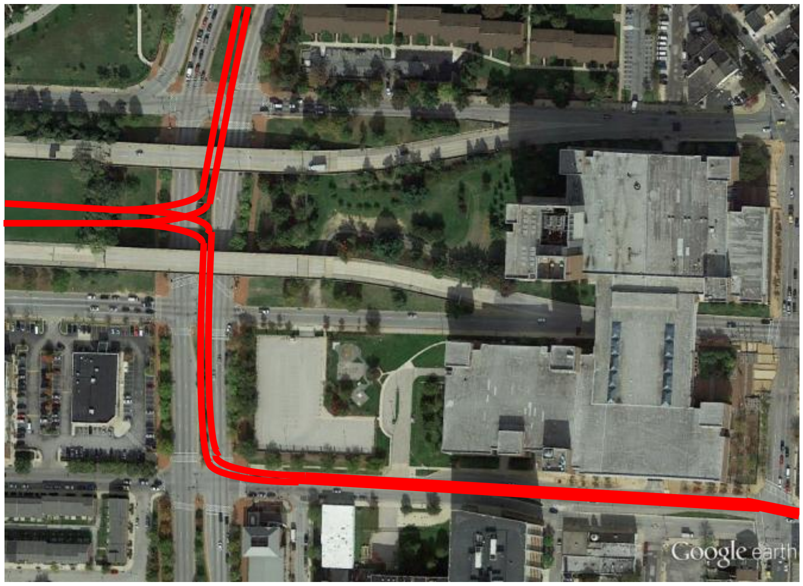


Figure 47: BRT could exit the median of Route 40 at MLK Blvd, use the median of MLK northbound and southbound turn immediately onto Saratoga Street.

Saratoga Street is wide and under-utilized, yet still close to the University of Maryland Medical Center.

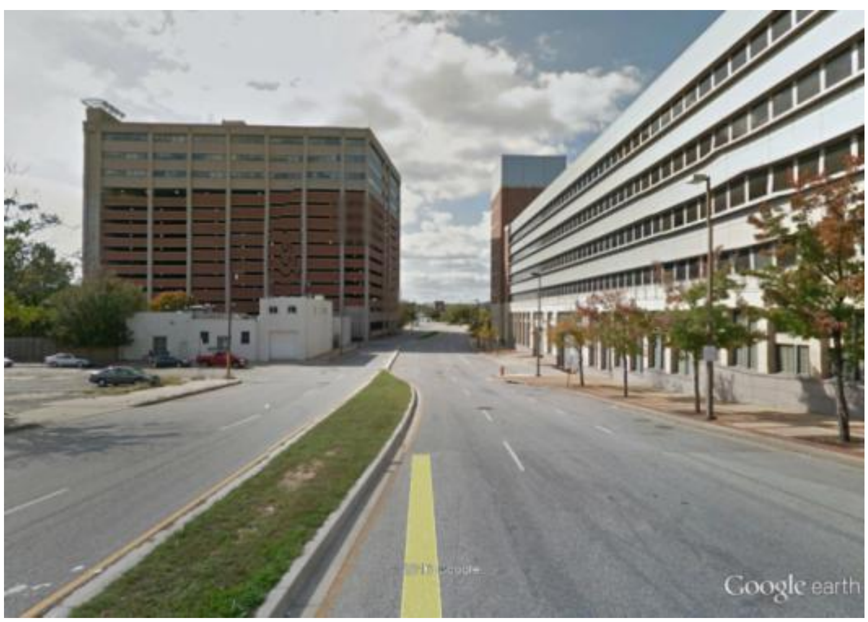


Figure 48: Saratoga has plenty of width for BRT lanes and a BRT station serving the Univ. of Maryland Medical Center.

The BRT would then turn south at Eutaw Street to pick up the heavy bus demand near the Metro station at Lexington Market.

Figure 49: The existing bus stop at Eutaw St and Lexington Market could easily be upgraded to a full BRT station with at-level boarding and off-board fare collection.

There is available right-of-way to build two-way BRT on Eutaw, but a split one-way pair also using Paca Street could also be considered.

7.4. Section D: Downtown

Nine bus routes currently operate on Baltimore and Fayette Streets (Routes 5, 8, 20, 30, 36, 40, 46, 48, and 91). There are sufficiently high volumes of bus traffic on Baltimore and Fayette Streets downtown that giving them a dedicated lane and BRT stations would have a positive impact on both buses and mixed traffic. Buses would move through the area faster, freeing up more road space for mixed traffic. Some of the bus routes on congested Pratt and Lombard St could also be shifted to Baltimore and Fayette Streets.

As Baltimore and Fayette Streets are one-way streets, the BRT would need to be split into a one-way pair, as was the proposal for the Red Line surface BRT and LRT alternatives. Bus stops along these two streets are the highest demand bus stops in Baltimore and those stations, if they are built as BRT stations with off-board fare collection and platform-level boarding, would yield the highest benefits in Baltimore. These roads widen in specific locations where stations are most needed, and there is plenty of width to create dedicated bus lanes. There need to be two dedicated lanes in each direction at the stations to ensure that these high volume bus stops do not saturate, but one lane is sufficient where there is no station.

Figure 50: The existing bus stop on Fayette St in Downtown Baltimore is well-suited to become a BRT station

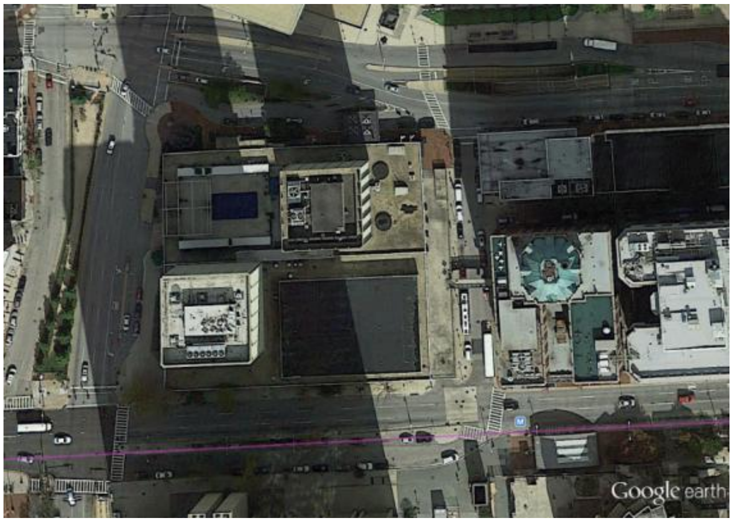


Figure 51: Fayette and Baltimore Streets at the Charles Center Metro Station

A full BRT station at the Charles Center Metro Station would provide an important connection downtown between the BRT and Metro and it happens to be where extra width is available.

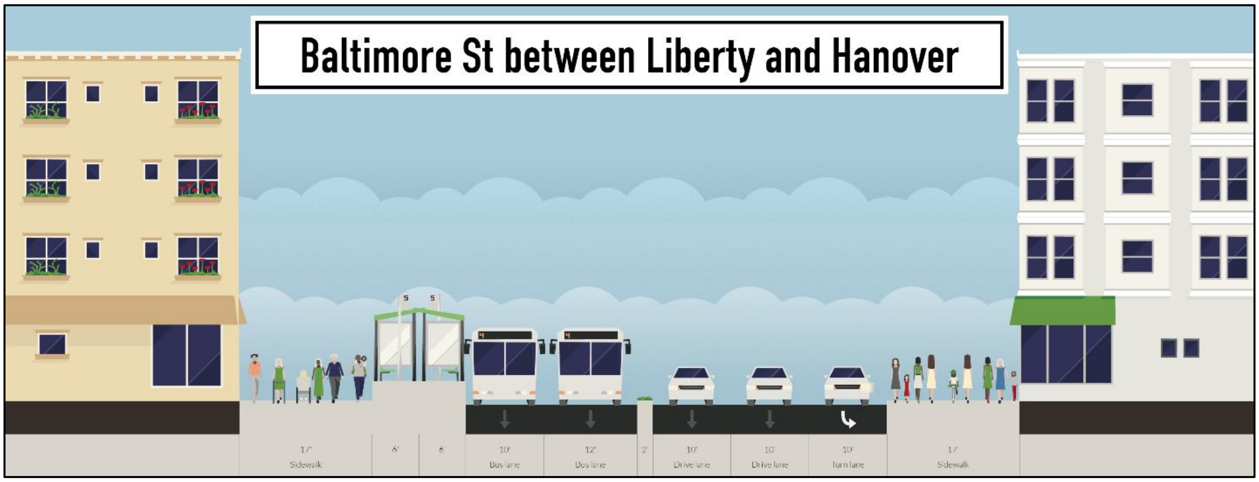


Figure 52: Cross section for BRT on Baltimore and Fayette Streets at Charles Center Metro Station

7.5. Section E: Downtown to Broadway

Figure 53: Fayette St. East of downtown Baltimore

The busway on Baltimore Street would be routed back onto Fayette Street via President Street, allowing for a station at the Shot Tower Metro Station. It would continue down Fayette Street two-way to Broadway. Fayette Street has a median where stations could be built as needed. This follows existing bus Route 23 and QB40, as well as the recommendations of the BRT/LRT alternatives considered as part of the Red Line feasibility studies.

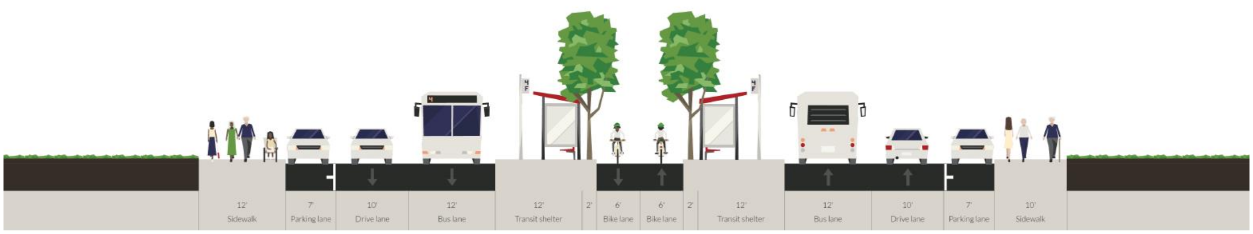
Figure 54: South Central Ave has a classic pre-BRT configuration

South Central Avenue could also accommodate full BRT infrastructure and is slated for reconstruction anyway. These funds could be re-purposed for this link of BRT. South Central Avenue does not currently have an MTA bus route (the Orange Line Circulator uses it for part of its route), but Route 21 could be relocated there to increase its speed if the community supported the idea. South Central Avenue would provide a direct connection to the new developments at Harbor East.

7.5. Sections F and H: Broadway and Eutaw Place

Both Broadway and Eutaw Place are wide roads with moderate traffic and large green medians. Broadway from Fells Point to Hartford Road has a classic "pre-BRT configuration." It is a wide two-way road with a wide central median. BRT infrastructure on Broadway would provide a fast link between Fells Point, the JHU Medical School, and North Avenue.

Figure 55: Broadway has a classic pre-BRT configuration



Broadway does not currently have continuous bus routes along it (only a short section of Route 15) but CityLink routes are planned on it and there are high volume bus routes on both sides of Broadway which could potentially take advantage of this infrastructure. Placing the existing bicycle lane in the central median would provide the best protection and would allow it to avoid conflicts with turning vehicles.

Figure 56. Eutaw Place between MLK Blvd and North Avenue could easily accommodate full BRT without losing much of the linear park.

The median on Eutaw Place is more intricately landscaped than the median on Broadway. The BRT on Eutaw Place could use the existing traffic lane adjacent to the median for the busway, taking only a marginal amount of the median for the station where it is needed. The stations would need to be of a high architectural merit to be consistent with the landscaping. Parking would need to be removed only in the station areas. A possible cross section is shown below.

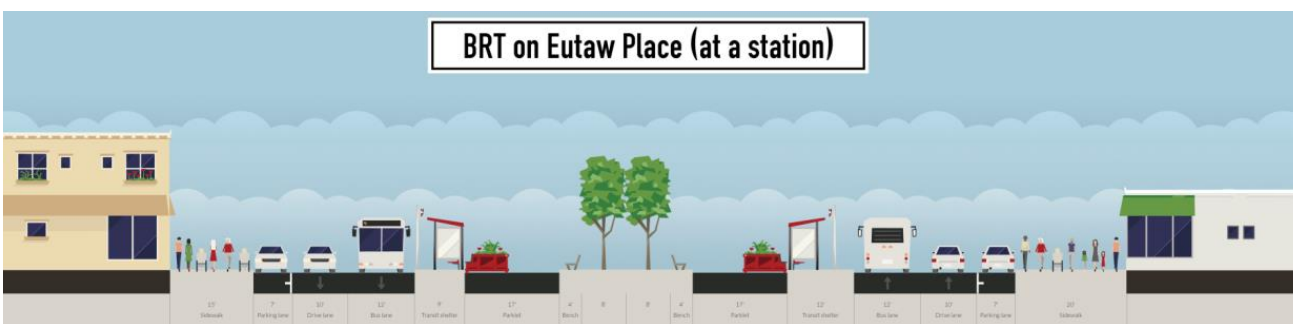


Figure 57: Possible BRT cross section for Eutaw Place. Alternative would be to convert the parking lane to a traffic lane.

7.6. Section I: MLK Boulevard

MLK Blvd would connect Eutaw Place to Route 40, serving planned new developments at State Center. MLK Blvd is an important long distance truck route and traffic route, but claiming the median for a dedicated BRT corridor should cause minimal traffic disruption, as there is median with greenspace along it that could be used for BRT.

Figure 58: MLK Blvd between Route 40 and Eutaw Pl has a median and additional ROW that could accommodate BRT.

8. BRT services and their relationship to BRT infrastructure proposal

8.1. Introduction

Baltimore is currently undergoing a major bus network restructuring known as BaltimoreLink. Many of the service changes recommended under BaltimoreLink are similar to those that would generally be made when implementing a BRT system, with two important differences. BaltimoreLink is not proposing any of the BRT infrastructure that is essential to increasing Baltimore's bus speed, frequency, and reliability. As a result, CityLink services have not taken into consideration the potential benefits of rerouting services onto BRT corridors. Further, currently proposed BaltimoreLink service changes force thousands of daily commuters to go out of their way and make needless transfers. This proposal envisions that CityLink – the downtown portion of BalitmoreLink – with important modifications, would become the bus routes on Baltimore's BRT infrastructure (Figure 59).

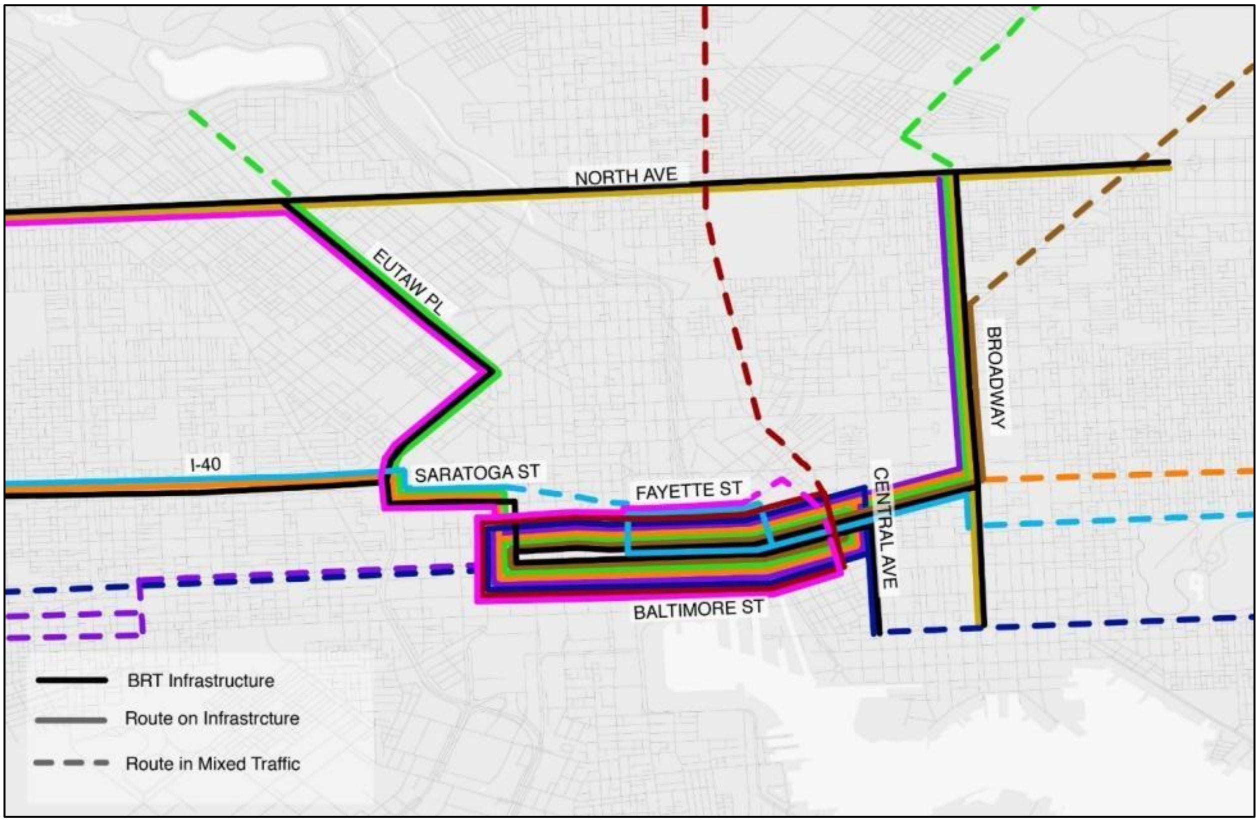


Figure 59: 9 modified CityLink routes would use the proposed BRT infrastructure

For this BRT proposal, minor modifications have been made to CityLink routes to better utilize proposed BRT infrastructure or to minimize unnecessary transfers.

Routes would follow the service pattern of other successful BRT projects in the United States like CTfastrak in Hartford-New Britain (Figure 60 below). That is, bus routes would operate inside the BRT infrastructure where it is available, then operate in mixed traffic to complete their routes where there is no BRT infrastructure available.

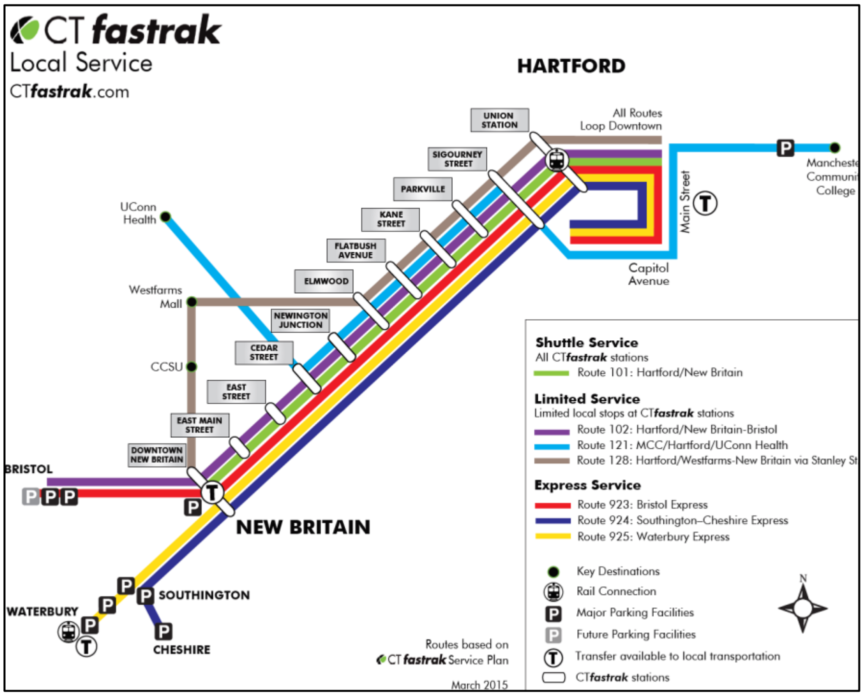


Figure 60: The bus route map for Hartford's CTfastrak BRT system

Based on the existing ridership on the routes that these CityLink/BRT routes most closely resemble, not considering that the higher travel speeds on BRT routes should attract additional passengers, these BRT links should be able to bring significant time savings benefits to approximately 154,000 daily passengers.

ROUTE	DAILY PAX
15	20,305
23	20,278
40	17,790
8	17,291
13	15,846
10	15,543
20	14,077
91	10,652
48	9,375
Total	153,382

Table 3: Current passengers on bus services routes that most closely resemble planned CityLink services routes that would be incorporated into the BRT. (BNIP data)

8.2. Comments on BaltimoreLink service changes

Most of the BaltimoreLink route changes were proposed in the spirit of modernizing and making more efficient many of Baltimore's more archaic bus routes. Many of the CityLink routes are shorter versions of existing popular bus routes. The shortening of these routes is consistent with contemporary planning practice, as it tends to improve service reliability and adds frequency where it is most critical. The planned changes continue to be improved with community input as they evolve. Most of them are generally complementary with the suggested BRT infrastructure and some would serve, with modifications, as BRT routes.

While most of the route changes are positive, several gaps in the new network can be observed. In Figure 61 below, the new CityLink and LocalLink routes are overlaid on top of the existing bus network. CityLink routes are colored blue, LocalLink routes are green, and the existing routes are grey. **Route 20**, the 8th most popular route in the city and **Route 30** are cut, leaving a service gap on Baltimore Street. Route 7 is cut leaving a service gap on Pennsylvania Avenue. **Route 11** and **Route 27** are also cut, leaving service gaps. Harder to see from this map are the changes in Routes 15, 19, and 91.

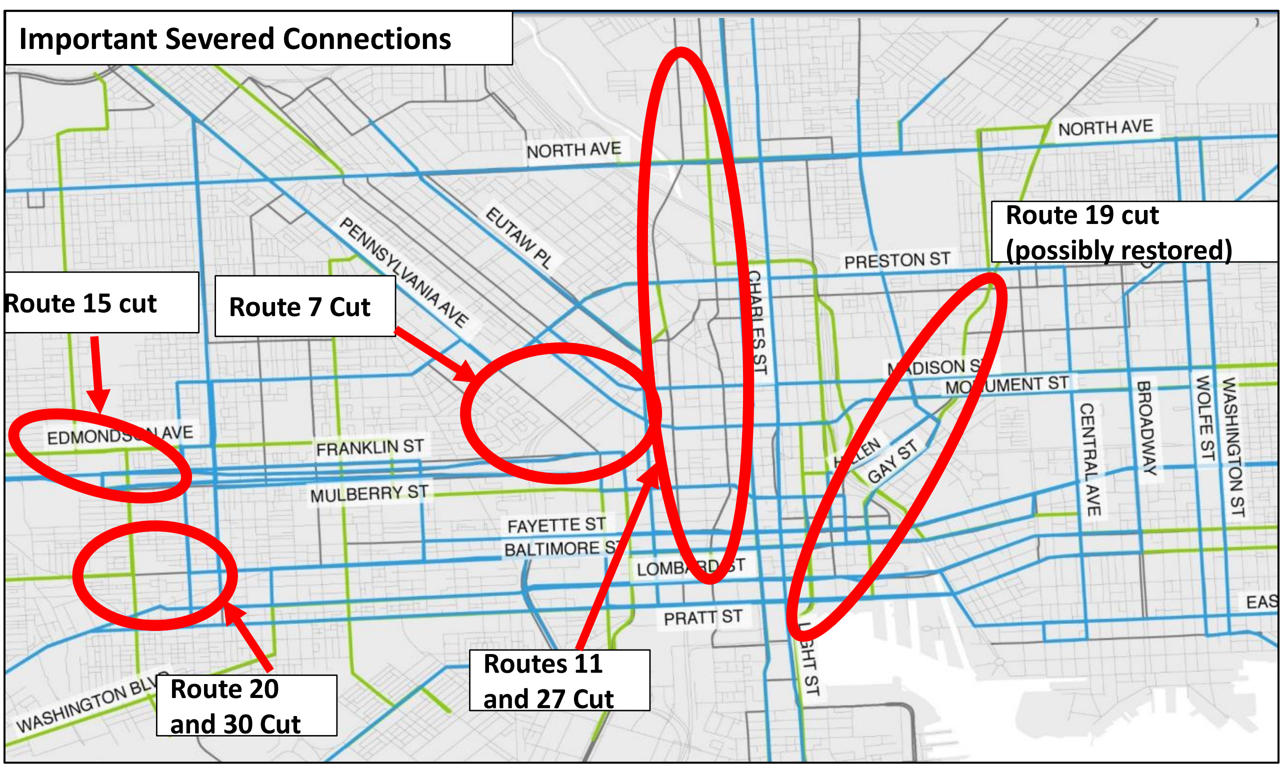


Figure 61: Blue lines represent new CityLink routes, green lines represent LocalLink routes, and grey lines represent exiting bus routes

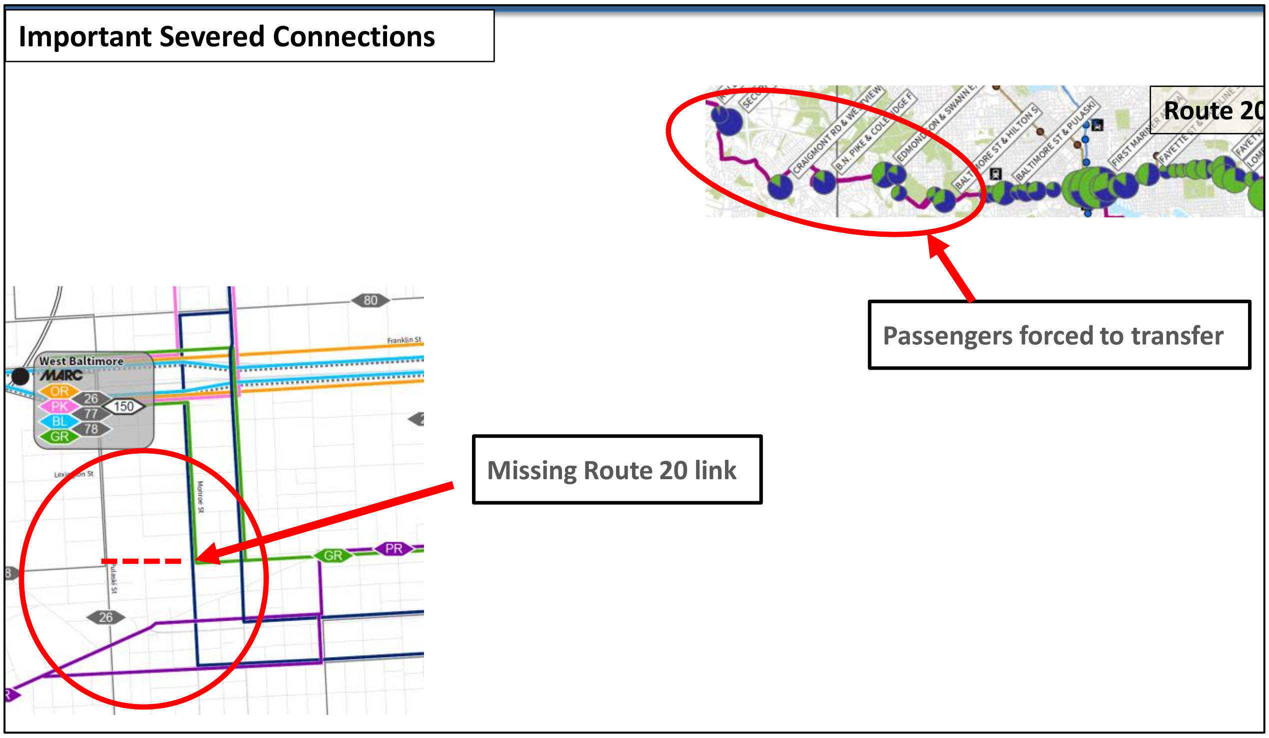


Figure 62: Under BaltimoreLink, Route 20 is rerouted and terminates at West Baltimore MARC station, forcing thousands of needless transfers

Under BaltimoreLink as it is currently envisioned, passengers currently taking **Route 20** or **Route 30** will no longer be able to go directly downtown. They will need to take LocalLink 78 out of their way north to the West Baltimore MARC station, from where they will need to transfer to CityLink Green to continue their journey downtown. This is a needless diversion and a forced transfer for thousands of passengers with no clear benefit.

Route 15 in West Baltimore, currently the most popular route in the city, which continues down Edmonson Avenue to Poplar Grove/Bloomingdale Road, will become CityLink Orange and will be cut at the West Baltimore MARC station.

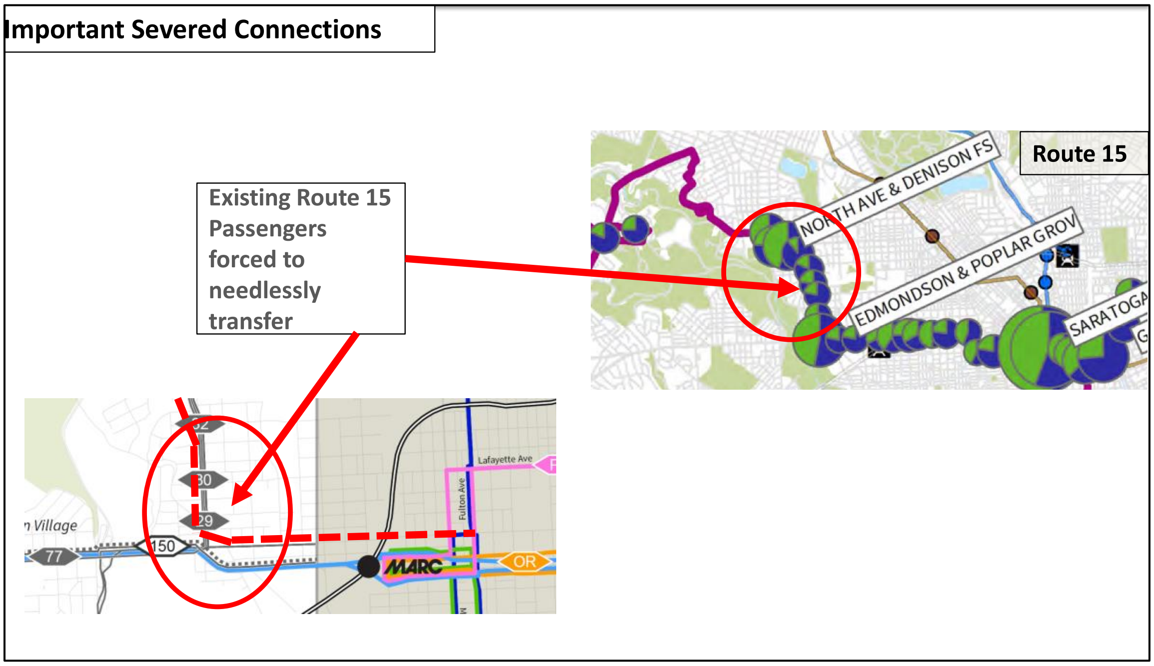


Figure 63: Under BaltimoreLink, many existing Route 15 passengers will be forced to transfer

Passengers currently traveling on **Route 15** towards downtown will, under BaltimoreLink, be forced to transfer from LocalLink 29, 30 or 32 onto CityLink Blue, and no transfer facility is planned for this site. This will needlessly force thousands of daily transfers in uncomfortable roadside waiting conditions.

Route 19 would no longer provide a continuous connection from Hartford Road through downtown and up to State Center, but would terminate at City Hall, forcing thousands of Hartford Road passengers traveling beyond City Hall to transfer. However, discussions with MTA indicate that Route 19 has been restored after community feedback.

Route 91, will be cut, which along with the **Route 7** cut, leaves a service gap through Sandtown/Winchester, connecting Northwest Baltimore to downtown.

BaltimoreLink is forcing several needless transfers at the West Baltimore MARC station, which in turn is leading MTA to spend needless money on an expensive transfer facility at the West Baltimore MARC station. Normally, a transfer terminal is located in a location where many routes operating on a single arterial road diverge onto multiple routes. In much of the world, transfer facilities, even when well located, are generally falling out of favor. In this case, very few passengers are going to the West Baltimore MARC station, and no current bus routes naturally terminate there.

Figure 64: Grey circles indicate total boarding and alighting passengers per day.
West Baltimore MARC Station is not a natural transfer point

If these shortcomings are addressed, and BRT infrastructure is implemented where recommended, BaltimoreLink could bring benefits.

8.3. Proposed CityLink Services as BRT Services

The following section uses proposed BaltimoreLink routes either as proposed by MTA or modified to better utilize BRT infrastructure or to overcome observed shortcomings of BaltimoreLink service changes.

8.3.1. BRT CityLink Gold

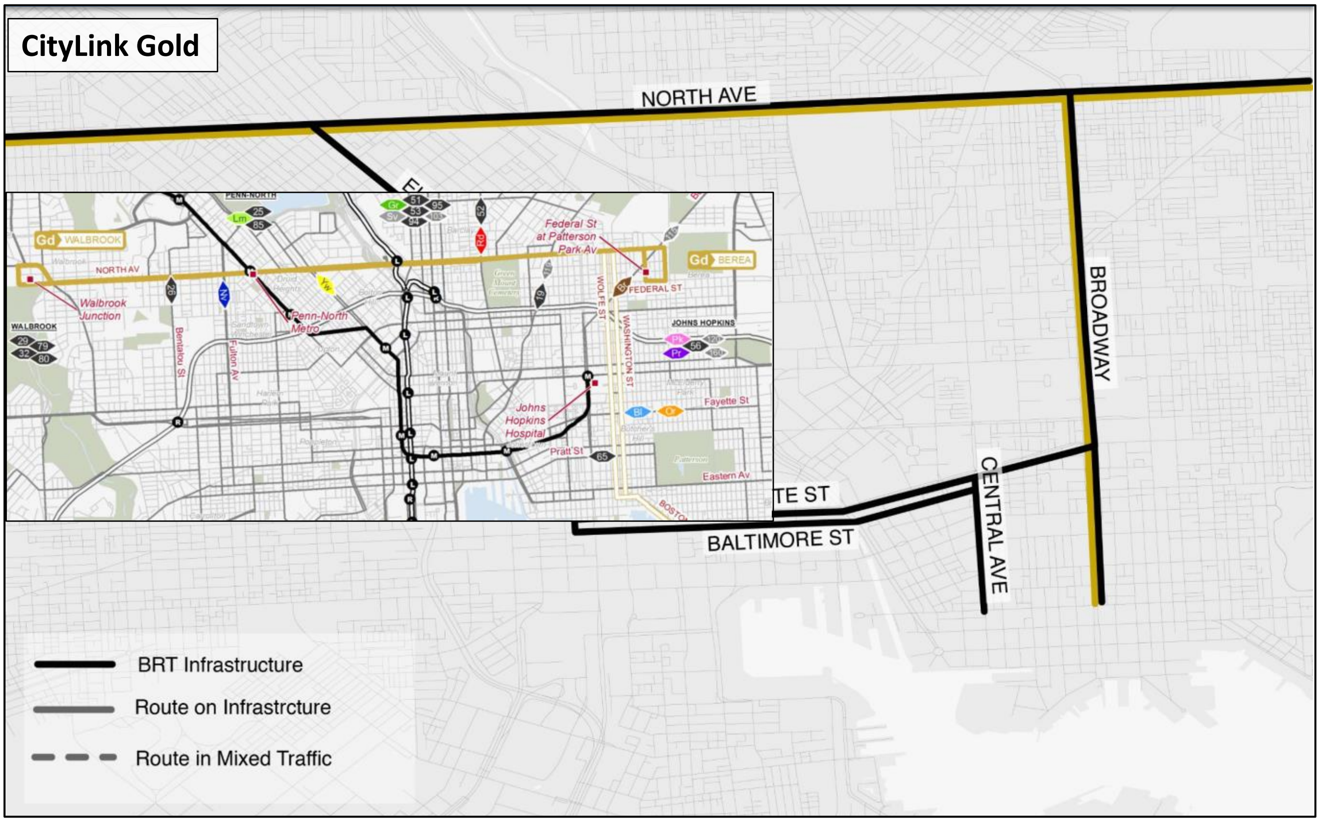


Figure 65: CityLink Gold would be the main BRT service on North Avenue, and could also serve as a service on Broadway.

The proposed CityLink Gold route, which essentially replaces Route 13, would be the primary BRT service on North Avenue, which might be the first section of BRT infrastructure to be built. It would be re-routed onto Broadway and the current proposed connection between North Avenue and Patterson Park would become a LocalLink route.

8.3.2. BRT CityLink Route 19

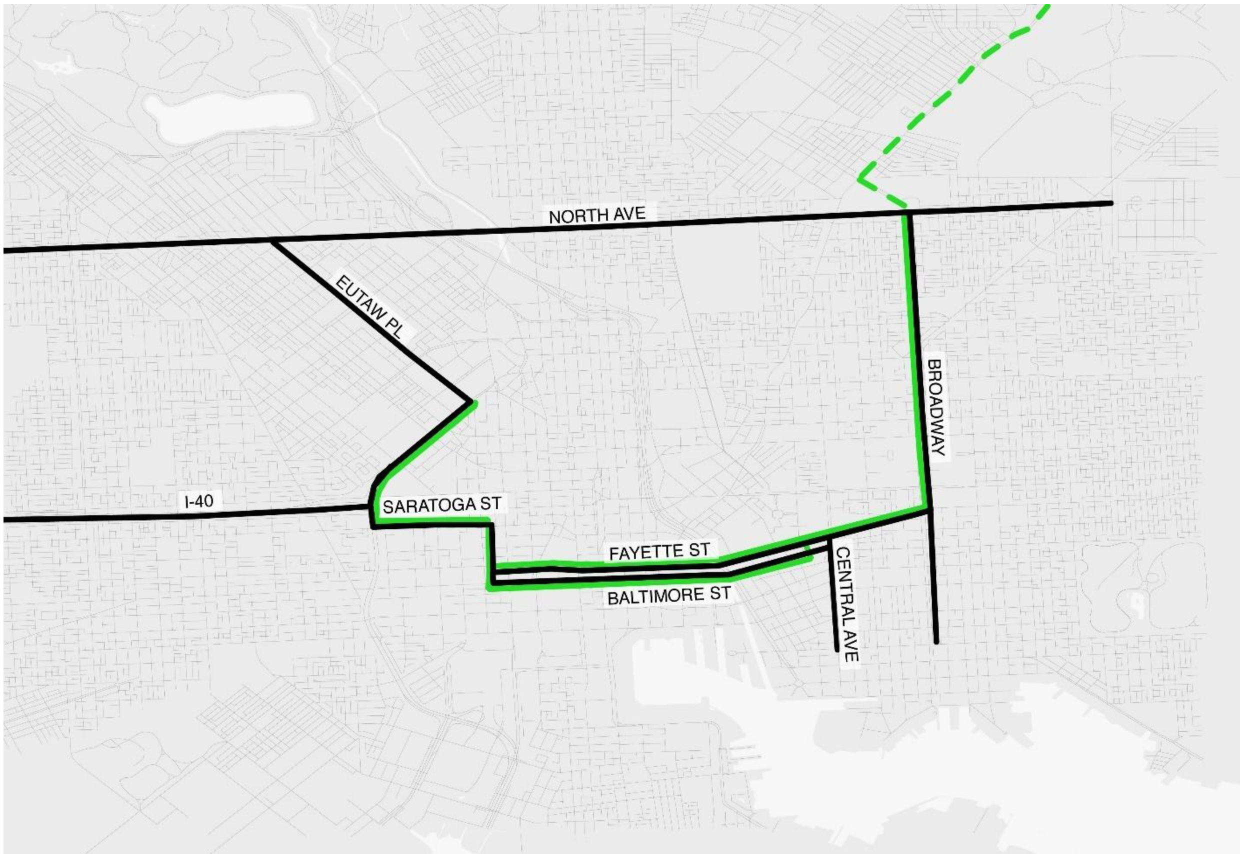


Figure 66: BRT CityLink Route 19.

BaltimoreLink's most recent iteration retains Route 19 in roughly its current configuration, though it has not yet been given a CityLink color. Route 19 could become a BRT route running from State Center, following the BRT infrastructure through downtown and back up Broadway to Hartford Road.

8.3.3. BRT CityLink Orange

CityLink Orange would become a main BRT service. CityLink Orange is mostly the eastern portion of existing Route 23 and QB40. By shortening the route, reliability should improve. Together with CityLink Blue, it is the BRT route most similar to what would have been the Red Line service. It would operate in mixed traffic in eastern Baltimore, joining the BRT infrastructure at Broadway and Fayette, following the BRT infrastructure through downtown, and out Route 40. CityLink Orange should have a less frequent extended service that continues past the West Baltimore MARC station down the Edmonson BRT infrastructure as far as Poplar Grove/Bloomingdale Rd where it would head northward as far as North

Avenue where it would connect to BRT CityLink Gold. This modification of CityLink Orange would pick up the demand from the previous Route 15 that the BaltimoreLink plan currently forces to transfer at the West Baltimore MARC station. MTA has mentioned that this alternative was considered and is a possible modification.

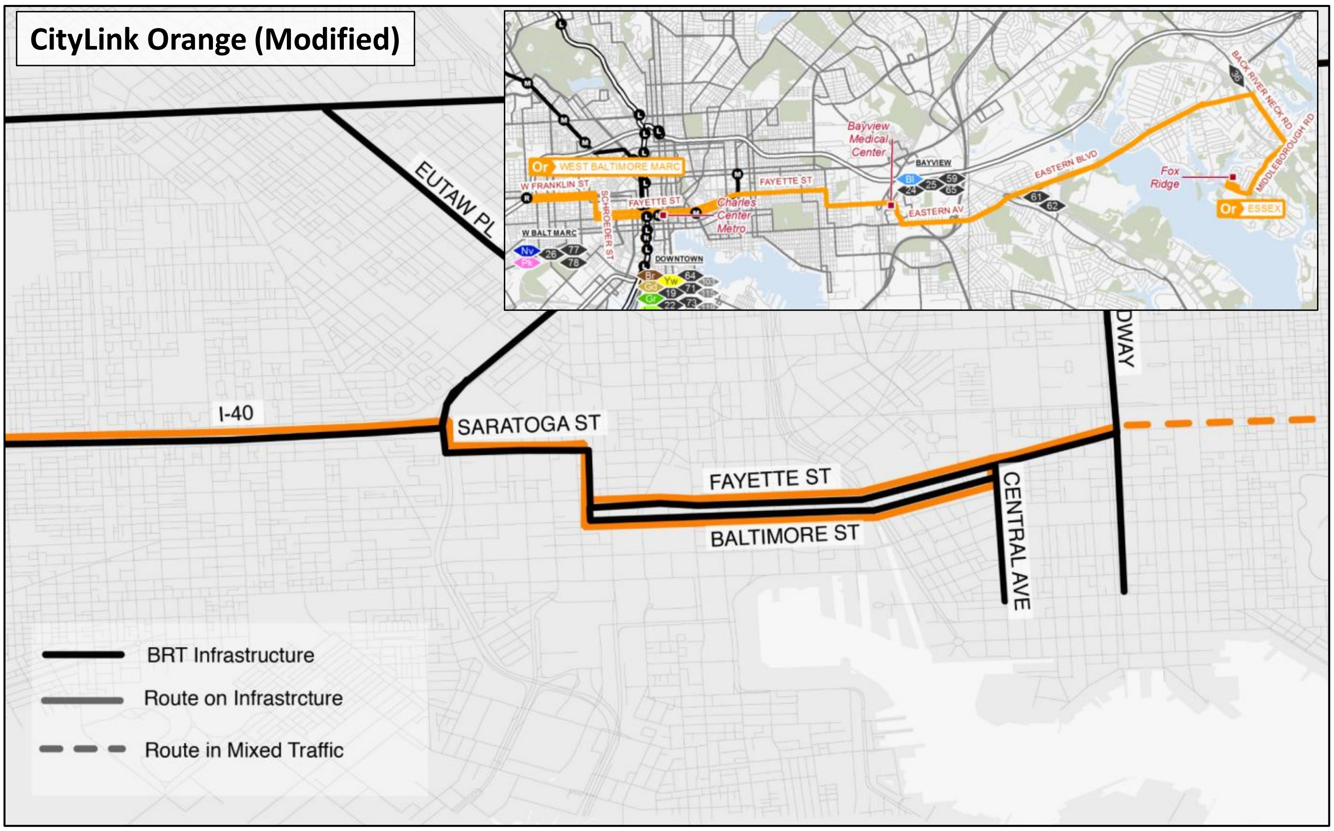


Figure 67: BRT CityLink Orange will be a main east-west BRT service

8.3.4. BRT CityLink Blue

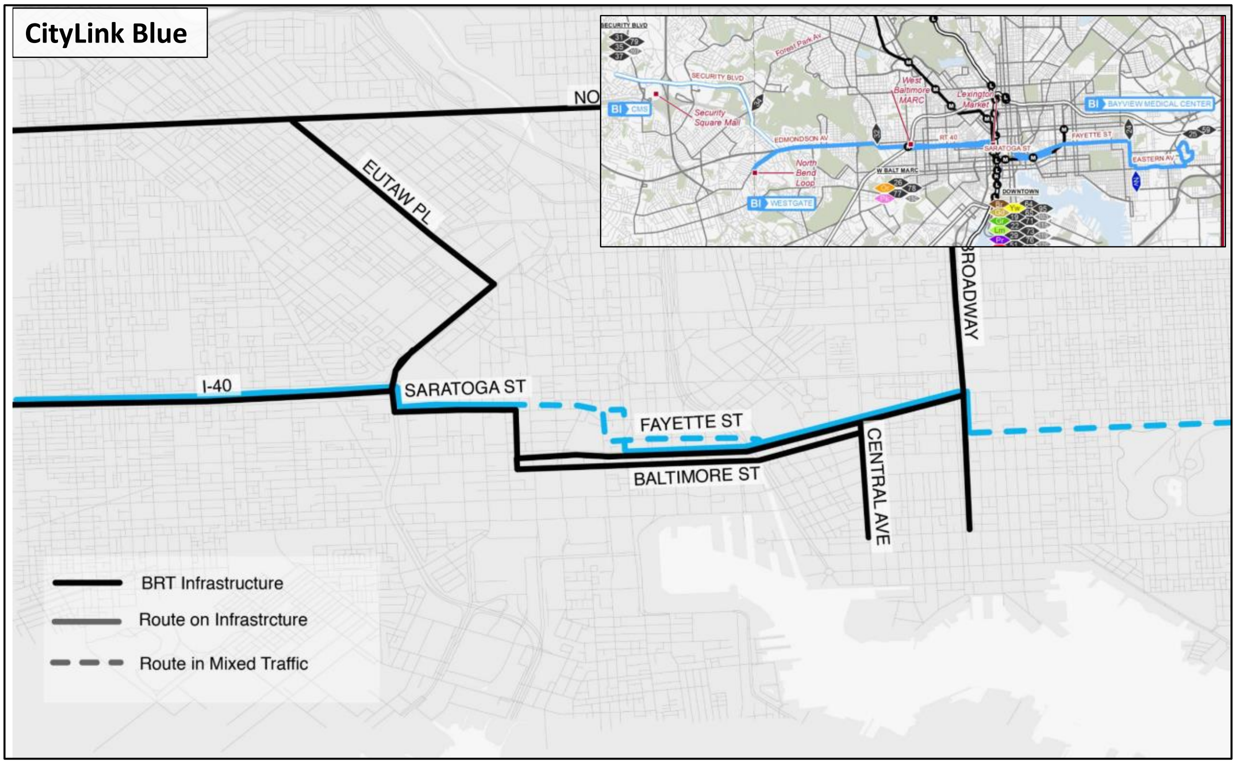


Figure 68: BRT CityLink Blue essentially follows the current Route 23 and much of the QB40. Downtown, it is similar to CityLink Orange but provides access to important commercial establishments on Saratoga.

BRT CityLink Blue, which largely replaces Route 23 and QB 40, and which was the route that the Red Line LRT was largely going to replace, would also be one of the core services of the BRT system. Route 23 and QB 40 are the second and third most popular bus routes in the city and their combined demand makes it the highest demand bus corridor in Baltimore. This route would secure most of the benefits of the LRT Red Line at a much lower cost, as it would operate in mixed traffic east of Broadway, where delays are not so serious and where dedicated right-of-way would be more difficult to secure.

8.3.5. BRT CityLink Brown

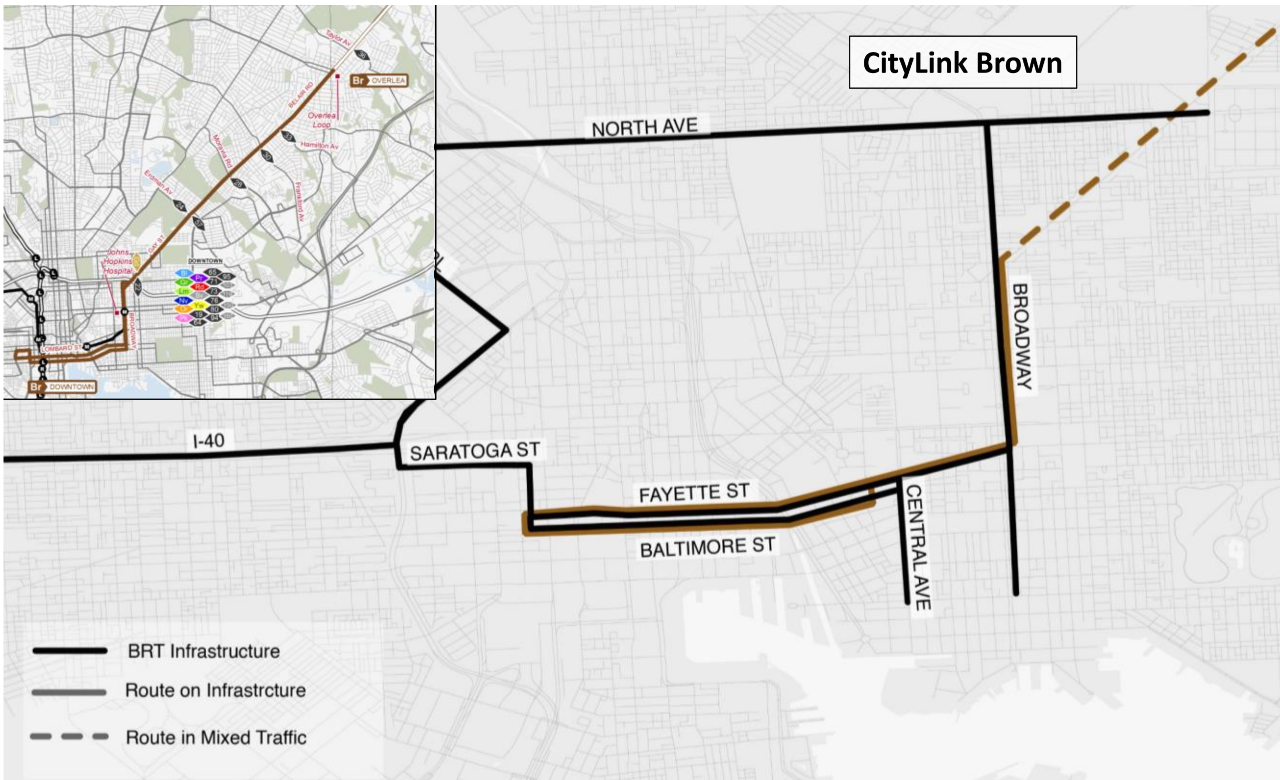


Figure 69: BRT CityLInk Brown, similar to the eastern portion of Route 15, could use the BRT infrastructure on Broadway, Fayette & Baltimore, and Route 40.

BRT CityLink Brown, or the East Baltimore portions of old Route 15 (currently the most popular bus route in Baltimore), could be routed onto the proposed BRT infrastructure. BRT CityLink Brown would capture much of the current Route 15 demand from Belair Road to downtown, providing passengers a route that takes them closer to downtown. By shortening the route from the former Route 15 and routing CityLink Brown onto BRT infrastructure, reliability should be significantly improved.

8.3.6. BRT CityLink Purple

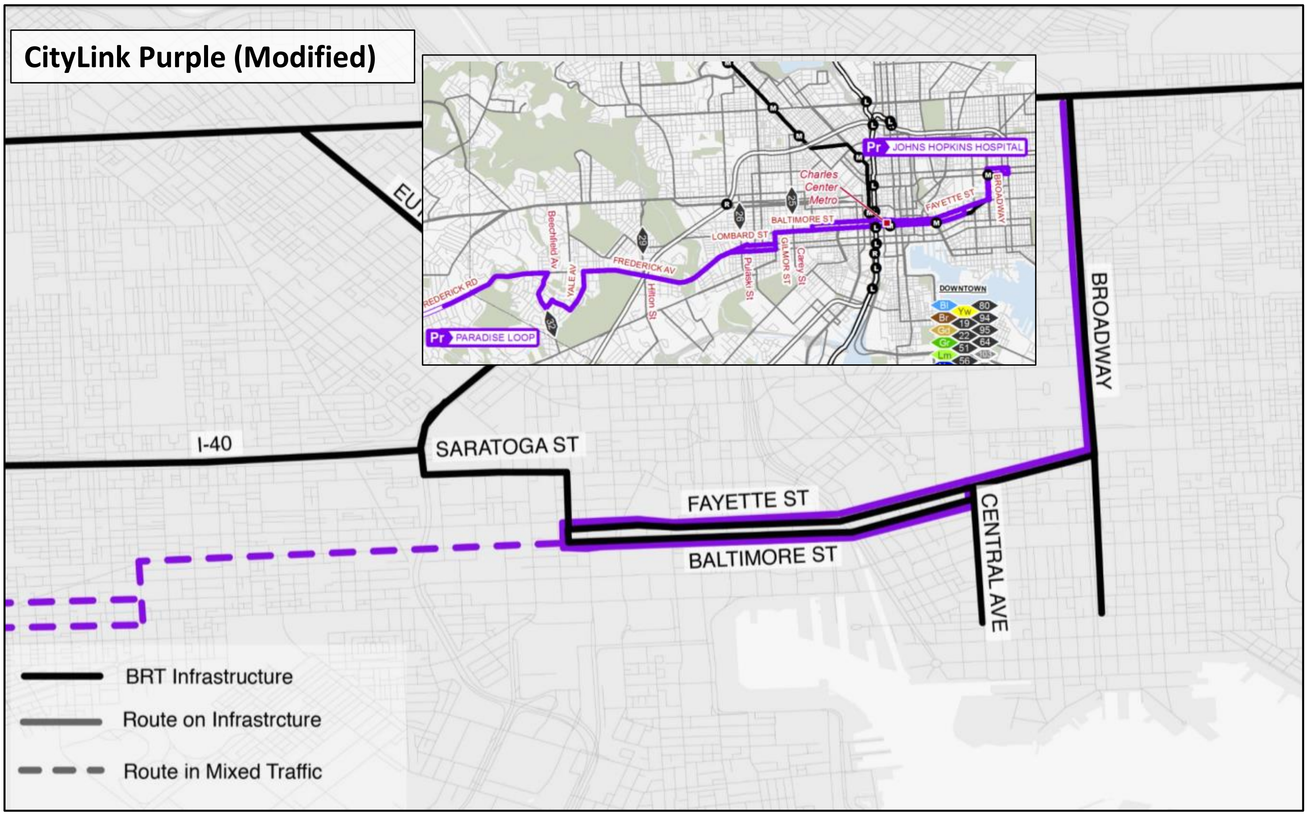


Figure 70: BRT CityLink Purple, former Route 10 in West Baltimore, would use the downtown and Broadway BRT corridors

BRT CityLink Purple replaces the West Baltimore portions of Route 10, creating a shorter route that should have higher reliability. For conversion from CityLink Purple to BRT CityLink Purple, it has been slightly extended to North Avenue.

8.3.7. BRT Route 91 (restored)

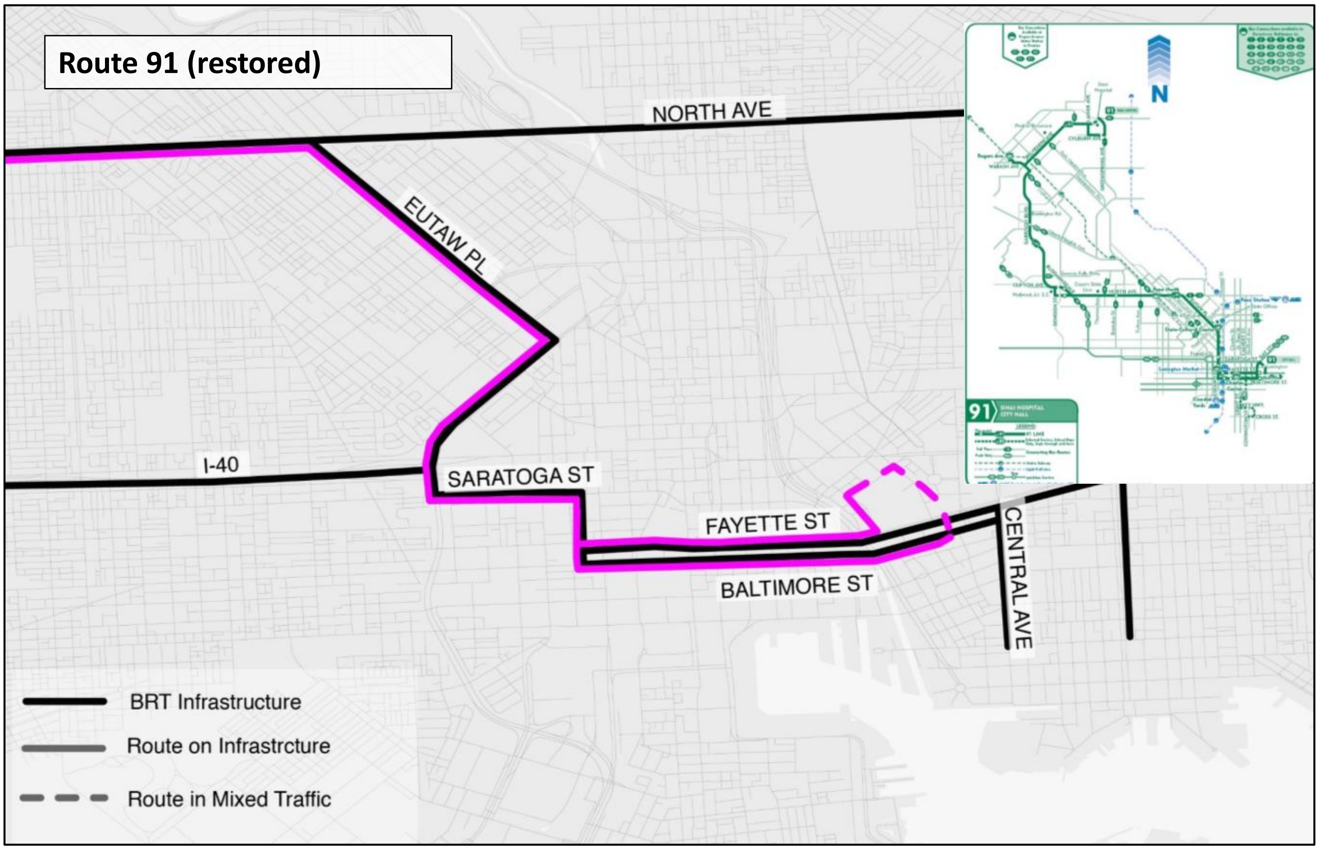


Figure 71: Route 91 is currently abolished by BaltimoreLink. It should be restored and included in the BRT.

BaltimoreLink currently removes Route 91, the 16th most popular route in Baltimore. Route 91 is circuitous (likely the reason for its elimination), but it carries a large volume of passengers that are senior citizens and persons with disabilities from downtown Baltimore to Mt. Sinai hospital without a transfer. Perhaps these passengers could be accommodated by other routes but the proposed route changes were unconvincing, particularly as Route 7, which serves some similar passengers closer to downtown, has also been removed. Some version of Route 91 would provide a useful connection to downtown from northwest Baltimore using the BRT infrastructure.

8.3.8. BRT CityLink Navy

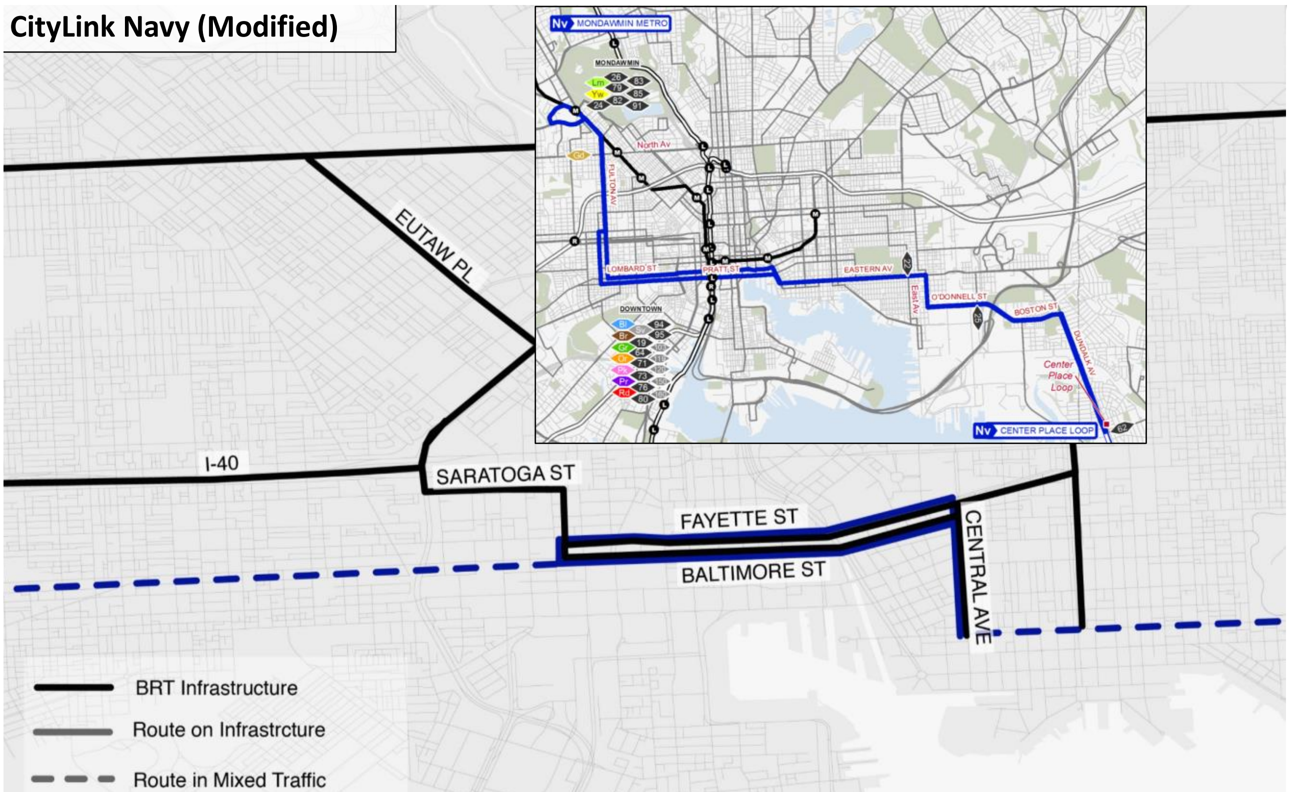


Figure 72: CityLink Navy should be modified to cover the old Route 20 in West Baltimore.

BRT CityLink Navy replaces Route 10 in East Baltimore and use the BRT infrastructure from South Central Ave into downtown Baltimore. It is recommended that instead of turning North on Fulton, it should continue west, following the current Route 20. A new LocalLink route could provide a new north-south connection up Carey Street to Mondawman Mall.

8.3.9. BRT CityLink Red

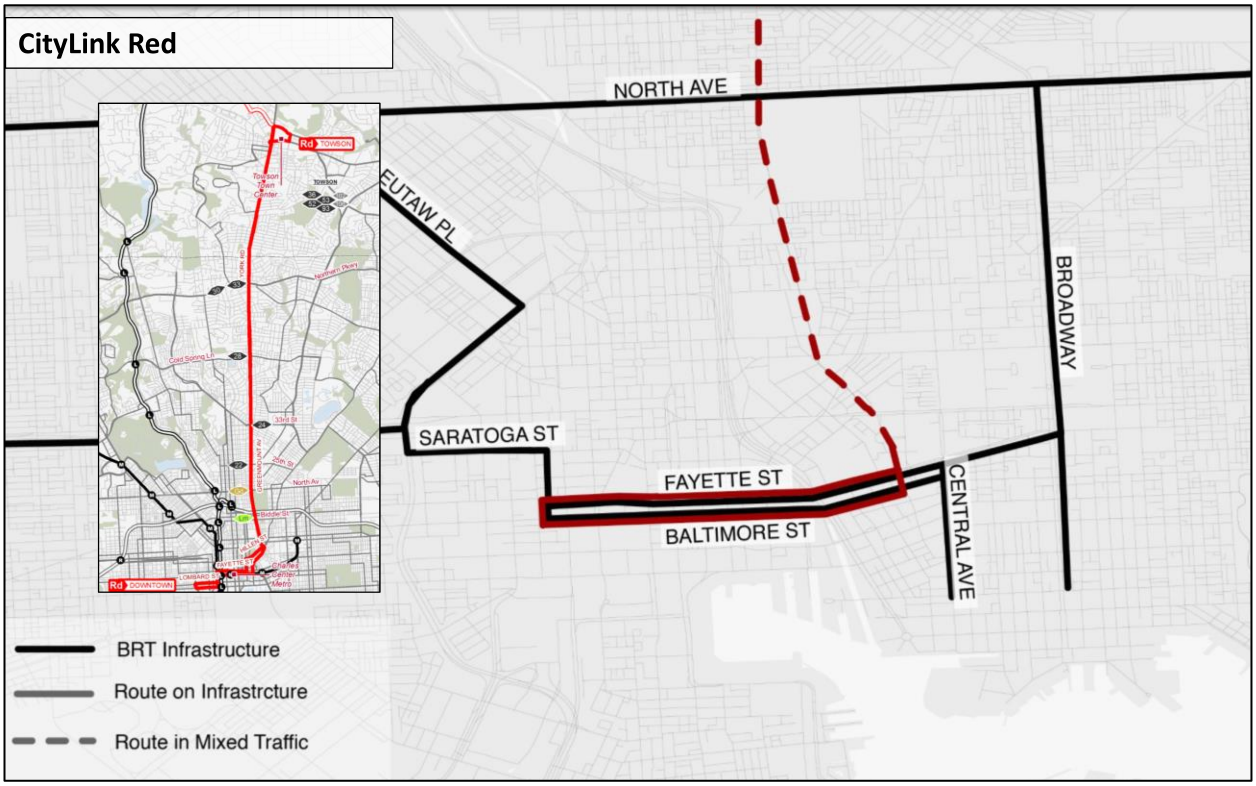


Figure 73: BRT CityLink Red, former Route 8 and QB48, would use the downtown section of the BRT infrastructure

The most important north-south bus services in Baltimore, Route 8 and QB48, both run from downtown up Greenmount Avenue to York Road and Towson. Initially cut in the first iteration of BaltimoreLink, they were restored as CityLink Red. BRT CityLink Red would benefit primarily from the downtown portion of the proposed BRT.

9. Estimated infrastructure costs

This BRT infrastructure proposal would cost about $287 million to build. While an accurate costing requires an engineering analysis, the costs per mile of the BRT systems in the United States are listed in Table 4 below. The wide variability in costing is mainly because of the elevated sections of the Hartford BRT. Otherwise, BRT has cost a reasonably reliable $20 million or so per mile, which usually includes other infrastructure improvements in the corridor.

Bus Rapid Transit Systems, N. America		
Las Vegas Strip & Downtown Express (SDX) BRT	$	6,306,667
Eugene Emerald Express BRT	$	6,310,010
Cleveland HealthLine BRT	$	7,132,268
Pittsburgh South Busway BRT	$	19,049,651
Los Angeles Orange Line BRT	$	25,475,368
Pittsburgh Martin Luther King Jr. East Busway BRT	$	27,667,069
Ottawa Transitway BRT	$	30,721,244
Hartford CTFastrak (Elevated)	$	60,638,298
Average	**$**	**20,366,730.41**

Table 4: Cost per mile of all certified BRT systems in the US

This total network would cover about 14.35 miles. At $20 million per mile, this is roughly $287 million.

SEGMENT	MILES	BRT COST (millions)	
Former Red Line (Cooks Lane to MLK)	3.98	$	79.6
North Ave	4.2	$	84
Downtown links	2.6	$	52
Fayette, N. President St to Broadway	0.68	$	13.6
Broadway, Fells Point to North Ave	1.96	$	39.2
Eutaw Pl, north to MLK	0.93	$	18.6
Total Estimated Cost	14.35	$	287

Table 5: Preliminary BRT infrastructure cost estimate

This BRT infrastructure could be built in phases. If there is more political support for some sections over others, the sections with greater support could be built first, and immediately bring benefits for bus routes using those corridors. Currently, it seems likely that North Avenue has the greatest political consensus to move forward. With BRT, customers do not need to wait until an entire corridor is completed to begin to enjoy the benefits, as the buses can operate part of their route in normal mixed traffic conditions until the next phase has been built.

Baltimore City was set to receive approximately $1.6 billion in state and federal funding for transit from 2016 until 2019, or about $400 million a year. After the cancellation of the Red Line, this fell to $944 million, or about $236 million a year. Hardest hit will be the potential future passengers of the Red Line LRT system. The loss of $659 million over four years represents a devastating blow to the Baltimore economy.

	ORIGINAL	REVISED	CHANGE
Bus System Investments	**$ 277**	**$ 418**	**$ 141**
MTA bus replacement	$ 118	$ 157	$ 39
BaltimoreLink non-vehicle elements, etc*	$ 10	$ 55	$ 44
Kirk bus depot overhaul	$ 148	$ 164	$ 16
New S. Baltimore Main bus facility	$ -	$ 42	$ 42
MARC Investments	**$ 77**	**$ 77**	**$ -**
MARC mainline rolling stock	$ 44	$ 44	$ -
MARC improvements	$ 29	$ 29	$ -
MARC facilities	$ 4	$ 4	$ -
LRT and Metro Investments	**$ 1,249**	**$ 449**	**$ (800)**
Red Line	$ 800	$ -	$ (800)
LRT mid-life overhaul	$ 70	$ 70	$ -
LRT and Metro Preventative Maintenance+	$ 192	$ 192	$ -
Metro rail car and signaling replacement	$ 188	$ 188	$ -
Total	**$ 1,603**	**$ 944**	**$ (659)**

Source: 2016 - 2019 TIP and ammendments

*Includes some nominal rail maintenance

+includes some nominal bus maintenance

Table 6: Currently planned capital investments in the Baltimore Transit Investment Plan (TIP)

The State of Maryland in its own budget has indicated a willingness to spend about $45 million on BRT infrastructure in Baltimore over the same four years and has since secured another $10 million in TIGER funds for North Avenue. Current plans for the use of the $45 million are unclear, but discussions with the MTA indicate that it may be used for a transit center at the West Baltimore MARC station. The importance of this facility is unclear, particularly in light of recommended modifications to CityLink services which would disadvantage many passengers. If this money were diverted to BRT infrastructure, it would be enough to build the downtown section, or the highest demand 2.6-mile segment of North Avenue. The benefits of this investment would be substantially greater than the benefits of a transit center at the West Baltimore MARC station, which has yet to develop as a destination in itself. These would be sufficient funds to initiate the program, while Small Starts funding from the FTA could be sought for another $100 million. This proposal, given its high number of potential beneficiaries (154,000 daily passengers) and comparatively low cost ($287 million) should make a proposal to New Starts or Small Starts from the Federal Transit Administration highly competitive. There is also some $39 million in funds for new buses. The bus funds are enough to buy about 80 new BRT-compatible 40 foot buses with doors on both sides of the bus: a very sizable fleet.

This "People's Alternative to Baltimorelink" represents one part of ATU Local 1300's "People's Plan for Baltimore Transit." More can be found at www.transitbaltimore.com.