**A Proposal to Unravel Baltimore's Tangled Rail Lines**

Joint Open Infrastructure Subcommittee of the
MTA Citizens Advisory Committee;
MTA Citizens Advisory Committee for Accessible Transportation;
MARC Riders Advisory Committee
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In April of 2002 the I-95 Corridor Coalition released its "Mid-Atlantic Rail Operations Study" which identified many choke points and decaying infrastructure throughout New Jersey, Pennsylvania, Delaware, Maryland, and Virginia that prevent expansion of rail capacity that the rest of the system could otherwise accommodate. These include the Howard Street Tunnel, the B&P Tunnels, and the Union Tunnels in Baltimore as well as several bridges in Maryland.

The study divided the projects into near, medium, and long-term time frames.
The near term projects (5 years or done by 2007) included:
Design for reconstruction of the Howard Street Tunnel and approaches
Design for reconstruction of Amtrak's Union Tunnels and the B&P Tunnels.

The Medium Term projects (5 to 10 years or 2007 to 2012) included:
Reconstruct the Howard Street Tunnel and approaches
Reconstruct Amtrak's Union Tunnels and the B&P Tunnels.

The long term projects listed in the I-95 Corridor Coalition study are not part of this report and so are not listed herein.

In November 2005, the U. S. Department of Transportation Federal Railroad Administration issued "Report to Congress: Baltimore's Railroad Network: Challenges and Alternatives" (The FRA 2005 report) that says

> In the end, each of the competing carriers built its own, inferior right-of-way, compromising even the then-prevailing standards for gradient, curvature, and operating efficiency. Despite subsequent improvements, today's network — still reliant on the Baltimore & Potomac (B&P), Union, and Howard Street Tunnels for connectivity — is essentially the same as the geometrically compromised and operationally handicapped system cobbled together during the post-Civil War decades.
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> Although convoluted and antiquated, Baltimore's railroads have strategic importance far beyond the confines of their immediate region. Originating and terminating rail freight traffic in the Baltimore region remains significant, largely due to the Port — which ranks fourth among Atlantic Coast ports, and is the closest Atlantic port to major Midwestern markets — and the region's remaining industrial base. Through freight traffic is important on the CSXT's traffic lanes traversing Baltimore between

> the Northeast on the one hand, and the Midwest and South on the other, despite restrictions due to clearance limitations. Indeed, CSXT owns no alternate north-south route east of the Appalachian Mountains. With respect to intercity passenger service, one-fifth of Amtrak's passenger-trips, one-quarter of its passenger-miles, and one-third of its ticket revenues depend on travel over Baltimore's railways. For all these reasons, the condition, capacity, efficiency, and effectiveness of the Baltimore region's rail network affect the performance of the national transportation grid — as became graphically evident in the massive traffic dislocations caused by the 2001 fire in the Howard Street Tunnel. (Page ES-2)

Both of these reports state that congestion of Baltimore's Rail infrastructure has national significance; therefore, it would seem reasonable that significant Federal assistance should be available for these projects.

A problem with past and current transportation planning methods is that they are project focused. The projects that get done first are the ones with the greatest political muscle, and not necessarily the projects that make the most engineering, operational, fiscal, or financial sense. Generally, construction of new service receives the political support while maintenance is underfunded and the existing systems slowly decay.

As indicated by the FRA report, Baltimore's rail problems are a tangled mess built project by project, each compromising performance to fit the then achievable project constraints. Perhaps the tangle is best demonstrated by the east end of the B&P Tunnels, which has been described as one of the densest transportation points in the region with the CSX tracks passing right above the B&P tunnels, and the Central Light Rail squeezed between the CSX tracks, Howard Street, North Ave, and I-83. Both the freight and Central Light Rail were built with grades that exceeded the recommended maximum. It is necessary to take a full system approach to this problem and "unpack" the conflicts. By doing things in the correct order, the total construction costs will be reduced by several billion dollars and the final system performance significantly enhanced, with reduced operating costs, over what can be achieved using a project by project approach.

The most important projects (the tunnels) have been too large to attempt within a reasonable "project" budget. Therefore, there have been minor efforts to "modernize" the system, such as single tracking the CSX line to accommodate taller trains, which actually reduced capacity, while not addressing the fundamental problems. There have also been minor repairs and maintenance such as to the B&P Tunnels, which prevent them from falling down but don't solve the underlying problems. Meanwhile, the years go by and the structures deteriorate. When they become unusable, there will not be sufficient time to replace them and the service will be disrupted for an extended time. However, a comprehensive examination of the infrastructure needs, with a commitment to implementing it, is three quarters of a century overdue.

The proposal here is primarily one for preservation of current rail capacity (intercity passenger and freight service through Baltimore) designed and phased in such a way

as to set the stage for future expansion. It is our view that the shape of the intercity rail system (track, tunnel, and station locations) should be established before significant investment is made in local service because the available and appropriate local routes and destinations may change depending upon major rail system structure. In many cases, work on intercity lines will disrupt existing local service. Therefore, some local projects are phased ahead of the intercity projects either to clear space for future construction or to provide alternate travel options during disruptions so as to avoid any Title 6 issues.

While we are only recommending an order of construction, and not a construction schedule, the condition of the existing rail tunnels and their critical importance to the local and national economies should impel us to build these as soon as we can finance them.

This report focuses only on heavier radial systems (mainline freight, Maglev, high-speed rail, Amtrak international service, and automated heavy metro.) No lighter system (light metro, aerial tramway, people mover, light rail, street car, trackless trolley or exclusive busway) should be planned or funded until all heavier systems are completed first. This means that all crosstown, cross-county, feeder, supplemental, short lines, and local service lines involving fixed guideway infrastructure should be delayed indefinitely. All lighter systems require space and funds. Implantation of these types of lines will certainly delay and may prevent construction of heaver systems. The serious accidents, congestion and delay during the testing of the H Street street car in Washington DC illustrates the danger of trying to do the job of heavier systems with lighter infrastructure in highly congested areas.

In the 21st century, there will be a renewed interest in rail travel. The proposal described herein sets the stage for the eventual reestablishment of rail service from Baltimore west through Westminster to western Maryland and the Midwest, north to York and central Pennsylvania, New York, and Ontario, and southeast to Annapolis and the Eastern Shore. (These routes are described in more detail at the end of this proposal.)

To untangle the rail transportation mess and set the stage for the intercity lines described above, the following projects should be done in this precise order:

0) Extending MARC service to Wilmington.

1) Automation and extension of the existing Baltimore Metro Subway from Johns Hopkins Hospital (JHH) along the south side of the Amtrak right-of-way (North East Corridor or NEC) to Orangeville, and on to the Travel Plaza with a yard, bus depot, and MARC connection at Orangeville. A junction at I-895, near Bayview yard, will permit a branch to North Point Blvd during Phase 3. Eventual extensions could go as far as Fort Howard to the southeast and Oliver Beach to the east. By using the exiting crosstown subway tunnel, and extending the line east then west, crosstown rail service can be built in three or more phases, each of which is a cost effective, affordable, minimally operable segment.

2) Construction of a freight tunnel from Marley Neck to Sparrows Point. As part of this project, MDOT would acquire title to some CSX tracks no longer needed for national freight movement.

Planning and commitment of funds for these two projects only could be completed in the short term.

3) Addition of a new branch to the current subway from a junction between Lexington Market and State Center west to FredHilton (Frederick Avenue and Hilton Street) and an east side extension to North Point Blvd. Later, the west side extension would go on to Edmondson Village, Westview, and, eventually, Columbia Mall and the Maryland School for the Deaf. The east side extension would travel parallel to NEC to Martin Airport Rail Station and Oliver Beach.

4) Tunnel for high speed, intercity rail under Fayette Street with a station at Charles Center Plaza.

5) In order to clear track space for Item 6, below (automated subway bypassing Howard Street) the Central Light Rail must be split at Camden Station and rerouted along the Camden Line and Curtis Bay rights-of-way between Camden and Westport Stations, and should be converted to MARC service south of Camden Station. Eventually MARC and Amtrak could go to Annapolis and, perhaps eventually, Ocean City.

6) Construction of an automated subway from Westport Station, under Howard, Pratt, Light, and St. Paul Streets through Charles Center, to Penn Station. Future southern extensions would go to UMBC and Lake Shore Plaza (east of Marley Station Mall). Eventual northern extensions would go through Towson and Hunt Valley to Sparks and through White Marsh to Martin Airport MARC Station.

7) Once there is an alternative intercity passenger route through Baltimore, rebuild the B&P and Union Tunnels for MARC access to Penn Station with several new stations along the line.

8) Once freight traffic no longer runs through it, the southern end of the Howard Street Tunnel can be rebuilt with a lower tunnel for Maglev (station at Baltimore Street) and an upper tunnel for Amtrak and MARC Camden line service to a Market Center Station. Eventual Amtrak extensions could go west to Cumberland, Pittsburgh, Chicago, Detroit, or St. Louis. Both Amtrak and future Maglev service could go north to Harrisburg, and points north to Ontario. An eventual MARC extension would branch to go to Penn Station or north to York or Hanover and Gettysburg, or west to Westminster, Hagerstown, and Cumberland. MARC and Amtrak train sections from the west would use the Western Maryland, Greenspring Valley branch right of way with MARC stations serving Stevenson University and Greenspring Station.

Note: it is necessary to increase the Howard Street east side setback for the new "super block" to 25 plus feet from the tunnel to permit expansion and reconstruction of the tunnel. The foundations of the Read's Drug Store at Lexington and Howard would need to be stabilized as part of tunnel construction.

Items 3 through 8 should be added to the Consolidated Transportation Plan (CTP) during Governor Hogan's term in office.

## Explanation of construction order:

Item 1, conversion of the existing subway to an automated line with an east side extension of the Metro from JHH to the Travel Plaza with a proposed Metro rail yard on the Armco Specialty Steel brownfield site at Orangeville must be done in phase 1 as later work will cut the Subway line (between Lexington and State Center stations) for a west side branch. The Orangeville yard will permit service east from Lexington Market during the later west side branch construction, and the length (more than 6 miles) of the line will justify continued eastside operation. This line, with the west side extension, will provide a rail bridge around Penn Station for MARC passengers to/from Harford and Cecil Counties while the B&P and Union Tunnels are rebuilt during phase 7.

This alignment would be far less costly and provide much better service than the proposed Red Line east side. The direct connection from I-95 and I-895 to the Travel Plaza with its ample free parking and short rail travel time (about 10 to 12 minutes) to downtown will attract a significant amount of traffic from I-95 and I-895. Unlike the Red Line, there will be no temptation for commuters to park on the streets of Canton to avoid downtown parking fees. This subway extension will reduce congestion in the Fort McHenry Tunnel because some fraction of the cars from the north that use the tunnel to access downtown by way of I-395 will switch to the automated metro. Eastside subway service will permit restructuring of the east side bus lines. This will increase bus reliability, reduce bus operating costs, increase the number of buses available for use on over crowded bus lines, and reduce rider travel times. By being farther from the harbor, and higher than Boston Street, this alignment will be immune to the coastal surge flooding that made a Red Line Boston Street portal risky with sea levels rising. This line would likely increase MARC ridership from northeast of Baltimore by providing a quick connection at Orangeville to JHH and the development around it, downtown, and University Center (from Lexington Market Station).

An automated line may be economically operated on much shorter headways than if motormen needs to be paid. For example, 2 car trains every 2 minutes yield the same hourly line capacity as 6 car trains every 6 minutes but with one third the waiting time. Shorter waiting times attract more riders, improve connections with feeder bus lines, increase the transit impact and lower the operating cost per passenger mile.

This project requires only one new underground station and about 1.15 miles of new tunnel. It costs less than half of what the Red Line would cost. The east side portal would be north of Madison and Curley Streets and any current structures.

Item 2, a two track freight tunnel, is necessary to remove freight traffic from the Howard and B&P and Union Tunnels before any other work can be done on them. (Before this tunnel is done, any work on or near the Howard Street tunnel risks a complete shut down of East Coast freight traffic, with huge port access, national freight movement, and liability issues for the state.) Unlike the current freight alignment and the other alignments proposed in the FRA report, the alignment proposed here keeps hazardous material (Hazmat) freight out of downtown and densely residential West Baltimore and provides the most direct east coast route. Without this improved rail access, especially given the cancelation of the Morrell Park intermodal transfer terminal, the Port of Baltimore will continue to suffer and lose business to other east coast ports, because of the slow continuing loss of competitive rail access and increased transportation costs required to serve the Port of Baltimore. A Norfolk Southern vice president has already said that the railroad would be willing to negotiate a per car toll to use this tunnel, which would permit the construction to be funded by bonds. Toll rates charged to CSX could depend on how quickly it signs onto the deal. The state owned Patapsco and Back River Railroad could guarantee both CSX and Norfolk Southern access to Bayview yard and Sparrows Point. The tunnel should be owned by MDOT. As part of the deal, MDOT would obtain title to the Howard Street Tunnel and the belt line from Russell Street to Bayview yard, the CSX Sparrows Point branch, the Hanover Sub, the Old Western Maryland and Maryland and Midland rights of ways including the Bear Creek trestle. Some of these rights of way will eventually be used for the Baltimore Metro Subway, and others for MARC and/or intercity passenger service.

Item 3 is construction of a branch from the current subway tunnel west to a portal at Fremont Avenue in the median of the Route 40 expressway then continuing above ground to the intersection of Frederick Avenue and Hilton Street (FredHilton) by way of the West Baltimore MARC Station. This would provide a location with sufficient auto catchment (Frederick, Wilkens and I-95 access) to make the line cost effective. The line would eventually be extended northwest under Loudon Park cemetery to Edmondson Village, Westview and on to Normandy, Columbia Mall, and the Maryland School for the Deaf. (See Item 4 for notes about the portal for this.)

During construction, subway service can be provided from Owings Mills to State Center and from Lexington Market to the Travel Plaza. The Central Light Rail, augmented by bus service, will provide bridge service between the two stations. As part of this project, the Metro Subway on the east side is branched to a station at North Point Boulevard on the Northeast Corridor to provide a layover spot for east/west trains. Subway service between Orangeville and West Baltimore Stations is required to provide a MARC rail service bridge during reconstruction of the B&P and Union tunnels in phase 7.

There is infrastructure built into the Lexington Market Station which would permit a west side rail transit line to terminate underground there, which some have recently suggested for a west side light rail instead of the Red Line. That proposal is inferior to branching the current line as proposed here for several reasons. Trains operating north of Lexington Market Station must be run at a higher frequency so as to be well below

capacity in order to accommodate passengers transferring at Lexington Market for travel to other downtown stations with higher ridership. The excessive frequency drives up operating costs. The east side is proposed to branch and if the west side doesn't branch, its service frequency would be twice that of the east side (half the headways). While some trains could be short turned at Rogers Station, 5.5 miles beyond Lexington Market Station, there would still be significant overcapacity and increased operating expense. Branching the west side balances the load on each end of the line, and provides operating flexibility.

Without a through connection between Orangeville and West Baltimore MARC Stations, there is no MARC rail bridge during reconstruction of the B&P and Union tunnels during phase 7 below.

A Light Rail in West Baltimore will reduce street capacity, which will increase congestion and reduce air quality. It will have insufficient rider capacity because the trains must be short to fit on city blocks and will have limited operating speeds, which would increase operating costs and reduce rider attractiveness. A West Baltimore Light Rail will almost certainly have safety issues involving frequent collisions with crossing vehicle traffic. (A quick search on Washington H Street Trolley accidents indicates that it hit several cars during its test phase. The Central Light Rail is involved in a vehicle collision about every ten days.) In addition to the liability, injury, and property loss these cause, the resulting delays reduce operational reliability and reduce rider attractiveness. The relatively low speed of the Red Line (18.8 MPH average speed) compared to the Metro Subway (30.2 MPH average) greatly narrows the angular width of the effective service sector because it limits the number of transfers that can provide rider benefit vs. a through bus trip. For these reasons, a west Baltimore Light Rail would provide inferior service compared to the west side branch proposed here.

By using the existing tunnel, this east/west alignment can be financed over multiple funding and construction cycles for an initial cost significantly less than the formerly proposed Red Line while providing better service to more people along a similar corridor.
This west side project requires about 0.75 miles of new tunnel.

Items 1 and 3 should be proposed as two phases of a minimum operable segment for a project that eventually could provide service from Oliver Beach to the Maryland School for the Deaf and from Fort Howard to Glyndon. Together, they initially require less than 2 miles of new tunnel to provide significantly superior service and service growth to most of the corridor of the proposed Red Line. By using the existing downtown subway tunnel we can avoid the need to construct a new tunnel parallel to an existing one. Total costs would be much less than the Red Line for the same amount of track. This single transit project can be divided into two segments each meeting Federal funding cost effectiveness requirements and can be spread over two Federal funding cycles, which should make project financing much easier.

Item 4 is construction of a two track tunnel under downtown for high speed Amtrak rail travel across the city under Fayette Street with a station east of Howard Street at Charles Center Plaza. In order to build this alignment, the line would need to be deep bored under the Howard Street and future Maglev tunnels; making it the "bottom layer" there. Unlike other proposed high speed alignments, placement of the station at Charles Center Plaza provides rail system connectivity to all subway lines at Charles Center, the MARC Camden Line at Howard and Baltimore, the Maglev, and future Amtrak service towards the Midwest and Canada. This high speed alignment eliminates the need for the great circle tunnel into Penn Station because the B&P tunnels would be rebuilt for MARC service in the phase 6. The high speed tunnel is for Amtrak only. No freight or MARC trains would use it. At Charles Center Station, eastbound and westbound trains would be on different levels, one above the other. Each track would be split into 3 station tracks. The south-side platform would service slower trains and all trains with baggage cars. High speed trains stopping in Baltimore would be served by the north-side platform. The north-side and south-side tracks would be separated by walls from the center track, which would carry only high speed through trains, bypassing Baltimore. All platforms would be side platforms. There will be no island platform at either Charles Center Station or Market Center Station. Norfolk Southern trains will be restricted to the Northern Central Line, the Hanover Sub, the Freight Tunnel, the Curtis Bay Branch, and lines owned by MDOT. No freight will be permitted in the B&P, Howard Street, or Amtrak-owned high speed tunnels. This means no freight trains will pass through underground stations. Non-hazmat freight will still be permitted to pass through Penn Station and the Union Tunnels.

The west end high speed tunnel should start from the center two tracks on the Northeast Corridor near Stafford Street, and it must go deep enough to pass under the Gwynns Falls. The high speed south portal is located very close to the east portal for the subway extension west from FredHilton Station under Loudon Park Cemetery to the next station at Irvington. These two portals are so close together that they need to be planned, and likely built, as a single engineering project. Boring of the subway tunnel westward toward Westview and extension of the automated metro line from Oliver Beach to Columbia would occur in a later phase. The east side tunnel portal is in Bayview Yard and directs Amtrak service onto the northern pair of tracks (tracks 2 and 3) so that MARC can operate on the southern pair (tracks A and 1).

After this project, MDOT would obtain title to the current Penn Line between the two portals of the high speed tunnel, including the B&P and Union Tunnels, Penn Station, and all current and future MARC stations between the portals. In addition, MDOT would obtain title, northeast of Bayview Yard at least as far as Oliver Beach, to the east (south) pair of tracks (tracks A and 1) for MARC service with space for parallel Metro service beside or above those tracks. Amtrak would own the high speed line, Charles Center Station, and tracks 2 and 3 east of Bayview.

Item 5, is reconfiguration of the Central Light Rail south of Camden Station to make room for an automated subway line in phase 6. Light Rail service would terminate at

Camden Station, with MARC operated commuter service consisting of electric multiple unit (EMU) trains operating from Camden Station along the Curtis Bay Freight lines to Westport, Cherry Hill, and points south. Crossover tracks would allow the trains to switch over to the existing central light rail track serving Cherry Hill and points south to Cromwell Station. The trains would use battery packs, as is currently being tested by British Rail (see links below or search on "Prototype-battery-powered-train-carries-passengers") for operation on the Curtis Bay Branch, where overhead wires would interfere with double-stacked freight operations. (Search for "Battery powered passenger trains or see the following web sites.)

http://networkrailmediacentre.co.uk/News-Releases/Batteries-included-Prototype-battery-powered-train-carries-passengers-for-first-time-2230.aspx
http://www.greenoptimistic.com/battery-powered-trains-uk/
http://www.reuters.com/video/2015/02/02/space-age-swedish-shower-cuts-water-cons?videoId=363072111&videoChannel=74&channelName=Environment
http://www.railway-technology.com/news/newsuks-first-battery-powered-train-enters-revenue-service-4489154

Item 6, construction of an automated subway line from Westport to Penn Station, is required to provide a rail bridge for the Central Light Rail between Camden and Penn Stations while the Howard Street Tunnel is rebuilt as item 8. Operating on the current light rail tracks north from Westport, the line enters a portal near Hamburg Street south of Camden Station imbedded in a raised berm and elevated to protect the tunnel from storm surge flooding. This requires a new Ostend Street Station to replace the one at Hamburg Street. The subway tunnel would run under Howard, Pratt, Light, and St. Paul Streets, through Charles Center and north under St. Paul. The north end of the tunnel is at Chase Street and Fallsway (east of the Jones Falls). The subway will elevate over the Penn Line to the north side of Penn Station. From Penn Station, the line would continue west with a service track crossing the Jones Falls to use the current Light Rail yard, and an eventual route north under Maryland Avenue. The Guilford Avenue Bridge would need to be replaced by a pedestrian passerelle with elevators at each end. Once construction is finished, traffic impacts should be minimal.

Item 7: Once all traffic has been removed from the B&P and Union Tunnels, they can be rebuilt for MARC Penn Line access to Penn Station. All current Amtrak trains would permanently switch over to the high speed tunnel. The project would move the current West Baltimore MARC station south to between Mulberry Street and Calverton Road (because the track is sufficiently straight to allow loading full length trains) and aligns well with the subway station. In addition to Penn Station, new MARC stations would be at Relay, Pineheights (Wilkens Avenue), Sandtown/Winchester between Monroe and Gilmor Streets (the west end of the B&P Tunnels), at Pennsylvania Avenue (over and connecting with the subway underground at Upton Station), Orangeville (with a subway transfer and possible MARC maintenance facility), Chesaco Park, Perryman, Havre De Grace, Charlestown, Northeast, and Elkton.

Note that there is no station at Bayview or Washington Street. Bayview is too remote from roadways, has no ramp access for wheelchairs in the event of a power outage, has no access for emergency vehicles, and the catenary wires prevent any helicopter evacuations. The proposed Washington Street MARC Station on the North East Corridor S turn is too curvy and too close to Penn Station (less than 1.5 miles), Orangeville (less than 1.3 miles), and the Bond Street portal. The area will be served by the Patterson Park Metro Subway Station.

Item 8: Once all of the train traffic has been removed from the Howard Street Tunnel and there is an automated Metro rail bridge in place for the Central Light Rail between Penn and Camden Stations, the Howard Street Tunnel can be rebuilt for MARC and Amtrak service between Washington DC, the new Market Center Station, York, Cumberland, the midwest, and, eventually, a branch to Penn Station. A deep tunnel for Maglev service, between Washington DC, and the Jones Falls Valley, would be concurrently built below a tunnel for conventional MARC and future Amtrak service on the Camden Line, with a station (temporarily a terminal station) at the site of the Royal Farms Arena at Howard and Baltimore Streets. [There is currently a proposal to build a new arena at Conway and Charles Streets.] The MARC/Amtrak station, running north from Fayette Street would connect underground to a local and regional bus station built at the current arena site above the Maglev station, as well as to the high speed station at Charles Center Plaza and to all subway lines at Charles Center and Lexington Market Stations.

Because Maglev stations must be off line, there must be four guideways on two levels. Levels under Howard Street are from bottom to top:

1) Crossing Amtrak NEC with high speed (one direction),
2) Crossing Amtrak NEC high speed (opposite direction),
3) Maglev bypass tracks,
4) Maglev station platform level,
5) Crossing Metro level and pedestrian crossing,
6) Amtrak and MARC Market Station platform level and Charles Center Station ticket and service level,
7) Street level station entrances, and other station ticking and service levels (Market Center Station ticket service level is at Fayette and Howard Streets),
8) Central Maryland bus station, ticketing, and service level,
9) Bus station boarding level, and
10) Bus storage level.

Later, the Maglev and MARC service in the Howard Street Tunnel can be extended northward up the Jones Falls Valley to Pennsylvania. When I-83 needs to be rebuilt or replaced, MARC tracks can be constructed to permit access from the Howard Street Tunnel into Penn Station.

In the end, there will be a freight tunnel under the harbor south of Baltimore. There is a rebuilt Howard Street tunnel that will eventually be able to connect Penn

Station to the Camden Line. The rebuilt B&P and Union Tunnels provide MARC service into/from Penn Station. Trains from Penn Station will be able to serve all MARC stations. There is a downtown integrated Maryland Transportation Center with underground connections between a high speed intercity station at Charles Center, a MARC and Amtrak station at Market Center, Metro Stations at Lexington Market and Charles Center containing all four automated metro routes, and a Maglev Station at the current Royal Farms Arena site with an MTA and intercity bus station above it.

Initially, there are three Metro Subway lines: the current Red Line operating from Owings Mills to the Travel Plaza, the Green Line, sharing the tunnel with the Red Line, and operating from FredHilton to North Point Blvd, and the Blue Line operating from Penn Station to Westport. There is an in-system vertical transfer between the two sets of lines at Charles Center.

By proper timing of the trains, there are two "virtual" subway lines. One line is between Owings Mills and FredHilton. The second line is between Northpoint Blvd and the Travel Plaza. This is achieved by scheduling the trains on the Red and Green lines traveling in opposite directions to arrive at Lexington Market and Orangeville Stations at the same time for cross platform, no wait transfers. In the same way, two more virtual lines would eventually be created by the Orange and Blue lines with cross platform transfers at Camden and 25th Street Stations. By constructing three new lines worth of track, Baltimore ends up with 8 functional service routes. The four virtual lines are constructed and operated for free.

Eventually each line can be extended as described below. Each endpoint, except for UMBC, is about 15 miles, as the crow flies, from Penn Station, creating a balanced system. Each Metro Subway line has a connection outside downtown to a parallel MARC passenger line. All extensions but two can be built with no additional tunneling. Construction of each Metro Subway line should be done before restoration of intercity and commuter passenger rail in each of the rail corridors to prevent service losses and reduce disruptions during the construction of the heavier rail systems.

The Blue and Orange Lines can be extended north under Maryland Avenue to a junction north of 25th Street where the Orange Line branches to a portal on the belt line near Guilford Avenue. It follows the belt line to Clifton Park and then goes northeast to Martin Airport Rail Station. The Blue Line continues north to a portal north of University Parkway near Linkwood Road, and on to Towson and, eventually, Sparks. Proper timing of train arrivals at the 25th Street Station creates a virtual line between Northeast Baltimore and North central Baltimore. At the south end, the Blue and Orange lines share a portal at the berm south of Hamburg Street and then split with the Blue Line going to Lake Shore Plaza and the Orange line going to UMBC.

The Red and Green lines can eventually be extended. The Red Line could be extended northwest from Owings Mills to Glyndon with a transfer to four MARC and two Amtrak lines. It could be extended southeast to Sparrows Point and Fort Howard. The Green Line can be extended west through a tunnel from Stafford and Hilton Streets to just

north and west of the Baltimore National Pike and Briarclift Road, then continuing on to Columbia Mall and the Maryland School for the Deaf. A Camden line spur from Savage Station would connect to the Green Line at Columbia Gateway. The Green Line could be extended east to Martins Airport Rail Station and on to Oliver Beach with a connection to MARC at Martins Airport at a later time.

This proposal eliminates the need for the Red Line Light Rail downtown tunnel and the Great Circle Tunnel into Penn Station. Cost savings to the state would be in the billions of dollars. The extended map should be incorporated into the long-term state rail plan, but be constructed beyond the CPT's time frame. By mapping it now, we ensure economical, integrated future expansion rather than haphazard, costly, inefficient, and ineffective, project focused expansion.

### Future Intercity (Amtrak) passenger routes.

This is a list of future possible Amtrak passenger routes through Maryland. The order is roughly in the temporal order of implementation. Intrastate service would be provided by MARC.

A) North from Baltimore along the Northern Central Railroad right of way to Timonium, New Freedom, York, and Harrisburg. Long distance trains could travel to Williamsport, Buffalo, and Toronto, or to Williamsport, Elmira and Rochester, or to Wylkes-Barre, Scranton, Syracuse, and Ottawa. This route would permit direct passenger service from Toronto to Miami. MARC commuter service along this route from York to Baltimore would likely reduce traffic on I-83 as 21% percent of the labor force of York and Adams Counties commutes to work in the Washington-Baltimore CSA (BMC data). Pennsylvania has long expressed interest in restoring this service.

B) Future MARC service branching off the Penn Line west of Sandtown/Winchester Station at Fulton Junction would run along the Western Maryland right of way serving Coppin State University, Northern Parkway, Owings Mills, Glyndon, Hampstead, Manchester, Hanover, and Gettysburg. Implementation of this MARC service north of Glydon would be concurrent with the state of Pennsylvania rebuilding a railroad trestle across the Susquehanna River at Columbia to establish Amtrak service from Washington through Baltimore, York, Lancaster, Reading, Allentown, Morristown, to Newark, and either Hoboken or Pennsylvania Station New York. This route will expand Amtrak service to new cities and provide an alternative route to the crowded NEC for trains coming from south of Washington. MARC service south of Glydon can be initiated after the Western Maryland Greenspring Valley branch opens to Owings Mills.

Amtrak service would operate to the west along the Western Maryland right of way to Westminster, Hagerstown and Cumberland extending west to Pittsburgh, Cleveland, Detroit and Chicago; or Columbus, Indianapolis, St. Louis, and on to Denver and points west. MARC service would connect Cumberland, Hagerstown, Thurmont, Westminster, Glyndon (with a connection to the Baltimore Subway), Owings Mills, Stevenson, Northern Parkway (in the Jones Falls valley), and intermediate stations to Market Center

Station and on to Annapolis.

A new track through Parr's Ridge from Finksburg to New Windsor, bypassing Westminster, under Catoctin Mountain (avoiding Camp David) and South Mountain between Thurmont and Smithburg could carry mainline freight between Chicago and the Port of Baltimore. Baltimore does not get much freight from the Midwest anymore because steep grades and sharp curves make the routing unsuitable. This bypass track would change that. Our port is closer to Chicago than any other Atlantic port, and it is the most efficient port in the nation. By eliminating these grades and curves, we could expect a large increase in port traffic. This, in turn, could attract new factories in our region, as manufacturing has been increasing again in the United States. MARC and Amtrak would serve Westminster along the existing Maryland and Midland track, and would not use the Parr's Ridge cut.

If and when a bridge is built across the Chesapeake Bay at Hart-Miller Island, it should be provided with space for a rail component that would service Chestertown and Dover.

C) When I-83 needs to be rebuilt or replaced, it will be possible to connect Penn Station to the Howard Street Tunnel. This would permit MARC trains to run from Penn Station through the Howard Street tunnel to the Old Main Line and west with service to Lansdowne, Ellicott City, Sykesville, Mt Airy, Monocacy, Frederick, and intermediate points. Intercity passenger traffic could go farther west to Cumberland; Cincinnati; St. Louis; Springfield, Missouri; and westward to Tulsa, Oklahoma City; and El Paso.

D) Intercity passenger service can be extended from the Northeast Corridor at Perryville northward along the Susquehanna River (Port Road) to Columbia, Pennsylvania, and with a rebuilt junction, on to Lancaster, Reading, and Allentown.

E) When the Bay Bridges are rebuilt/replaced, space for a rail line on them must be included that would permit future train service from Baltimore to Kent Island, and points on the lower Eastern Shore such as Easton, Cambridge, Salisbury, and Ocean City. The railroad right of way still exists here. A future MARC line connecting Annapolis and Bowie Junction on the Penn Line would allow for Amtrak and MARC service between Annapolis and Washington D.C., with far fewer construction miles and than would be required to build a bus rapid transit route.

F) Washington to Brunswick along a line through Keedysville to Hagerstown, then along the Western Maryland to Cumberland and west, including St. Louis, Springfield Missouri, and on to Tulsa, Oklahoma City, and El Paso. MARC service from Washington to Waynesboro and Chambersburg could be accommodated if it were built by Pennsylvania north of the Mason-Dixon Line.

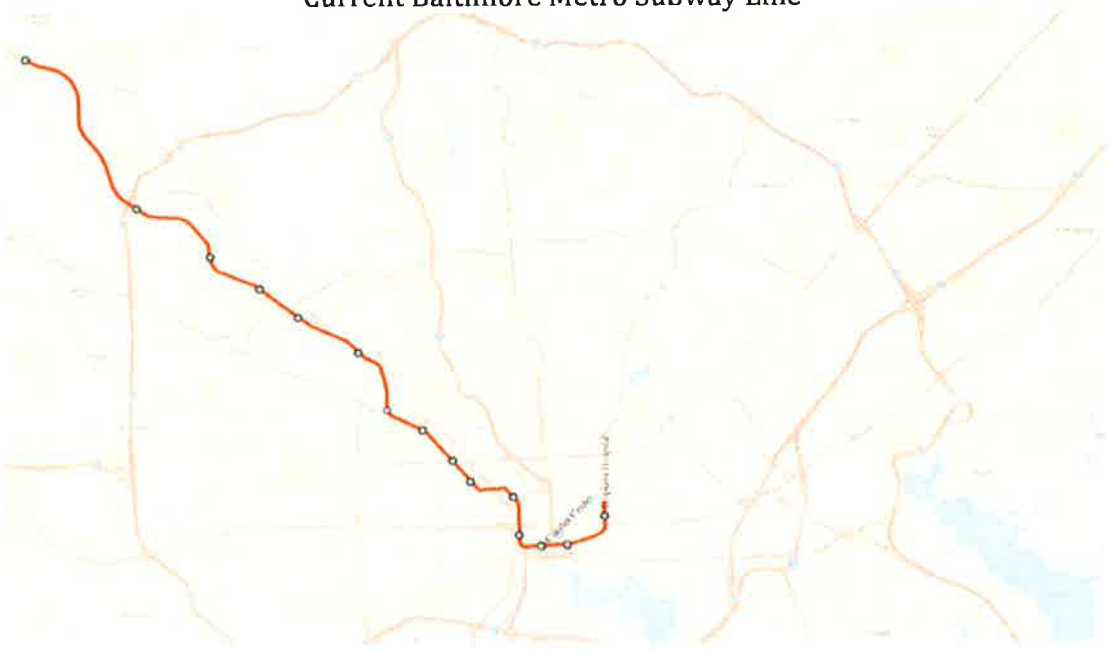
## Maps

The following pages show maps of the proposal in steps as it grown.

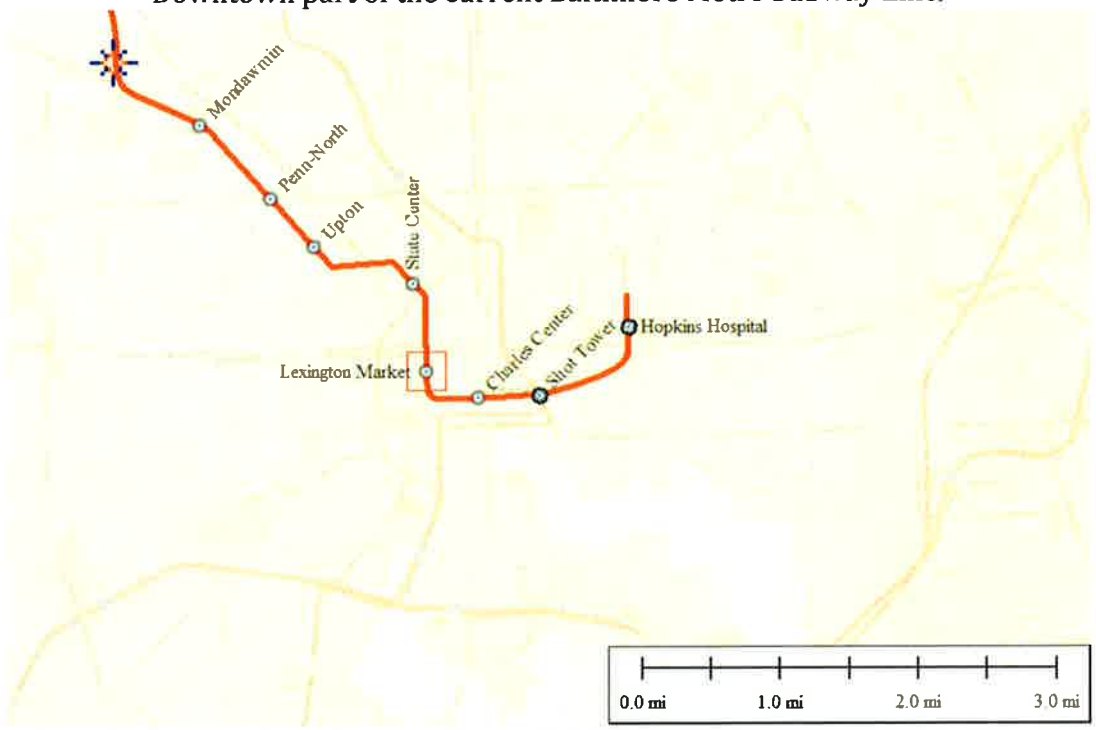


Note that all maps on pages 15 to 17 and 19 have the same scale.

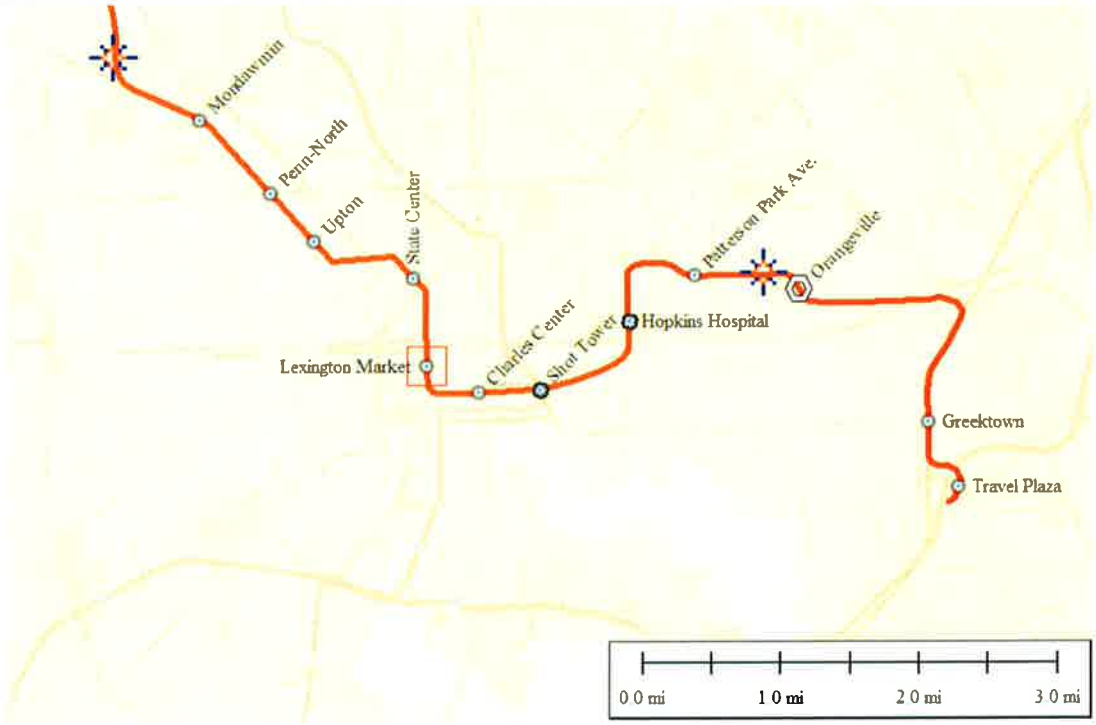
Current Baltimore Metro Subway Line



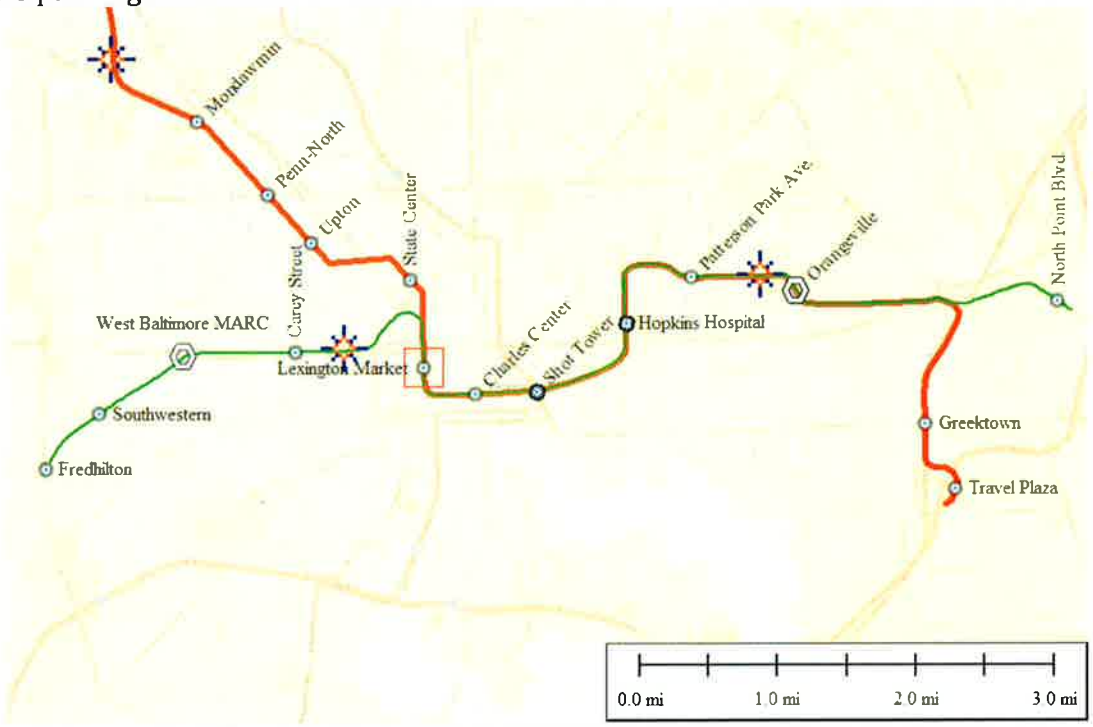
Downtown part of the current Baltimore Metro Subway Line.



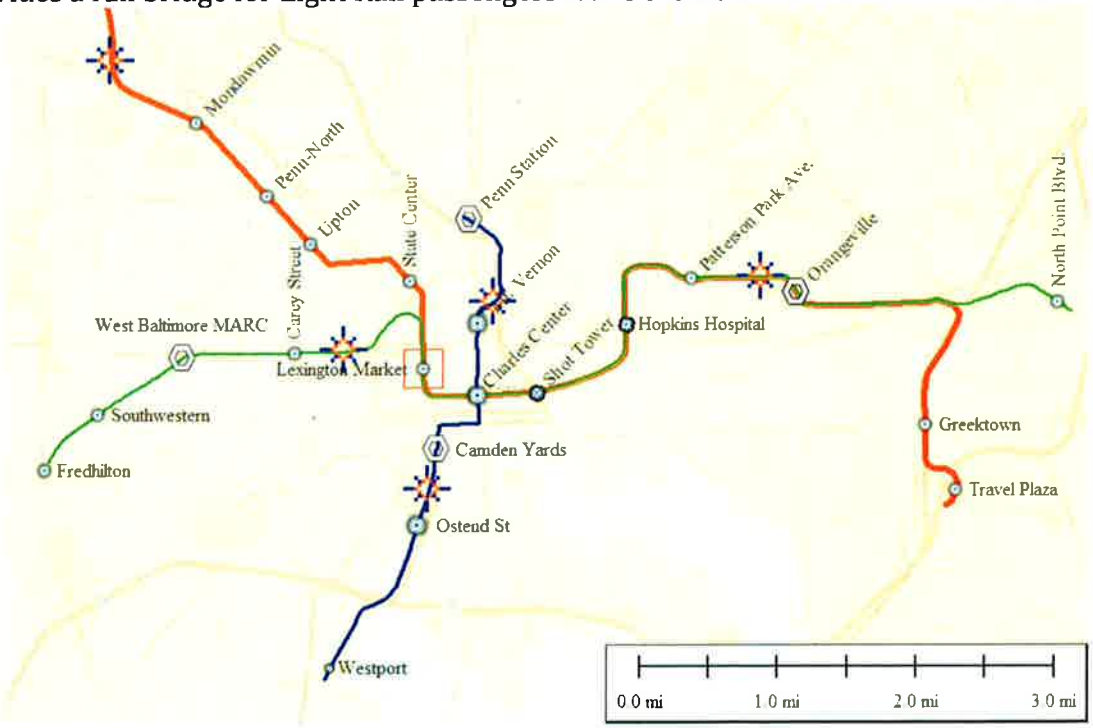

Phase 1, eastside extension of current line to the Travel Plaza. The hexagon at Orangeville denotes a subway/MARC connection. Orangeville would also be the location of a subway rail yard. The tunnel portals are indicated by the star bursts between Orangeville and Patterson Park Stations and north of the Mondawmin station.



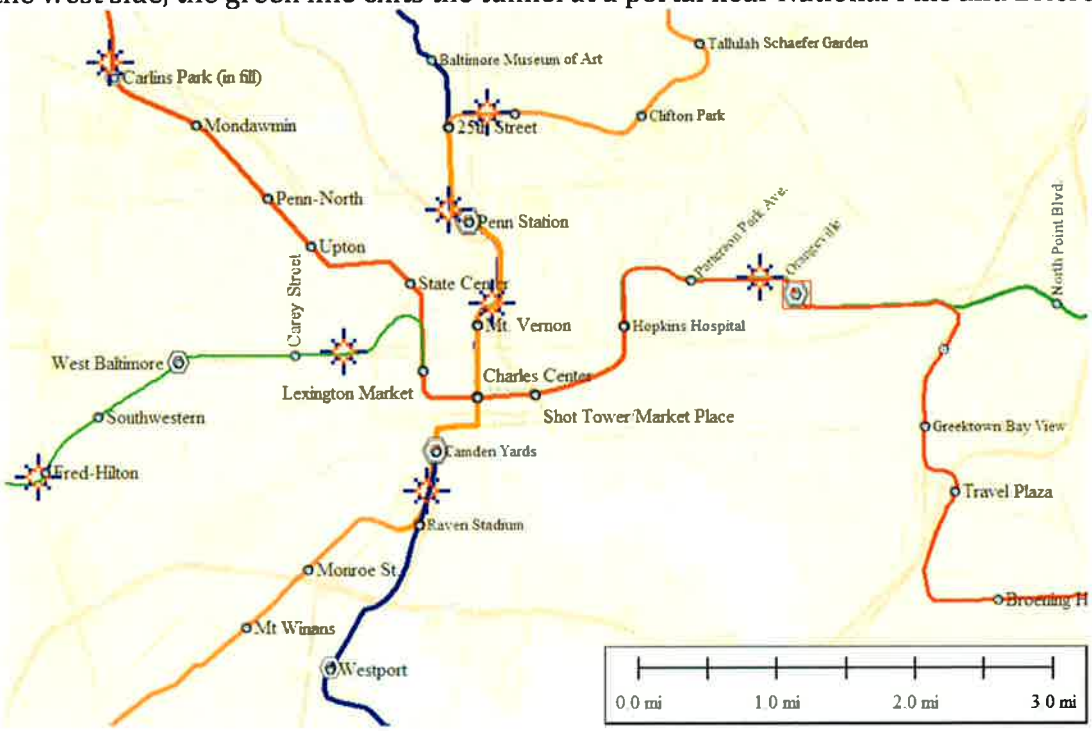
Metro Subway after Phase 3 with Green Line between North Point Blvd and FredHilton. Cross platform transfers at Lexington Market and a MARC connection at West Baltimore link Owings Mills and northwest Baltimore to Washington DC. The western portal, indicated by the star, is at Fremont Avenue. The Green Line will provide a rail bridge for MARC passengers around Penn Station while the B&P and Union Tunnels are rebuilt.



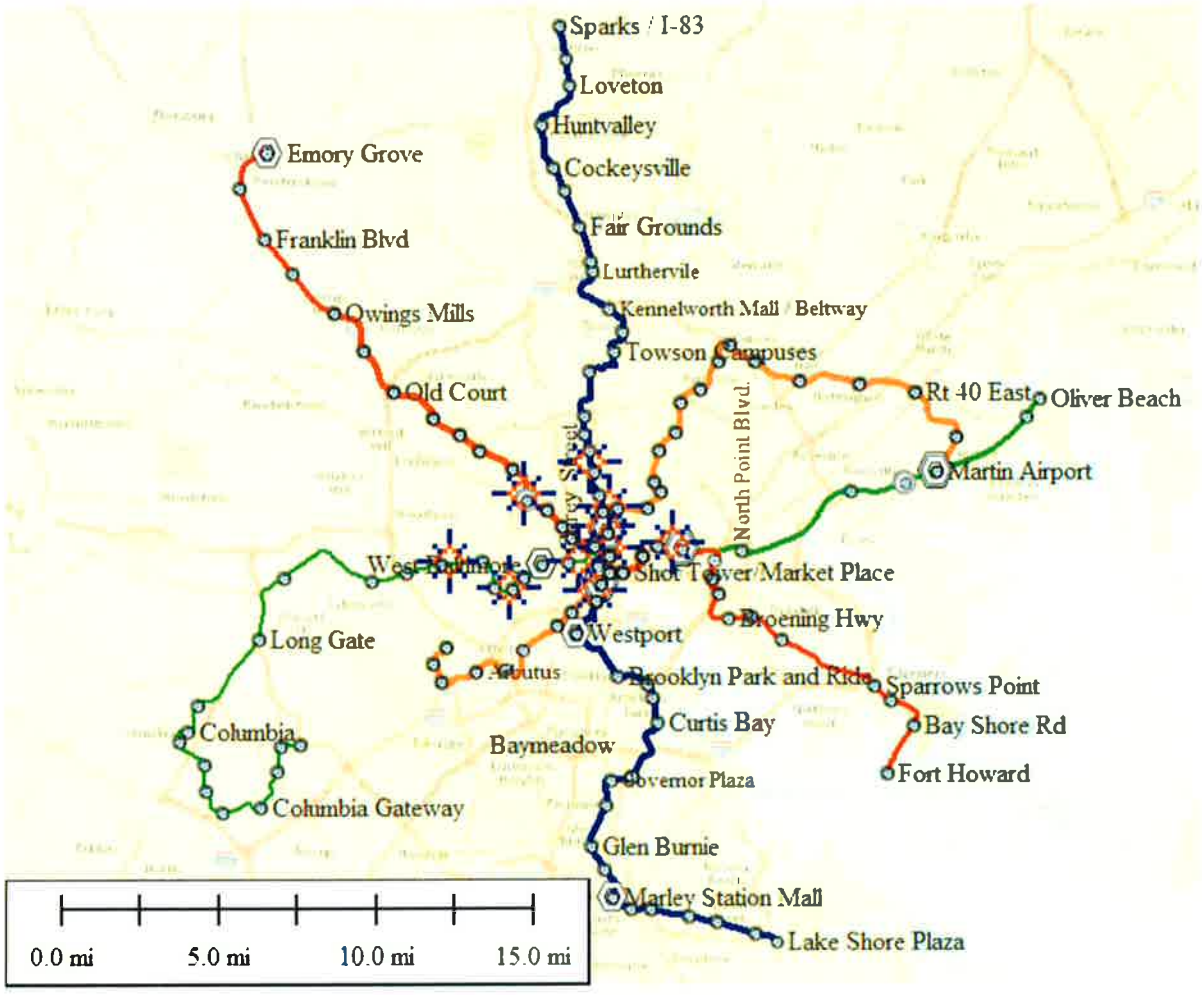

Metro Subway after Phase 6, construction of the Blue Line between Penn Station and Westport. with Metro /MARC connections at Camden and Penn Stations. The Blue Line provides a rail bridge for Light Rail passengers while the Howard St Tunnel is rebuilt.



Downtown view of the finished Metro Subway system. From Penn Station, the line enters a tunnel under Maryland Ave. The orange line branches and exits at a portal in the beltline. The blue line continues north to a portal north of University Parkway.
On the west side, the green line exits the tunnel at a portal near National Pike and Brierclift.



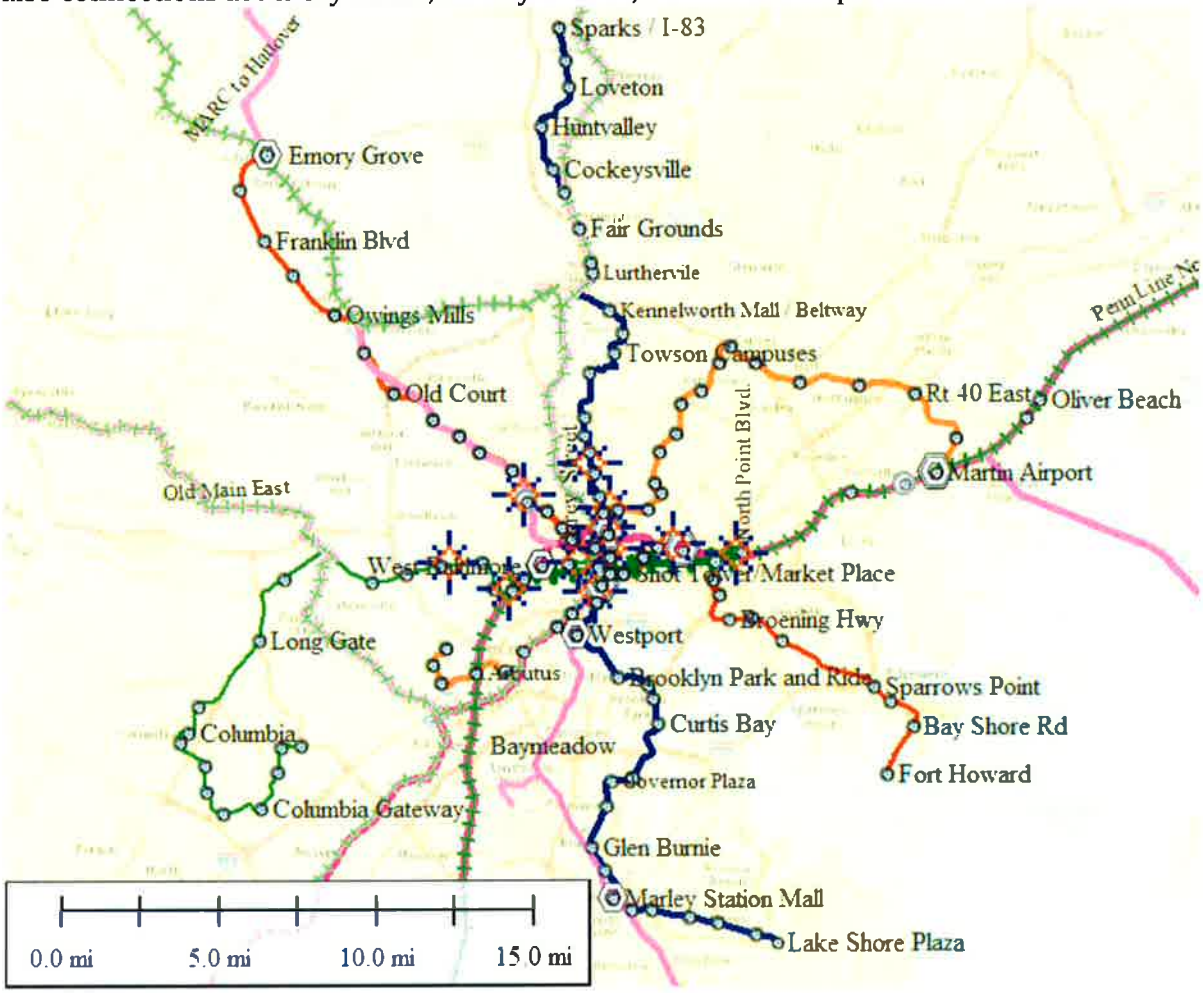
Map of the proposed, complete Metro Subway system. On average, each line extends about 15 miles from Penn Station; about the same geographic extent as the Washington DC Metrorail system.



Center city view of the finished MARC (in pink) and Metro sysstems. MARC trains from the Camden Line and Curtis Bay Branch can continue north through a rebuilt Howard Street Tunnel to the Jones Falls Valley. A MARC station at Market Center provides a connection to Metro at Lexington Market and Charles Center. Other central city MARC/ Metro connections are at Orangeville, Westport, West Baltimore, Camden and Penn Stations.

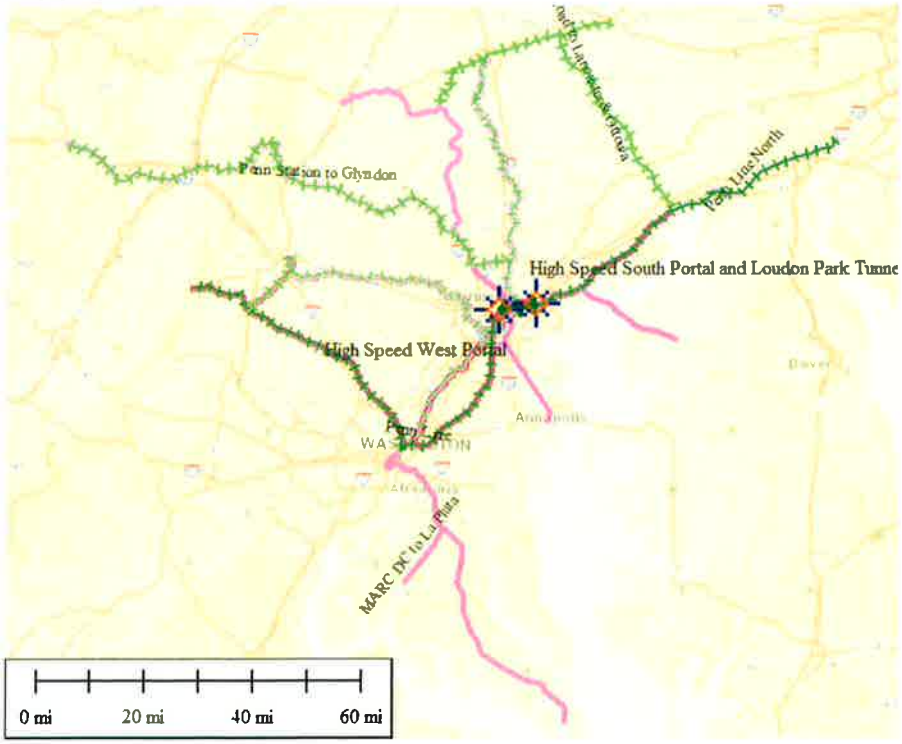

Center city view of the finished Metro system with Amtrak (green) and MARC (pink) lines through Baltimore. The high-speed tunnel is shown in dark green track symbols. The Charles Center Plaza Station is just east of Howard Street.

Map showing the full build Metro Subway with MARC (pink) and Amtrak (green) lines shown. In addition to the MARC/Metro Subway connections identified above, there are also connections at Emory Grove, Marley Station, and Martin Airport.



View of the proposed, expanded intercity (Amtrak) and commuter (MARC) passenger routes in the Baltimore Region. Current lines are in wide, bright green. Proposed lines are in a light green (Amtrak and MARC) and purple (MARC only). The high-speed Amtrak tunnel is shown in dark green with cross hatch. See text for a description of routes and destinations


Statewide Amtrak and MARC routes.



Statewide Amtrak and AMRC routes with new freight lines shown in black.