B&P TUNNEL PROJECT

B&P Tunnel Project
Baltimore, Maryland

ALTERNATIVES REPORT

October 2015

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation

EXECUTIVE SUMMARY

Project Background

This Alternatives Report presents an evaluation of the alternatives being studied for the Baltimore and Potomac (B&P) Tunnel Project. A National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) evaluating the potential impacts to the human environment from making improvements to the B&P Tunnel is being prepared by the Federal Railroad Administration (FRA), in coordination with the Maryland Department of Transportation (MDOT) and National Railroad Passenger Corporation (Amtrak).

This report, prepared by FRA and MDOT, represents an interim step in the alternative evaluation process, prior to publishing the Draft EIS. It builds upon the B&P Tunnel Project Scoping Report, released in September 2014 (FRA and MDOT, 2014a), and the B&P Tunnel Project Final Preliminary Alternatives Screening Report (PASR), circulated in December 2014 (FRA and MDOT, 2014b). The purpose of this report is to present the evaluation of the four alternatives resulting from the PASR, and the evaluation that resulted in the elimination of additional alternatives.

The B&P Tunnel Project study area surrounds the existing 1.4-mile B&P Tunnel, which is located in the west-central portion of Baltimore City, Maryland. The project limits extend along the Northeast Corridor (NEC), between Baltimore's Pennsylvania Station (Penn Station) to the north and the Gwynns Falls Bridge to the south (**Figure ES-1**).The B&P Tunnel was built in 1873 and is one of the oldest structures on the NEC, operating between Washington, DC and Boston, Massachusetts. The tunnel lies beneath several West Baltimore neighborhoods and connects Baltimore's Penn Station to the West Baltimore Maryland Area Regional Commuter (MARC) Station. It provides service to Amtrak, Maryland's MARC Commuter Rail passenger trains, and Norfolk Southern Railway freight trains. The existing B&P Tunnel is approaching the end of its useful service life. The FRA awarded High-Speed Intercity Passenger Rail (HSIPR) grant funding to the MDOT, in cooperation with Amtrak, to conduct preliminary engineering and environmental analysis to study improvements to the B&P Tunnel.

Purpose and Need

The purpose of the Project is to address the structural and operational deficiencies of the B&P Tunnel. In addition, the Project would:

- Improve travel time;
- Accommodate existing and projected travel demand for passenger services (regional and commuter);
- Eliminate impediments to existing and projected operations along the NEC;
- Provide operational reliability; and,
- Take into account the value of the existing tunnel as an important element of Baltimore's rail infrastructure.

The purpose of the Project was derived from the following needs:

- The existing B&P Tunnel is more than 140 years old and is approaching the end of its useful life with regard to its physical condition. While the tunnel currently remains safe for rail transportation, it requires substantial maintenance and repairs, and it does not meet current design standards. The tunnel is considered to be structurally deficient due to its age and wear and tear.
- The tunnel is functionally obsolete, meaning that it is not able to meet current and future rail demands due to its vertical and horizontal track alignment. The low-speed tunnel creates a bottleneck at a critical point in the NEC, affecting operations of the most heavily-traveled rail line in the United States.


Liberty Square
Burleith Leighton
Hanlon Longwood
Gwynns Falls Pw
Druid Hill Park
Mondawmin
Penn North
McCulloh St
Reservoir Hill
Remington
CSX
Better Waverly
Charles Village
Barclay
East Baltimore Midway
Walbrook
W North Ave
Coppin Heights/Ash-Co-East
N Monroe St
N Fulton Ave
Druid Hill Ave
Existing B & P Tunnel
Wilson St Tunnel
McMechen St
John St Tunnel
Charles North
Penn Station
Amtrak Northeast Corridor
Bolton Hill
Eutaw Pl
Rosemont
CSX
Sandtown-Winchester
Gilmor St Tunnel
Mid-Town Belvedere
St Paul St
Johnston Square
Winchester
Bridgeview/Greenlawn
Howard St Tunnel
CSX
Upton
W Lafayette Ave
Pennsylvnia Ave
Jr. Blvd
Martin Luther King
Fremont Ave
Mount Vernon
Mosher
Evergreen Lawn
Harlem Park
Seton Hill
Edmondson Ave
W Franklin St
40
W Mulberry St
West Baltimore MARC
Amtrak Northeast Corridor
Amtrak Gwynns Falls Bridge
Franklin Square
Poppleton
Downtown
University
Carroll-South Hilton
83
Existing B&P Tunnel
B & P Tunnel Openings
Light Rail Station
Metro Station
Metro Line
Light Rail Line
Railroad
Interstate
Parks
0 0.125 0.25 0.5 Miles
NORTH
Figure ES-1: Study Area Overview
B&P TUNNEL PROJECT
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- The tunnel does not provide enough capacity to support existing and projected demands for regional and commuter passenger service.
- The existing tunnel is not suited for modern high-speed usage due to the current horizontal and vertical track alignment, which limits passenger train speeds through the tunnel to 30 mph.
- The existing tunnel is a valuable resource. The disposition of the existing tunnel needs to be considered in the Project.

Alternatives Development

Based on the 2014 PASR, the following four alternatives were recommended for further engineering design and environmental study:

- Alternative 1: No-Build Alternative;
- Alternative 2: Restore/Rehabilitate the Existing B&P Tunnel;
- Alternative 3: Great Circle; and
- Alternative 11: Robert Street.

NEC Operations

Development of the four alternatives is based on existing NEC operations and planned future NEC operations. Initially constructed between 1830 and 1917, the 457-mile NEC extending from Washington, DC to Boston Massachusetts is one of the most heavily traveled rail corridors in the world, moving more than 365 million passengers and 14 million car-miles of freight per year.

In the Project area, NEC operations consist of shared rail service through the B&P Tunnel by Amtrak long-distance, Northeast Regional and Acela Express electric passenger trains; the electric and diesel Penn Line MARC commuter trains between the West Baltimore MARC Station and Baltimore's Penn Station; and Norfolk Southern diesel freight trains. In 2014, a total of 145 daily trains with a peak of 35 trains during the four-hour afternoon peak period traversed the B&P Tunnel carrying 21,600 passengers daily. The majority (79 percent) were Amtrak passengers.

The FRA is developing an NEC FUTURE program, a rail investment program through 2040. This program will identify capacity and operational needs for the NEC, including the need for four tracks through the City of Baltimore.

FRA and Amtrak plans and programs such as High Speed Intercity Passenger Rail (HSIPR) Program, NEC FUTURE, the Amtrak *NEC Master Plan* (Amtrak, 2010), the Amtrak *Vision for the Northeast Corridor* (Amtrak, 2012), and the 2001 Congressional mandate emphasize the need for time savings to provide an efficient transit system that meets and exceeds customer expectations.

Consistent with FRA and Amtrak planning, the B&P Tunnel Alternatives 3 and 11 propose four tracks to provide sufficient operational flexibility and expand capacity to accommodate future high-frequency and high speed passenger train service.

Penn Station Master Plan

A master plan for Penn Station is in the early stages of development. Early coordination between the B&P Tunnel team and Penn Station representatives indicate neither project would impact the other. Planned high level platforms at Penn Station would not have any material effect to the alternatives considered for replacing the B&P Tunnel.

Overall Design Goals and Design Criteria

Overall design goals are to provide four mainline tracks south from Penn Station; improve travel times through the tunnel relative to existing travel times; provide greater capacity and universal interlocking; preserve existing infrastructure to the extent possible; serve the West Baltimore MARC Station; accommodate double stack container freight cars; enable freight at current levels; and continue two-track operations through the existing tunnel during construction.

Design criteria categories include speed, horizontal geometry, slope/grade, geotechnical, mining portal depth, tunnel clearances, tunnel dimensions, Fire/Life/Safety, signals, utilities, and right-of-way specifications. The design criteria include four standard-gauge tracks optimized for Amtrak and MARC operations, and the ability for all tracks to support use by freight trains. Tunnels must allow design speeds to reduce travel time relative to the existing tunnel. Sufficient vertical clearance is also needed to accommodate double stack container freight rail cars (Plate H double stack clearance envelope). Design speed is a maximum 110 mph for intercity passenger trains, maximum 70 mph for commuter passenger trains, and maximum 50 mph for freight trains. Frequent changes in gradient are to be avoided and change in elevation in feet per 100 feet of horizontal distance shall not exceed 2 feet (or 2.000 percent grade). At the mining portals, depth must be a minimum of 50 feet from existing ground surface to top of rail. Tunnels should be on physically separate right-of-way within a secure perimeter that prevents unauthorized access.

Ventilation plants for the tunnels would be required for normal operation, maintenance and emergency ventilation. The ventilation plants would control air quality inside the tunnel to maintain safe limits by automatically turning on fans when sensors indicate that the air is nearing air quality standards limits for carbon monoxide (an indicator pollutant) regulated by EPA, and heat. In the event of fire, the ventilation system would control the movement of hot gasses and smoke to maintain visibility and facilitate safe evacuation. The number and placement of ventilation plants is determined by tunnel length and the number of vent zones needed to maintain efficient train traffic through the tunnel while maintaining safe ventilation. Three ventilation plants per build alternative would be needed, two at either tunnel end and at an intermediate location along the tunnel. These structures would be built within a 200 feet by 100 feet area and extend up to 55 feet high. The proposed ventilation plants would be designed to complement and blend with the surrounding built environment to the greatest practical degree.

Physical constraints to be considered by the design include serving the West Baltimore MARC Station and avoiding the Metro subway tunnel at Pennsylvania Avenue. To maximize the use of existing infrastructure, no substantial track modifications would occur south of the Gwynns Falls Bridge or north of Penn Station. The alternatives should not impact the CSX Howard Street Tunnel, the Amtrak Jones Falls Bridge, the Jones Falls Expressway, or the Howard Street Bridge. The alternatives should minimize impacts to the Baltimore Light Rail (LRT) North Avenue Station. Connections to the NEC mainline would be between the Penn Station platforms in the north and the "Bridge" Interlocking near the Gwynns Falls Bridge in the south.

Disposition of Existing Tunnel

Preliminary options for disposition of the existing tunnel include permanent abandonment achieved by backfilling; secure closure so it remains available for future use; modifying the tunnel for single-track rail use (storage of MARC trainsets); and adaptive re-use for other purposes (i.e., utility corridor or subterranean linear park). All but the first option would require repair, installation of safety features, long-term maintenance of tunnel elements and regular inspection. Additional ideas and public comments regarding the disposition of the existing tunnel in the event of replacement in a new location will be gathered and shared as the EIS process advances.

Description of Alternatives Carried Forward

The alternatives presented in this report resulted from the alternatives recommended for further study from the PASR, but have been further refined based upon additional technical studies, engineering, public input, and agency consultation.

Alternative 1

Alternative 1, as the baseline alternative, would continue to operate the existing tunnel with minimal repairs. This alternative assumes no new tunnel would be constructed and continued use for train traffic with no significant improvements to the existing B&P Tunnel aside from maintenance. The B&P Tunnel's basic geometry and structure would not be improved and the existing tunnel and tracks would be left in place.

Alternative 2

Alternative 2 would involve full reconstruction of the existing tunnel to meet modern design and safety standards. Open excavation that would be subsequently covered (cut-and-cover) would be required for the entire alignment of Alternative 2: Reconstruct and Modernize Existing Tunnel. This alternative stays on existing alignment and accommodates both double tracks and double stack container freight. Tunnel dimensions increase to 45 foot horizontal clearance and 27 foot vertical clearance. The tunnel liner and track slab would be replaced to address deficiencies and repair drainage.

Alternative 3 and Alternative 11 Options

Alternative 3 would construct a new tunnel with a wide arc north of the existing tunnel. Alternative 3 was developed, in part, as a way to bypass the tight curves that slow train traffic through the existing B&P Tunnel while still maintaining the existing platforms at Penn Station, which are situated nearly perpendicular to the overall orientation of the NEC. This is achieved by creating a wide, continuous arc so that trains can travel at higher speeds. Three alignment options developed for Alternative 3 address issues such as minimizing impacts to the human environment, flattening curves to increase speeds, and/or minimizing impacts to large utilities, discussed in more detail below. The north portal of Alternative 3 would be in the vicinity of the retaining wall next to the MTA North Avenue LRT Station, whereas the alignment options vary mostly in the area of the south portal. Alternative 11 was developed as a straighter alternative to the large, gradual curve of Alternative 3, and would achieve greater speed benefits than other alignments. Two options for Alternative 11 would provide a straightened alignment that would cross diagonally underneath the existing B&P Tunnel. Alternative 11 options differ principally in the area of the south portal; both options would locate the north portal in the vicinity of the Baltimore City DOT Facility Maintenance yard in Jones Falls Valley. Alternative 11 Option B was developed to minimize environmental impacts compared to Option A.

Alternative 3 and Alternative 11 would replace the B&P Tunnel in a new location. Consideration of a double track tunnel was eliminated from both alternatives because of its much larger tunnel diameter (about 50 percent larger compared to a single-track tunnel), the tight profile constraints posed by the design criteria, portal elevations, and intermediate underground obstructions. The resulting configuration is using four single-track tunnels for all alignment options for Alternatives 3 and 11. Horizontal excavation (boring) is proposed for these alternatives to minimize surface impacts. Four tracks in four separate bores of equal size would support train capacity requirements, service flexibility for conflict-free operations, design within physical constraints, and constructability. The tunnel vertical clearances for both Alternative 3 and Alternative 11 would also accommodate double stack container freight.

Alternative 3 and Alternative 11 each incorporate a subterranean grade-separated track crossing or "duck under" approach to aligning the four individual tunnel bores to minimize conflicts between turning trains and increase operational efficiency, while correctly aligning tracks with those being planned at Penn Station. Each option includes ventilation plants at permanent portals and at an intermediate location along the tunnel, and emergency

egresses. Outside approaches to portals for each would consist of open trench transitioning to cut-and-cover to the portal entrance. Each provides universal interlocking to the NEC mainline and avoids the Metro Subway tunnel while servicing the West Baltimore MARC Station. All of these options would relocate a pier of the CSX Baltimore & Ohio Bridge in Jones Falls Valley. All Alternative 3 and Alternative 11 options also consider disposition of the existing tunnel.

Alternative 3 Options

The purpose of Alternative 3 Option A is to provide a wide continuous arc that would increase speeds while minimizing adverse environmental impacts. Alternative 3 Option A is a large arc beginning under the Howard Street Bridge to the north portal about 600 feet north of the existing portal in the Jones Falls Valley. It would continue below ground, arcing to the southwest, crossing under I-83 below the intersection of Reservoir Street and Mount Royal Terrace. The alignment then continues in a gradual curve north of Reservoir Street and Ducatel Street, and south of the east-west portion of Whitelock Street. The alignment continues to curve southwest, crossing the northeast-southwest portion of Whitelock Street and then the intersection of North Avenue and Pennsylvania Avenue. The alignment begins to curve more directly to the south, as the western side of the alignment runs near the east side of the Carver Vocational-Technical High School athletic field boundary. The south portal would be in the vicinity of an industrial property at 1320 North Monroe Street, continuing south to tie into existing alignment at about Rayner Avenue. Additional track work would occur south to Gwynns Falls Bridge.

Alternative 3 Option A maximizes staying on existing alignment for the outside approach tracks to the proposed south portal. This alternative would not impact the West Baltimore MARC Station. Further study determined Alternative 3 Option A travel time would be limited by the tight curve where the West Baltimore MARC Station is currently located (referred to as Curve 381) and its construction would prevent future efforts to address that curve. It would therefore produce less travel time savings relative to the other Alternative 3 options.

Alternative 3 Option B was developed to increase speeds relative to Alternative 3 Option A by flattening the existing curve at the West Baltimore MARC Station (Curve 381). This is done by swinging west toward the inside of the curve, and proceeding north and east. Option B differs from Option A at the south portal by shifting the south portal slightly southeasterly near the intersection of Riggs Avenue and North Payson Street, with its outside approach approximately 200 feet to the east relative to Option A. It would curve back to the existing alignment just south of Edmondson Avenue, shifting the West Baltimore MARC Station platforms slightly west. It would continue south until completely tying into existing alignment at about North Calverton Road. From there, additional at-grade track work would occur southerly to the south approach of the Gwynns Falls Bridge.

Alternative 3 Option C was developed as a westerly alternative in the area of the south portal to determine if fewer environmental impacts would result while retaining the operational characteristics of Alternative 3 Option B. This alignment would also avoid impacting several major utilities on the east side of existing right-of-way near the south portal. It would arc further north than the other Alternative 3 options. Starting at the north end it would cross under I-83 north of the Reservoir and Mount Royal Terrace intersection, continuing in a gradual curve south of Chauncey Avenue and north of Newington Avenue and Whitelock Street. At the intersection of Madison Avenue and Brooks Lane it arcs southwest, traveling below the intersection of Payson and Baker streets and under the Carver Vocational-Technical High School athletic field. The south portal would be on the west side of the industrial property at 1320 North Monroe Street. The proposed alignment would continue south and about 100 feet west of existing alignment until merging completely with the existing right-of-way near Lafayette Avenue. From there, at-grade track work would occur southerly towards the north approach of the Gwynns Falls Bridge. The south portal would shift slightly north and west of the other Alternative 3 options and its outside approach would be approximately 100 feet west of the existing. This alternative would require reconstructing the West Baltimore MARC Station a short distance to the west of existing alignment.

Alternative 11 Options

Alternative 11 Option A begins at the North Charles Street Bridge north of Penn Station and travels north to the proposed north portal at the Baltimore DOT Facility Maintenance yard. From the north portal, the alignment curves slightly to the southwest as it crosses under I-83 below the intersection of Reservoir Street and Mount Royal Terrace. The alignment straightens southwest as it travels under North Avenue, just west of Park Avenue. It continues directly to the southwest, running parallel to the south side of Robert Street, then Waltemeyer Court. After crossing below North Fremont Avenue, the alignment continues directly to the southwest below the Sandtown-Winchester neighborhood toward the south portal near the intersection of Harlem Avenue and Appleton Street in the Midtown-Edmondson neighborhood. It would continue southwest to rejoin the existing right-of-way near the Mary Ann Winterling Elementary School and tie into existing tracks south of Mulberry Street. From there, at-grade track work would extend southerly to the south approach to Gwynns Falls Bridge. It would relocate the West Baltimore MARC Station to between Warwick Avenue and Mulberry Street at embankment elevation.

Alternative 11 Option B was developed as an alternative to Alternative 11 Option A to reduce community impacts in the south portal area. It would achieve operational benefits relative to other build alternatives. Alternative 11 Option B is aligned slightly north of Alternative 11 Option A and the south portal is located south of the Edmondson Avenue and North Pulaski Street intersection. It proceeds southwest to join existing right-of-way near the Mary Ann Winterling Elementary School to its tie-in with existing tracks just north of Gwynns Falls Bridge. At-grade track work would extend to just south of Gwynns Falls Bridge. Four temporary tracks would be built for use during construction parallel with the west side of existing and proposed tracks beginning at North Franklintown Road, tying back into existing alignment at just north of Franklin Street. It would relocate the West Baltimore MARC Station in an open cut or below-grade elevation between Franklin Street and Mulberry Street. During construction of the tunnels it would only be able to service the MARC station from one track.

Alternatives Evaluation Methodology

Impacts of the alternatives are evaluated and compared in their context and intensity in accordance with Council on Environmental Quality (CEQ) guidance (40 CFR §1502.16 and §1508.27). Context is based on the direct, indirect or cumulative effects on a local, state, or national scale that are either beneficial or adverse. Intensity is related to the likelihood, duration, and severity of an impact and the potential to minimize or mitigate adverse effects to reduce them to less than significant levels. Intensity is described as low/medium/high or as minor/moderate/major/severe. Evaluation criteria include both quantitative (i.e., how many of a given resource would be impacted) and qualitative (i.e., descriptive) based on existing environmental standards, thresholds, guidelines, or objectives established by federal, state, and local agencies to comply with applicable law.

Each of the alternatives are evaluated by comparing 51 criteria and through input received from the public. These criteria collectively address all major categories related to this project and the interest from agencies and the public. The overall categories are Operations, Engineering, Transportation, Cost, Construction, Right-of-Way, Community Resources, Cultural Resources, Natural Resources, and Other Environmental. No quantifiable method or weighting of the individual criteria is used to select an alternative for further study. The comparative evaluation table and comments received from the public are the tools used to collectively assess each alternative.

Evaluation of Alternatives

The evaluation of alternatives forms the basis in which to narrow down alternatives and ultimately select a Preferred Alternative. Application of the 51 evaluation criteria to each of the alternatives is shown in **Table 3** in the main body of report. The evaluation table provides a tool to collectively assess and compare each alternative. In comparing alternatives, it is extremely rare that one alternative will be “best” or “worst” with regard to all

criteria. Typically, a comparison of alternatives will lead to elimination of the overall worst alternatives as part of a process that ultimately results in the best overall alternative.

This Alternatives Report documents the conclusion that Alternatives 2, 11 Option A and Option B are not considered reasonable alternatives in relation to impacts and are eliminated from further consideration. Alternatives 1 and Alternative 3 Options A, B, and C are the alternatives that are still under consideration. These alternatives will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

Alternatives Eliminated from Further Consideration

Alternative 2

Alternative 2 would reconstruct and modernize the existing tunnel. Alternative 2 evaluated in this study would be on existing alignment and would continue to carry only two tracks, as described earlier in this report. Alternative 2 would only partially meet purpose and need for the Project by returning the tunnel to a good state of repair and satisfying current Life/Safety requirements. However, it would not meet a number of key purposes of the project. It would not improve travel time, not accommodate projected travel demand, not eliminate impediments to existing and proposed operations along the NEC, and not provide operational flexibility. It would not accommodate the high frequency, high speed, and double stack container freight cars needed to expand capacity and provide operational reliability needed for the NEC. Alternative 2 would require the complete reconstruction of the B&P Tunnel and construction of new track in the tunnel. This construction would require the cessation of all rail service through the B&P Tunnel for an extended period of time, thereby shutting down Amtrak NEC service through Baltimore.

Alternative 11 Options A and B

Alternative 11 Options A and B would meet project purpose and need. However, overall, the impacts associated with these alternatives would not result in commensurate benefits when compared to the alternatives still under consideration.

Specific reasons for the elimination of Alternative 11 Option A are as follows:

- Extensive excavation required within a residential area, with the following resulting impacts:
    - Highest number of historic buildings impacted at 140, more than any other build alternative.
    - Highest number of parcels impacted at 160, more than any other build alternative.
    - Highest number of residential displacements at 140, more than any other build alternative.
    - Highest number of business displacements at 20, more than any other build alternative.
    - 120 on-street parking spaces lost.
    - High level of community impacts during construction.
    - Potential Environmental Justice considerations – impacts within minority communities and partially within low income communities.
    - Highest number of buildings with potential noise impacts at 210, more than any other build alternative.
    - Permanent closure of some sections of local streets.
- Shifts West Baltimore MARC Station further south, a less desirable location for the station and access to parking lots and bus lines.
- Requires demolition of the Ice House building, a key historic resource.

- This alternative could also have a severe impact to the West Baltimore MARC Station Master Plan because it would relocate the station away from planned redevelopment properties capitalizing on proximity to MARC services, and demolish the American Ice Company building that is a centerpiece of the plan.
- Impacts the Winterling Elementary School.

Specific reasons for the elimination of Alternative 11 Option B are as follows:

- Requires taking of the entire block bounded by Edmondson Avenue, Franklin Street, Pulaski Street, and the Amtrak NEC. Due to the construction required, the entire block is lost to excavation and the needs for the B&P Project. There is no opportunity to use cut-and-cover construction and gain back any of the property for potential other uses.
- Potential Environmental Justice considerations - All of the residences and businesses taken are within minority and low income communities.
- This alternative would have severe impacts to the West Baltimore MARC Station Master Plan by displacing the American Ice House and other nearby properties proposed for redevelopment.
- Requires demolition of the Ice House building, a key historic resource. Also has impacts to other historic resources in the Midtown Edmondson Historic District.
- Impacts the Winterling Elementary School.
- Requires the reconstruction of Franklin and Mulberry Streets at a higher elevation to accommodate the new B&P Tunnel alignment to pass underneath. This higher elevation would raise Franklin and Mulberry Streets to between 10 and 20 feet higher, with resultant impacts, including visual, to adjacent residences.
- Has the highest capital cost among build alternatives, estimated at $4.2 Billion.
- Requires a MARC Station to be constructed below surface grade, in a cut section. Also requires taking of a portion of the existing West Baltimore MARC Station parking lots.
- Medium, as opposed to high, operational flexibility when compared with other build options:
    - During construction, most work would be performed without affecting NEC operations once temporary runaround tracks are in place. However, the runaround tracks require a lower operating speed, thereby affecting speeds during the construction of the project.
    - This alternative does not accommodate a new “Fulton” Interlocking. If one of the two tracks that would be allocated for MARC service were to be out-of-service due to maintenance, repairs, or other reasons, one MARC platform would not be accessible during the outage.

Alternatives Still Under Consideration

The following alternatives are still under consideration. These alternatives still under consideration will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

Alternative 1

Alternative 1 would not meet the purpose and need for the project. However, it is retained because it is the baseline in which the impacts of the build alternatives are compared. The characteristics of Alternative 1 are provided in the Evaluation Criteria **Table 3** in the main body of the report.

Alternative 3 Options A, B, and C

Alternative 3 Options A, B, and C are still under consideration and are continuing to be evaluated and discussed with agencies and the public.

Some major highlights of the Alternative 3 options are as follows:

- All three of these alternatives meet project purpose and need. All three improve travel time over existing conditions, accommodate existing and projected travel demand for passenger services, eliminate impediments to existing and projected operations along the NEC, and provide operational flexibility.
- All three alternatives have identical maximum and minimum design speeds.
- All three alternatives have similar tunnel depths and vertical grades.
- Alternative 3 Option B and Option C require a new West Baltimore MARC Station that could be rebuilt with high level platforms in the same geographic area as the existing station. Alternative 3 Option A leaves the MARC station as is, and would require the MTA to rebuild the station as a separate project to provide for high level platforms. This would require the platforms to move several hundred feet further south.

The construction, right-of-way, community, cultural resource, and other environmental impacts vary among the three alternatives, both in terms of number of impacts and the specific resources impacted. These comparisons can be viewed by resource in **Table 3** in the main body of the report.

Although an evaluation of these alternatives still under consideration has been tabulated in **Table 3**, this report does not specifically provide narrative on the comparison of the Alternative 3 options. These alternatives still under consideration will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

Agency and Public Coordination

FRA and MDOT have provided opportunities for agencies and the public to stay informed of Project progress and to provide input into the study, including input on the alternatives. Agency and public input was received through regular Interagency Review Meetings, a Public Open House in June 2015, seven Project community meetings in April and July 2015, individual community association meetings, the project website, an online comment form, and via project e-mail.

During the alternatives evaluation process, there were a number of themes that have been raised by agencies and the public. These themes are:

- Potential impacts from noise and vibration on historic residential structures;
- Potential impacts to community from ventilation plants, including air quality and noise concerns;
- Concern over impacts to property values in neighborhoods surrounding potential ventilation plant locations;
- Suggestions for public involvement initiatives;
- Concern over the frequency of and materials carried by freight trains through tunnel;
- Inquiries related to Amtrak easements and their right to inspect land;
- Inquiries related to compensation for potential damage to building foundations due to vibration;
- Parking at West Baltimore MARC Station;
- Future of the existing tunnel; and
- Preference or opposition for specific alternatives.

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I. INTRODUCTION

This Alternatives Report presents an interim evaluation of the alternatives being studied for the Baltimore and Potomac (B&P) Tunnel Project. A National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) evaluating the potential impacts to the human environment from making improvements to the B&P Tunnel is being prepared by the Federal Railroad Administration (FRA), in coordination with the Maryland Department of Transportation (MDOT) and National Railroad Passenger Corporation (Amtrak).

This report, prepared by FRA and MDOT, represents an interim step in the alternative evaluation process, prior to the publishing of the Draft EIS. It builds on the *B&P Tunnel Project Scoping Report* released in September 2014 (FRA and MDOT, 2014a), and the *B&P Tunnel Project Final Preliminary Alternatives Screening Report (PASR)* circulated in December 2014 (FRA and MDOT, 2014b). The purpose of this report is to provide an update on developments in the design, impact evaluation, and public input regarding Alternatives 1, 2, 3, and 11, which remained after completion of the PASR and the results that eliminated some of the alternatives from further consideration at this stage in the project.

The development of the alternatives is based on consistency with existing rail programs, plans, and congressional initiatives for improved travel times along the Northeast Corridor (NEC), the existing and future NEC operational needs, as well as an examination of the existing tunnel and its disposition if it were replaced with a tunnel on a new location. The alternative development discussions are followed with the identification of evaluation criteria, including ability to meet purpose and need; location, design, and operational characteristics; the physical constraints of the alternatives; preliminary cost and environmental effects; and a summary of agency and public coordination completed to date. The alternatives are then compared and critical differentiating factors are discussed.

The B&P Tunnel Project study area surrounds the existing 1.4-mile B&P Tunnel, which is located in the west-central portion of Baltimore City (**Figure 1**). The project limits extend along the NEC between Baltimore's Pennsylvania Station (Penn Station) to the north and the Gwynns Falls Bridge to the south.

A. Project Background

As shown in **Figure 1**, the B&P Tunnel is located beneath several West Baltimore neighborhoods, including Bolton Hill, Madison Park, and Upton. The tunnel is currently used by Amtrak, Maryland Area Regional Commuter (MARC) transit, and Norfolk Southern Railway (Norfolk Southern); it is owned by Amtrak. Built in 1873, the two-track tunnel is one of the oldest structures on the NEC. It is approximately 7,500 feet long (1.4 miles) comprised of three tunnel sections: the John Street Tunnel (1,152 feet long), the Wilson Street Tunnel (3,653 feet long) and the Gilmor Street Tunnel (2,190 feet long), with two daylighted sections separating the three tunnels. The grade varies from 0.86 to 1.34 percent

B. Purpose and Need

The purpose of the Project is to address the structural and operational deficiencies of the B&P Tunnel. In addition, the Project would:

- Improve travel time;
- Accommodate existing and projected travel demand for passenger services (regional and commuter);
- Eliminate impediments to existing and projected operations along the NEC;
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- Take into account the value of the existing tunnel as an important element of Baltimore's rail infrastructure. .


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Barclay
Charles Interlocking
Charles North
Penn Station
Amtrak Northeast Corridor
Walbrook
W North Ave
Coppin Heights/Ash-Co-East
Druid Hill Ave
N Monroe St
N Fulton Ave
Existing B & P Tunnel
John St Tunnel
McMechen St
Wilson St Tunnel
Eutaw Pl
Bolton Hill
Rosemont
CSX
Sandtown-Winchester
Gilmor St Tunnel
Mid-Town Belvedere
St Paul St
Johnston Square
Howard St Tunnel
Winchester
Bridgeview/Greenlawn
Upton
W Lafayette Ave
Pennsylvania Ave
Fremont Ave
Martin Luther King Jr. Blvd
Mount Vernon
83
Bridge Interlocking
Mosher
Harlem Park
Seton Hill
Edmondson Ave
W Franklin St
40
W Mulberry St
Amtrak Northeast Corridor
West Baltimore MARC
Amtrak Gwynns Falls Bridge
Franklin Square
Poppleton
Downtown
University
Carroll-South Hilton
Existing B&P Tunnel
B & P Tunnel Openings
Light Rail Station
Metro Station
Metro Line
Light Rail Line
Railroad
Interstate
Parks
Charles and Bridge Interlockings
0 0.125 0.25 0.5 Miles
NORTH
Figure 1: Study Area with Interlockings
B&P TUNNEL PROJECT
U.S. Department of Transportation
Federal Railroad Administration
Maryland Department of Transportation

The purpose of the Project was derived from the following needs:

- The existing B&P Tunnel is more than 140 years old and is approaching the end of its useful life, with regard to its physical condition. While the tunnel currently remains safe for rail transportation, it requires substantial maintenance and repairs and does not meet current design standards. The tunnel is considered to be structurally deficient due to its age, the original design, and wear and tear.
- The tunnel is also functionally obsolete, meaning that it is not able to meet current and future rail demands, due to its vertical and horizontal track alignment. The low-speed tunnel creates a bottleneck at a critical point in the NEC, affecting operations of the most heavily-traveled rail line in the United States.
- The tunnel does not provide enough capacity to support existing and projected demands for regional and commuter passenger service.
- The existing tunnel is not suited for modern high-speed usage, due to the current horizontal and vertical track alignment, which limits passenger train speeds through the tunnel to 30 mph.
- The existing tunnel is a valuable resource; the disposition of the existing tunnel needs to be considered in the Project.

II. ALTERNATIVES DEVELOPMENT

Four alternatives were selected for further design development and environmental evaluation from the PASR completed in 2014: Alternative 1 (No-Build), Alternative 2 (Restore/Rehabilitate Existing B&P Tunnel), Alternative 3 (Great Circle Passenger Tunnel), and Alternative 11 (Robert Street South). Based on the PASR screening criteria, Alternatives 3 and 11 met tunnel separation goals; had less conflict with physical constraints; maintained existing Amtrak operations; maintained at least two tracks and throughput capacity of at least 24 trains/hour per direction; supported NEC reliability; and required a potentially less-invasive primary construction method (boring instead of cut-and-cover).

These four alternatives were developed further with preliminary engineering design, more detailed information on the nature and extent of environmental resources in the study area, and public and agency input since completing the PASR.

A. NEC Operations

1. Existing NEC Operations

The NEC, the rail transportation spine of the Northeast region, is a key component of the region's transportation system and vital to its sustained economic growth (**Figure 2**). The current NEC took nearly a century to build, constructed by several railroad companies between 1830 and 1917. Today, the 457-mile NEC—anchored by Washington, DC's Union Station in the south, New York's Pennsylvania Station in the center, and Boston's South Station in the north—is one of the most heavily traveled rail corridors in the world. It has 17 tunnels (including the B&P Tunnel) and 1,186 bridges along its length. The NEC is shared by intercity, commuter, and freight operations and moves more than 365 million passengers and 14 million car-miles of freight per year. NEC riders comprise 69 percent of the combined rail and airline market between Washington, DC and New York City, and 51 percent between New York and Boston. In 2011, there were 11 million passengers on Amtrak's Northeast Regional and Acela Express services (FRA, 2015).

In the Project area, NEC operations consist of shared rail service through the B&P Tunnel by Amtrak Northeast Regional and Acela Express passenger trains; the MARC commuter train between the West Baltimore MARC Station and Baltimore's Penn Station; and Norfolk Southern freight. Amtrak NEC service and some MARC Penn Line trains are powered by overhead electric wires (catenary), while other MARC and freight trains are powered by diesel-electric locomotives. By 2017 MARC will operate exclusively a diesel-electric fleet. **Table 1** presents 2014 train volume data for the B&P Tunnel, provided by the NEC FUTURE program. A total of 145 daily trains with a peak of 35 trains during the four-hour PM peak period traverse the B&P Tunnel. Of these, the majority are Amtrak trains (61 percent), 38 percent are MARC trains and approximately 1 percent are Norfolk Southern freight trains. Passenger volume through the B&P Tunnel in 2014 estimates 21,600 people go through the tunnel daily, consisting of 79 percent Amtrak and 21 percent MARC passengers.

2. Future NEC Operations

Approximately 51 million people live in the Northeast Region which is projected to grow to about 58 million by 2040. The Northeast Region generates one-fifth of the nation's Gross Domestic Product.

The B&P Tunnel Project is consistent with existing programs and plans. The Project addresses a Congressional mandate established in the Passenger Rail Investment and Improvement Act of 2008, commonly referred to as PRIIA, by directing the NEC Commission to improve travel times on the NEC to support and enhance economic development. The B&P Tunnel Project is a major infrastructure investment on the NEC that is anticipated to provide service on the NEC for over 100 years.

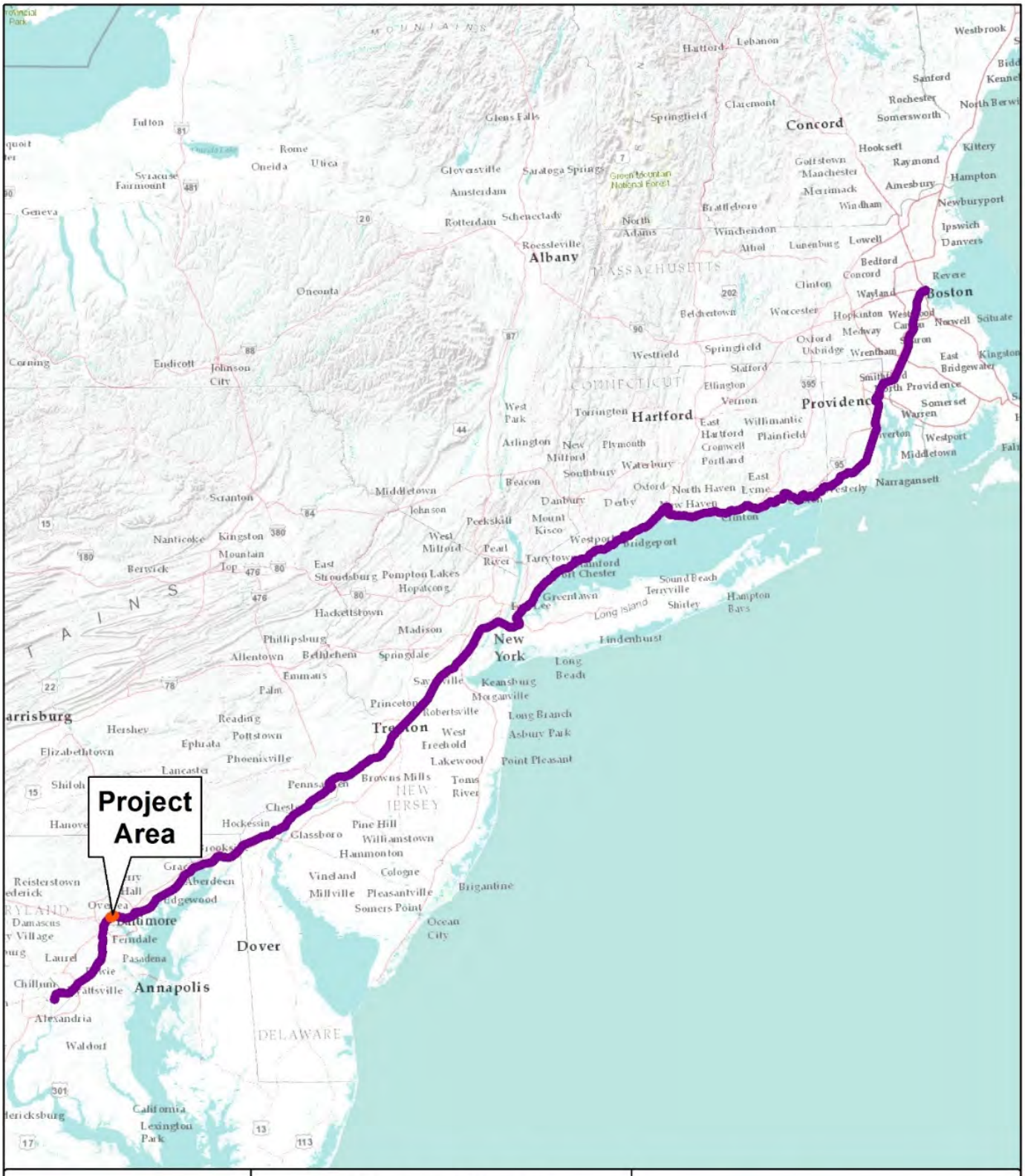


Figure 2: Amtrak Northeast Corridor

Table 1: Existing Train and Passenger Volumes through the B&P Tunnel Corridor

Tunnel Users	Number of Daily Trains	Trains 4-Hour PM Peak Period	Number of Daily Passengers	Passenger 4-Hour PM Peak Period
Amtrak	88	18	17,000	3,400
MARC	55	17	4,600	1,900
Norfolk Southern	2	0	n/a	n/a
Total	145	35	21,600	5,300

Source: NEC FUTURE (2015)

The NEC is included in multiple national efforts including the HSIPR Program, the 2008 Congressional mandate, the Amtrak NEC Master Plan, and NEC FUTURE Program described as follows:

- High Speed Intercity Passenger Rail Program (HSIPR)
  - Address the nation's transportation challenges by making strategic investments in an efficient network of passenger rail corridors that connect communities across the country
  - High Speed Rail Strategic Plan (FRA, April 2009)
- 2008 Congressional Mandate for Amtrak to Reduce Travel Time along the Northeast Corridor
  - Section 212(d) of the PRIIA Public Law 110 432
  - Reduced travel time, improved train operations, improved service capacity, maintain rail services, and cost benefits
- Amtrak NEC Master Plan (May 2010)
  - Provides the baseline of infrastructure investments needed to maintain the current NEC System in a state of good repair[1] (SOGR), integrate intercity commuter and freight service plans, and move the NEC forward to meet the expanded service, reliability, frequency, and trip-time improvements that are envisioned by the Northeast states and the District.
- NEC FUTURE Program
  - FRA comprehensive planning effort to define, evaluate, and prioritize future investments in the NEC, from Washington, DC to Boston, Massachusetts.
  - Improve the reliability, capacity, connectivity, performance, and resiliency of passenger rail service on the NEC for both intercity and regional trips

The NEC FUTURE Program is currently completing a Tier 1 EIS. Following the selection of a preferred alternative and Record of Decision, a Service Development Plan (SDP) would be completed that will outline how future passenger rail service will be provided on the NEC (FRA, 2015). The SDP will describe a phased implementation plan that details operational, network, and financial aspects of the Selected Alternative. For the NEC FUTURE program, the SDP will provide the framework for the selection of a preferred investment program in the corridor through 2040. The B&P Tunnel project is advancing in close coordination with the NEC FUTURE Program.

After public and agency scoping for the Tier 1 EIS, the needs of the NEC FUTURE Program were refined to include the following:

[1] A "state of good repair" is defined by the USDOT as "a condition in which the existing physical assets, both individually and as a system, (a) are functioning within their 'useful lives', and (b) are sustained through regular maintenance and replacement programs."

- **Bring the NEC to a State of Good Repair (SOGR):** Service quality currently falls short, due to the aging and obsolete infrastructure that has resulted from insufficient investment in maintaining a SOGR on the existing NEC. Achieving and maintaining a SOGR is needed to improve service. Because of the B&P Tunnel's age and obsolete design, it is increasingly difficult to repair and maintain.
- **Connectivity:** There is a need to improve the reach and effectiveness of the passenger rail network currently limited by gaps in connectivity among transportation modes and between different rail services.
- **Capacity:** In order to accommodate both existing riders and future growth in ridership, improvements at critical infrastructure chokepoints are needed to fix severe capacity constraints that limit service expansion and enhancements. Multiple previous studies have identified the B&P Tunnel as a critical infrastructure chokepoint on the NEC. The B&P Tunnel's height also prevents using double stack container freight rail cars. Other improvements north and south of the B&P Tunnel would be necessary before double stack container freight trains could use it.
- **Performance:** In many markets, the trip times on passenger rail within the study area are not competitive with travel by air or highway; however, Amtrak on the NEC is the dominant carrier between Washington, DC and New York City. Improvements in travel times, frequency, or hours of service are needed in other NEC markets to make passenger rail competitive with other modes. Because of the obsolete design of the B&P Tunnel, passenger and freight traffic must substantially slow down to negotiate the substandard small radius curves of the existing tunnel.
- **System-wide Resiliency:** The NEC is vulnerable to the effect of severe storms. A more resilient and redundant passenger rail network is needed to enhance safety, security, and the reliability of the region's transportation system. Currently there are no alternatives to maintaining rail traffic through the B&P Tunnel nor the option to divert to other nearby infrastructure should a service issue arise on the two tracks in the narrow tunnel facility.
- **Environmental Sustainability:** Energy use and emissions associated with transportation in the Northeast region affect the built and natural environment. Passenger rail can help meet the region's mobility needs with fewer environmental impacts.
- **Economic Growth:** A transportation system that provides options for reliable, efficient, and cost effective movement of passengers and goods is needed for continued economic growth in the Northeast region. The region's knowledge-based economic sector, including academic research and medical facilities, is especially reliant on access to convenient, reliable, and frequent rail service.

The NEC FUTURE Program considers the B&P Tunnel Project as related which may be incorporated into an action alternative. The FRA will continue to coordinate the technical analyses for the B&P Tunnel Project with the NEC FUTURE Program and will consider it a reasonably foreseeable project as part of the cumulative impact analysis in the NEC FUTURE Tier 1 EIS. Similarly, alternatives analyzed in the NEC FUTURE Program Tier 1 EIS will be considered in the B&P Tunnel's cumulative impact analysis. The FRA will continue to work with B&P Tunnel Project sponsors to ensure it remains compatible with and does not preclude the future design and construction of the NEC FUTURE alternatives.

3. Penn Station Master Plan

The Penn Station Master Plan is in its early planning stages that includes both short- and long-term improvements under consideration. In the short term, general station improvements would be made, including modifying existing low level platforms to high level platforms on certain tracks that provide level boarding. Importantly, none of these changes would affect where B&P Tunnel tracks would tie into station tracks. Long term planned changes (such as a streetscape, bike lanes, etc.) would have no effect on or need to be incorporated into the B&P Tunnel project.

4. Four Tracks

Consistent with NEC long-range planning, the B&P Tunnel Alternatives 3 and 11 include four tracks to eliminate a chokepoint, and expand capacity to accommodate future high-frequency, high-speed passenger train service on the NEC anticipated by 2040. Four tracks would also provide the resiliency/redundancy needed to maintain rail traffic between the West Baltimore MARC Station and Penn Station, and thereby NEC connectivity, in the event of interruptions to service on any one of the tracks. In addition, Alternatives 3 and 11 would increase the height of the new tunnel to accommodate double stack container freight cars. While Alternative 2 would increase the height of the rehabilitated tunnel to accommodate double stack container freight cars, neither Alternatives 1 nor 2 would accommodate four tracks.

B. Alternatives Design Criteria

Design criteria establish the standards and guidance needed to complete the engineering and design work for the proposed B&P Tunnel modernization or replacement. These criteria, standards and guidance are described in the B&P Tunnel Project *Draft Final Design Criteria Report,* and form the uniform basis for design to be updated as warranted during the Preliminary Engineering phase of the Project. The basic components of rail tunnels and principal construction methodology and overarching goals and objectives informing the design of the improved B&P Tunnel are discussed below. This is followed by discussion of specific design criteria critical to evaluating the alternatives to improving the B&P Tunnel.

1. Overall Design Goals

In addition to specific governing standards or codes, several goals for the B&P Tunnel Project guide the design process. The overall design for the B&P Tunnel Project will provide:

- Optimal Safety;
- Minimum travel times;
- Maximum passenger comfort;
- Optimum constructability; and,
- Minimum long-term maintenance costs.

The design must meet the purpose and need for the Project as well as preserve as much existing infrastructure as possible. Therefore, the design should:

- Operate four tracks optimized for Amtrak and MARC commuter services, with freight able to use either set of tracks;
- Provide better trip times relative to the existing tunnel by enabling higher speeds;
- Provide greater capacity than the existing tunnel by increasing the number of tracks and allowing double stack container freight cars;
- Provide universal interlockings with the NEC mainline;
- Not include substantial track modifications south of and over Gwynns Falls Bridge and through or north of the Baltimore Penn Station platforms;
- Serve the West Baltimore MARC Station;
- Not impact the MTA Metro Tunnels and underground Penn-North or Upton Avenue/Market stations ;
- Preserve the CSX track under Howard Street, the Amtrak Jones Falls Bridge, the Jones Falls Expressway or the Howard Street Bridge;
- Enable freight movement at current levels, and
- Continue operation of the two tracks through the existing tunnel during construction, with temporary outages allowed on weekdays only late at night.

An additional consideration is to ensure the design would not preclude implementing the alternatives of the NEC FUTURE Tier 1 EIS. The following describes applicable NEC FUTURE constraints:

- NEC FUTURE build alternatives would construct four tracks through the B&P Tunnel;
- All NEC FUTURE build alternatives would provide for at least 70 mph speeds for passenger trains at the B&P Tunnel;
- In order for express through-rail traffic at Baltimore's Penn Station to not conflict with MARC commuter trains turning at that station, express tracks should not be centered between local rail tracks in the B&P Tunnel. NEC FUTURE assumes NEC intercity operations would typically be on the railroad west (geographical north) side of Baltimore's Penn Station with MARC operations typically on the railroad east (geographical south) side, each fed by two mainline tracks on either side of the station, consistent with the current operating pattern. However, to provide operational redundancy and resiliency, either service would be able to use alternate station tracks when conditions warrant.

2. Design Criteria

Table 2 summarizes the design criteria and design assumptions most relevant to the development and evaluation of alternatives for replacing the B&P Tunnel. Many design criteria stipulate the components, size, clearances needed, and placement of design features. They originate from regulations and oversight agency guidance, and knowledge of safety standards, constructability, operational parameters, and maintenance needs. **Table 2** includes only those criteria that are key to development of the proposed alternatives, while the discussion below provides additional information concerning how tunnels are built, and the basis for the number of tunnels developed for the build options of Alternative 3 and Alternative 11.

Railroad tunnels may be constructed in several ways, including:

- Cut-and-cover construction where an open trench is excavated with the tunnel built and then covered, and
- Horizontal excavation of a tunnel by mining, which includes boring with a Tunnel Boring Machine, drill and blast, or Sequential Excavation Method.

The former method would require removal of everything on the surface above where the planned tunnel would be placed, and excavating a deep and wide trench. The second method would initiate boring at a portal where the alignment would transition from surface to underground, and excavating underground to the desired depth; surface disturbance would only be at the approaches to the mining portals on either end of the tunnel, and for ancillary structures like emergency exits. Tunnels could have mining portals in separate areas from the permanent entrances to the finished tunnel.

Because Alternative 2 would extensively modify the relatively shallow existing tunnel, proposed improvements would require cut-and-cover construction for access and constructability. The new replacement tunnels proposed as options under Alternatives 3 and 11 would all use tunnel boring techniques to minimize surface impacts. A combination pressurized face/rock tunnel boring machine would be used that maintains stability of the excavation face in soil and weathered bedrock while advancing the tunnel excavation. The outside approaches sloping down to the portals would be built with a combination of trench cutting and cut-and-cover construction techniques. Ancillary structures such as ventilation shafts or emergency egress may be mined in a combination of mechanical excavation and controlled blasting.

For all the build options of Alternatives 3 and 11, single sets of tracks in four separate, equally-sized tunnel bores are proposed. This design approach versus two double-track tunnels is based on several criteria: (1) conflict-free operations; (2) physical constraints, and (3) constructability.

Table 2: Design Criteria and Assumptions[1]

Design Criterion/Assumption	Description
Design Speed	Intercity Passenger Trains = Maximum 110 mph Commuter Passenger Trains = Maximum 70 mph Freight Trains = Maximum 50 mph
Horizontal Geometry	Curvature should allow desired maximum speeds. When a horizontal curve is located on the grade, the maximum allowed grade on the curve is reduced by 0.04% for each degree of horizontal curve.
Slope/Grade	Grades measured as the change in elevation in feet per 100 feet of horizontal distance shall not exceed 2' (or 2.000% grade). Frequent changes in gradient to be avoided.
Geotechnical	Maximize tunnel placement in bedrock to minimize the amount of soft ground and mixed face mining required.
Mining Tunnel Portal	At the mining portals, depth is preferred to be a minimum 50' from existing ground surface to top of rail in order to begin underground construction.
Tunnel Clearance	Accommodate one set of tracks per bore. Design to Plate H clearances suitable for double stack container freight operations (operating envelope of 10'8" wide by 20'3" tall).
Tunnel Dimensions	New interior tunnel dimensions would be approximately 30' diameter to allow safe passage of train vehicles, operation and maintenance of the tunnel, and meet applicable regulatory code[1.]
Fire Life/Safety	Fire/Life/Safety must provide emergency ventilation and emergency exits. Emergency ventilation would be provided by jet fans in the tunnel and/or ventilation plants housing fans and other equipment. With multiple tunnels, cross passageways for separate track tunnels at no more than 800' intervals between adjacent tunnels could be provided, or with fire resistant enclosed stairways-passageways with maximum distance to surface 2,500, separate from vent shafts. The maximum distance between emergency exits cannot exceed 2500'. Evacuation Walkways: 30" clearance between composite clearance template and any continuous obstruction alongside the track in a designated passenger emergency evacuation path.
Signals	All design will be based on fixed interlockings at the "Charles" Interlocking on the north and the "Bridge" Interlocking on the south.
Utilities	Railroad alignment changes to avoid or minimize difficult or costly utility relocations shall be considered.
Right-of- way	Safety and security of the traveling public, as well as the neighborhoods the railroad operates through, require a physically separate right-of-way with a well-protected perimeter. The Project must, by location and design, prevent unauthorized intrusion into or upon the operating railroad environment, discourage vandalism, loitering, or dumping on the right-of-way or adjacent to facilities.

[1]Code as specified by Americans with Disabilities Act, National Fire Protection Association, federal code and Code of Maryland Regulations 09.12.91.03

a. Conflict-free Operations

The goal of conflict-free operations and service flexibility is to minimize the number of conflicting moves at railroad interlockings and places where two or more sets of tracks would cross (junctions). These movements can be controlled by signaling or grade-separated crossings. Because four sets of tracks are required for replacing the existing two-track tunnel, a subterranean grade-separated track crossing or "duck under" is proposed as the most efficient method for preventing conflicts, and maintaining operational goals for the new B&P Tunnel. This could not be achieved if two sets of tracks were together in a single tunnel.

b. Physical Constraints

Physical constraints driving the need to separate four sets of tracks into individual tunnel bores include needing to pass beneath the existing Metro Subway Tunnel and its Penn-North or Upton/Avenue Market stations. The depth of the subway and geotechnical ground conditions in the area where the new tunnels need to cross beneath it would require approximately one-half tunnel diameter of separation; this would result in a railroad grade just under the design criterion of 2.000 percent, the within the maximum design grade that would allow connecting to the existing NEC in the vicinity of the West Baltimore MARC Station. Because a single bore with two sets of tracks would be wider, the required vertical separation between the new tunnel and the Metro subway would increase considerably. Lowering the tunnel to provide the additional clearance required would cause an increase in the steepness of the grade. This would exceed the maximum permissible grade needed for connection to the existing NEC at the West Baltimore MARC Station. To avoid an increase in profile grade, the connection between a new B&P Tunnel with double tracks and the existing NEC would have to be made further south of the West Baltimore MARC Station. This would increase surface impacts by requiring a longer trench excavation for the approach to the new tunnel, modifications to the West Baltimore MARC Station, and cause more extensive impacts to adjacent communities.

c. Constructability

Another issue considered in the decision to construct four sets of tracks in four separate tunnel bores is the constructability of the tunnel mining portal, where the surface transitions to the underground tunnel bore. A conservative criterion for locating the tunnel mining portal is where minimum ground cover above the tunnel is 75 percent of the proposed tunnel diameter. In the case of single tracks in a single bore, this would be a minimum of 50 feet below the overlying ground surface to the top of rail elevation. For the two-tracks-per-bore scenario, it would be a minimum of 62 feet from top of rail elevation to the overlying ground surface. The latter would not work at the north portal because the grade would be too steep for connecting to the existing "Charles" Interlocking, which is a relatively short distance to railroad north (geographical southeast). Moreover, the available space for "Charles" Interlocking between the north portal and Penn Station would be a limiting factor. It would also incur more surface impacts at the south portal from a longer trenched approach, which would have to connect to the existing NEC alignment profile further south. Alternatively, the north and south portals could be shifted further away from the existing alignment, but these locations would encroach further into neighborhoods, greatly increasing environmental impacts to communities.

In summary, based on the issues of conflict-free operations and service flexibility, physical constraints, and constructability, designing the replacement B&P Tunnels as four single-track tunnels is proposed for all Alternative 3 and Alternative 11 build options.

d. Ventilation Plants

An important Life/Safety component of the proposed tunnels is ventilation plants. These would be above-grade structures housing tunnel ventilation fans, operation and control rooms, and other equipment. The ventilation

plants would ventilate the tunnel during normal, maintenance, and fire emergency operations. The ventilation plants would control air quality inside the tunnel within safe limits by automatically turning on fans when sensors indicate that the air is nearing air quality standards limits for carbon monoxide (an indicator pollutant) regulated by the Environmental Protection Agency (EPA), and heat. In the event of fire, the ventilation system would control the movement of hot gasses and smoke to maintain visibility and facilitate safe evacuation. The number and placement of ventilation plants is determined by tunnel length and the number of vent zones needed for efficient train traffic through the tunnel while maintaining safe ventilation.

For the B&P Tunnel Project, generally three plants would be required placing one at the north portal, one at an intermediate location along the tunnel, and one at the south portal. The ventilation plant footprint would typically range up to 200 feet by 100 feet and approximately 55 feet high. These fan plants must be large enough to house the required number of fans and ancillary equipment such as silencers and dampers as well as their associated ductwork to connect to the train ways. In addition, the fan plants must also house the fan's electrical equipment such as transformers and motor starters. The fan plants must also provide emergency and maintenance access to the tunnels themselves. The ventilation plants would be designed to complement and blend with the surrounding built environment to the greatest practical degree and would conform to local building codes. **Plate 1** shows an example of a proposed ventilation plant design for another similar project.

Plate 1: Dyer Avenue, New York City Proposed Ventilation Plant Example

C. Existing Tunnel and its Disposition

The existing B&P Tunnel is a functioning railroad structure connecting Baltimore Penn Station with the NEC. As previously discussed, the purpose of the B&P Tunnel Project is to address deficiencies of the aging tunnel approaching the end of its useful service life as a railroad structure. If the No-Build Alternative is selected, the tunnel would continue use in its current configuration with relatively minor maintenance. If the tunnel is not modernized in its existing location as called for under Alternative 2, it would be replaced in a different location, as proposed by the build options of Alternative 3 and Alternative 11. If a replacement B&P Tunnel in a new location is to be constructed and made operational, the disposition of the existing B&P Tunnel would need to be determined. Therefore, under each build option for Alternative 3 and Alternative 11, an additional consideration in the alternatives analysis is the disposition of the existing B&P Tunnel.

Three base options for disposition of the existing B&P Tunnel would be:

(1) Close the existing tunnel with no additional use ("abandonment");
(2) Modified train use (single track); or
(3) Convert the existing tunnel for an alternative use.

These three potential outcomes for the existing B&P Tunnel will be considered for all the build alternatives except Alternative 2. The following briefly describes characteristics of the existing B&P Tunnel and describes the three alternatives for its disposition.

The existing B&P Tunnel built in 1873 is comprised of three tunnel sections separated by two daylight sections for a total length of approximately 7,500 linear feet (1.4 miles). See Section III.A "Alternative 1"for a detailed description of the existing tunnel. The three tunnels are approximately 21 feet in height at the centerline and 27 feet wide where the walls of the tunnel and its top meet (i.e., the springline). The tunnels are primarily supported by a multiple course brick-lined arch and masonry walls, with some stone masonry. Later work installed an invert slab for the floor of the tunnel and lining the walls with gunite (the proprietary name of an early form of shotcrete that is a mix of Portland cement and sand) sprayed on the walls. Repairs to the tunnel were completed in the early 1980s including repair of the tunnel lining, drainage improvements, replacement of the tunnel invert, and installation of an improved track system.

The present-day condition of the B&P Tunnel has been documented in a visual inspection conducted in July of 2014 and reported in the *Existing B&P Tunnel - Inspection Report December 2014*. This and prior studies of the B&P Tunnel condition indicate water is leaking through the tunnel, caused by groundwater seepage and leaking water pipes. The drainage system below the tracks is clogged with efflorescence (water soluble salts) and is not fully functioning. High saturation of water in the soil beneath the tunnels causes the aging floor slabs to sink, requiring continual repair. The tunnel lining is deteriorating with cracked and spalled gunite and some loss of bricks and deteriorated mortar in some areas of the brick-lined arch, especially in the Gilmor Street and Wilson Street tunnels. Utilities through the tunnels would require repairs and maintenance as well. Overall, the existing tunnel complex is safe, but requires a lot of maintenance.

1. Abandon the Existing B&P Tunnel

Abandonment can either be temporary or permanent, but either must provide for the long-term stability of the tunnel openings. Two methods of abandonment considered include:

- Permanent abandonment by backfilling the tunnel
- Temporary abandonment by securing the portals and conducting limited repairs

Backfilling would provide a walk-away solution with no future maintenance. It could consist of different materials such as concrete, crushed stone or aggregate filled with grout, or even temporarily stockpiled excavation materials from constructing the replacement tunnel. The tunnel could be filled by drilling holes from grade at intervals and filling through them, which would have temporary surface impacts to surrounding communities. Another method

would be by horizontally placing fill in the tunnel in stages using temporary bulkheads. The two daylight sections of the tunnel at Pennsylvania Avenue and John Street would be backfilled, graded and covered with top soils; these areas could be reclaimed for other surface uses. Backfilling would eliminate the risk of collapse and subsidence, making any subsequent re-use of the tunnel very unlikely.

Temporary indefinite abandonment would require securing the portals, conducting regular inspections of the tunnel and maintenance in the long term. This option would preserve the tunnel for either transportation or other uses in the future. A concrete bulkhead would fill the portal with a locked door for authorized access (**see Plate 2**). At the two daylight sections, an enclosed stairwell would provide access at the tunnel level to open access doors, with the adjacent open trench filled, graded and covered with topsoil, making it suitable for other surface uses. The tunnel liner could require some strengthening and/or mitigation for water leakage to maintain tunnel stability. Fire and Life/Safety facilities would be required to protect maintenance crews, but not the public as the tunnel would be closed. Also, the tunnels must be ventilated to prevent accumulation of unsafe gases and allow maintenance personnel to work. Disadvantages of temporary closure of the tunnel include commitment to long-term maintenance and risk of tunnel collapse or subsidence if such maintenance does not occur.

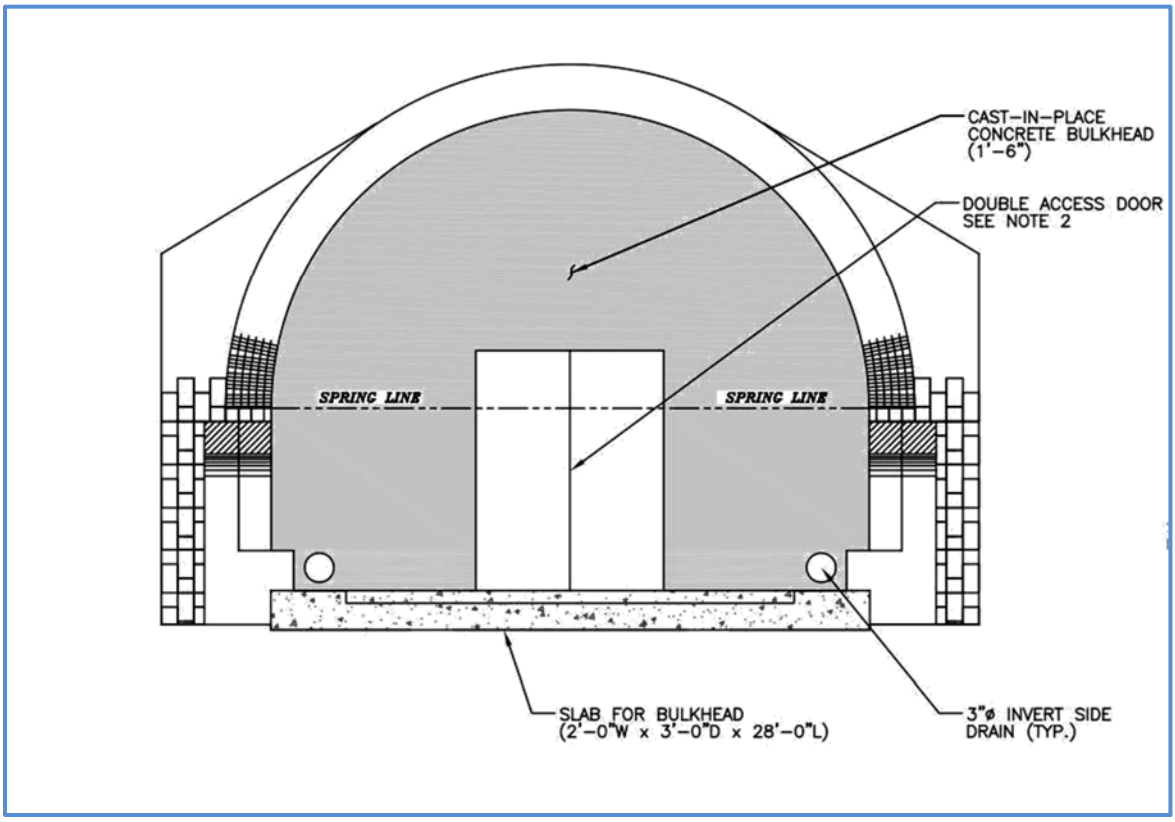


Plate 2: Temporary Abandonment Concept

2. Modified Train Use (Single Track)

The existing B&P Tunnel may still be a valuable transportation resource even if it is replaced on a new location. For example, the existing tunnel could be modified to use one track to move Amtrak or MARC trains, or freight trains for a variety of operators under a number of different circumstances (**Plate 3**). This approach would require new vertical clearance to accommodate double-stack rail cars which could be attained by either lowering the tracks or raising the tunnel roof, but without having to increase the width of the existing tunnel. Modification for

single track use would not require a lot of cut-and-cover construction along the majority of the existing alignment. It would, however, still require modernization of the tunnel potentially involving repair of the liner, replacement of the invert, and providing fire suppression, ventilation and emergency egress to current safety standards. Drainage problems would also need to be addressed. The track could be used by MARC to store out-of-service trains on nights, weekends, and between rush hours. This storage would free up platform space at Penn Station, and limit non-revenue movements to and from MARC's facility near Martins Airport. Since these should be non-revenue trains, the full rehabilitation to current safety standards would not be required.

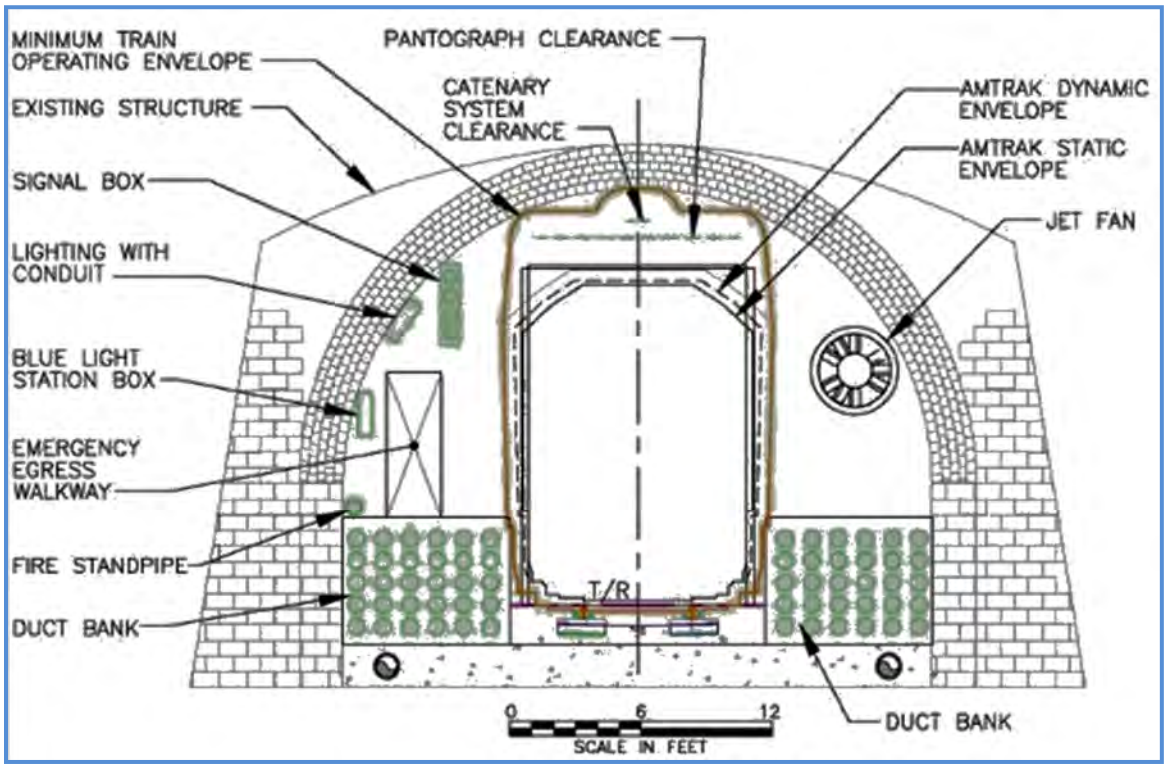


Plate 3: Single Track Concept

3. Adaptive Re-use of the Existing B&P Tunnel

A range of alternative uses have been considered, some of which are being evaluated for alternative uses of other tunnels in the country. Adaptive re-use of the existing B&P Tunnel would not necessarily be by Amtrak, but could involve other parties. Re-use concepts evaluated include:

- Recreation space;
- Underground Businesses (e.g. mushroom farm, storage);
- Community facility;
- Public exhibit;
- Utility corridor/stormwater control;
- Public Exhibit; and
- Linear Park.

While there are some potential economic and community building opportunities that could be derived from adaptive re-use, there would be significant challenges that must be taken into consideration. These relate to

feasibility of implementation due to the need for infrastructure upgrades, and the depth of the tunnel and its proximity to ground surface. A combination of uses would be feasible as well, such as for a utility corridor (**Plate 4**) and public space such as a recreational park (**Plate 5**). Public use as a park or community facility would require beginning with repairs to stabilize the tunnel lining and floor, and modifications to accommodate new utilities or new stormwater facilities. Once the new utilities/stormwater facilities would be placed, the tunnels could be further modified into another alternative use such as a subterranean linear public park. It would be about a 30-35 minute walk from the north portal to the south portal.

Some improvements would be made to ensure functionality and the safety of occupants. For example, the tunnel liner would need to be repaired and grouted, either throughout or in particular locations, depending on the use. In addition, new stairways and elevators may need to be installed at the existing tunnel portals, including the portals at the Pennsylvania Avenue and John Street open cuts, to allow for improved ingress and egress as required by code. Additional fire Life/Safety elements, such as low-velocity fan ventilation and construction of emergency vehicle access roadways, as required under local, state, and federal codes and ordinances may be required, as well as meeting Americans with Disabilities Act accessibility regulations.

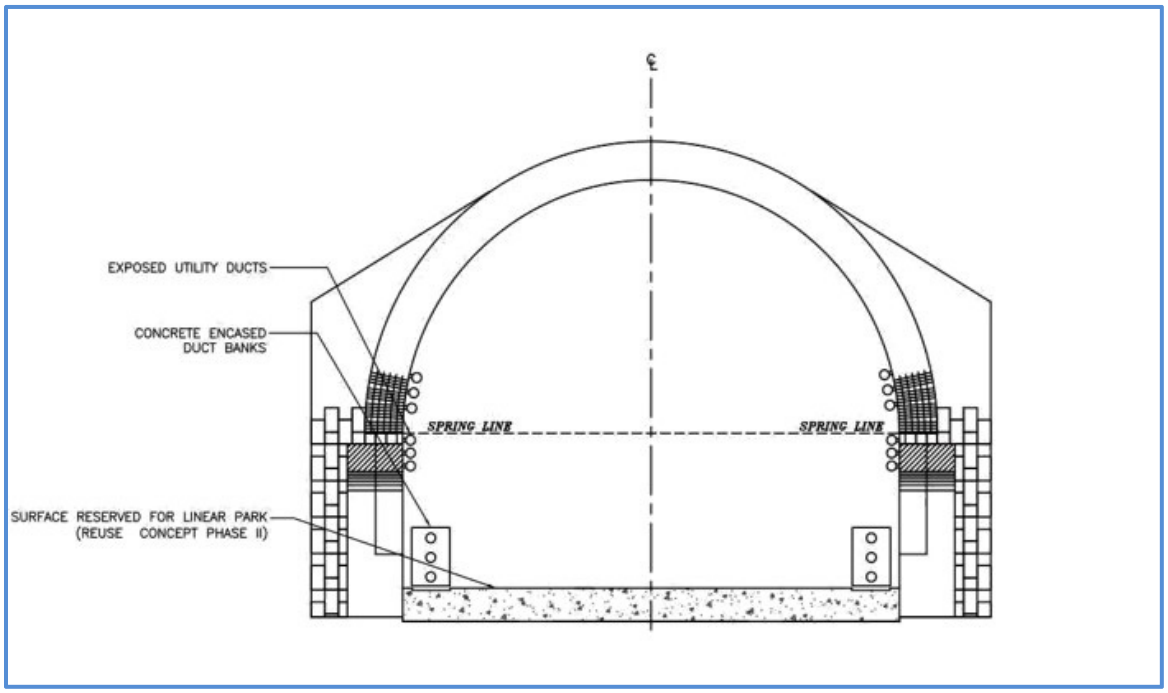


Plate 4: Utility Corridor Concept

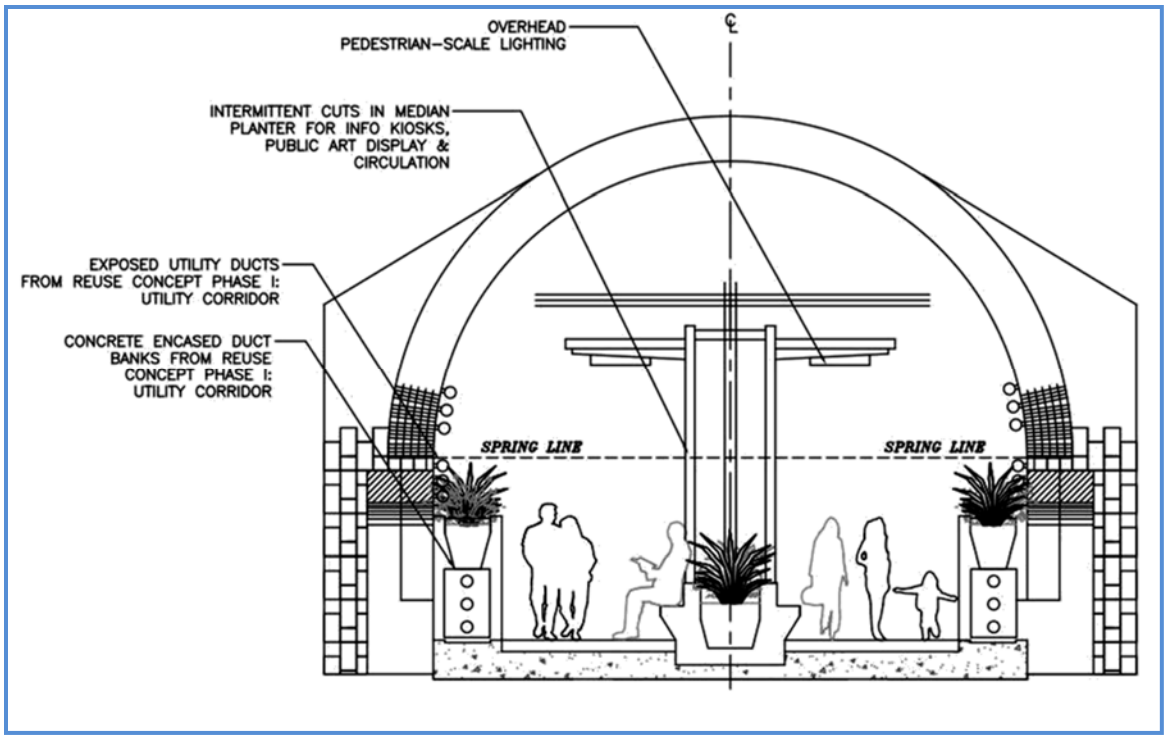


Plate 5: Linear Park Concept

4. Conclusion

The existing B&P Tunnel is a valuable resource and its disposition must be considered along with the build alternatives on new locations. Alternatives for the disposition of the existing B&P Tunnel will be developed further as additional public involvement and agency consultation occurs for the Project EIS.

III. DESCRIPTION OF ALTERNATIVES CARRIED FORWARD

With additional technical studies and information gathered from agency consultation and the public since releasing the Final PASR last year, the current alternatives evaluation expands on the same four alternatives recommended for further study: Alternative 1, Alternative 2, Alternative 3 and Alternative 11.

A. Alternative 1

Alternative 1 as the baseline for analysis of the build alternatives would entail continued use with no significant improvements to the existing B&P Tunnel aside from routine maintenance (**Plate 6**). This maintenance would include the following:

- Injection of waterproofing material behind the tunnel liner;
- Repair of leaking utility lines above the tunnel;
- Repair of brick and mortar defects in the tunnel liner;
- Rebuilding of deteriorated safety niches (also known as "manholes");
- Repair of the Gilmor Street Tunnel portal;
- Replacement of invert slab where deteriorated;
- Removal of debris;
- Demolition of remaining portions of the Pennsylvania Avenue depot which is no longer in use;
- Scale and removal of delaminated gunite/shotcrete;
- Cleaning of sidewall drains;
- Replacement of lighting and utility mounts; and
- Replacement of catenary supports.

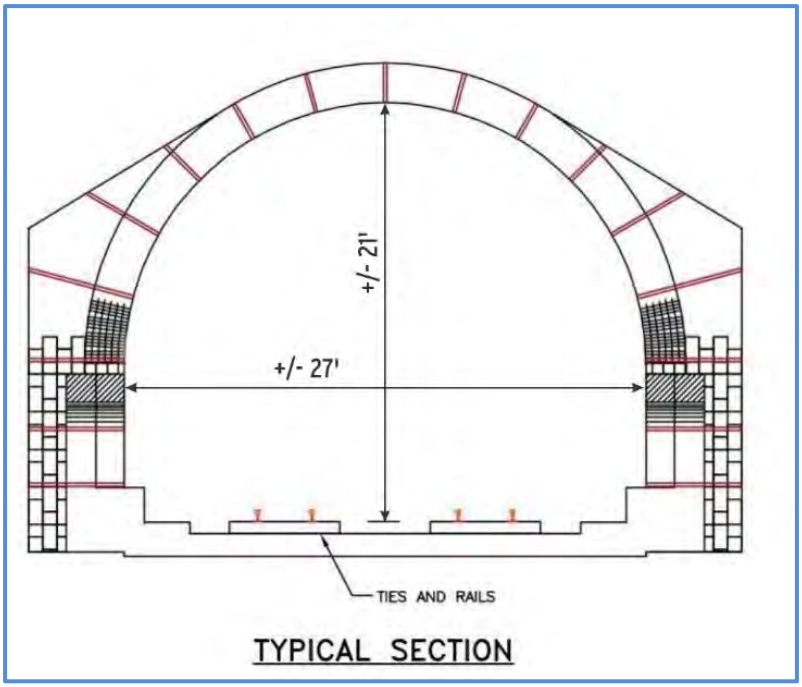


Plate 6: Alternative 1 Typical Section

The tunnel's basic geometry and structure would not be improved; the existing tunnel and tracks would be left in place. This alternative would be more intensive than the maintenance currently performed, but would not

modernize the tunnel and fall short of a SOGR, rather, it would maintain the existing service and ongoing maintenance as currently practiced with minimal disruption. This alternative would not meet purpose and need for the Project.

Repairs to the tunnel were completed in the early 1980s, including lowering of the tunnel invert, repair of the tunnel lining, drainage improvements, replacement of the tunnel invert, and installation of an improved track system. Since completion of these repairs, recent evaluations concluded that the B&P Tunnel should be replaced within 20 years as the existing tunnel is increasingly difficult and expensive to maintain due to the increase in train traffic and short work window during which maintenance can be performed without adversely affecting on-time performance.

B. Alternative 2

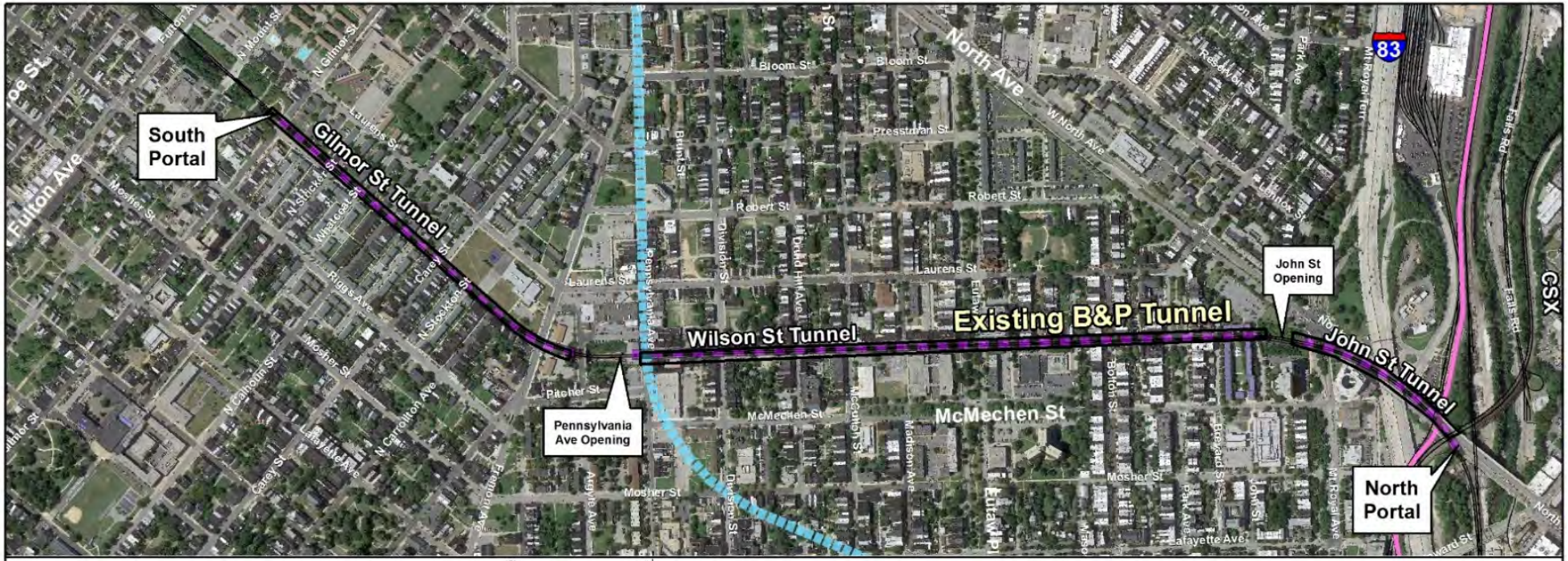
As the alternatives underwent engineering development, Alternative 2: Restore/Rehabilitate Existing B&P Tunnel was renamed Alternative 2: Reconstruct and Modernize Existing Tunnel in order to more accurately reflect the alternative.

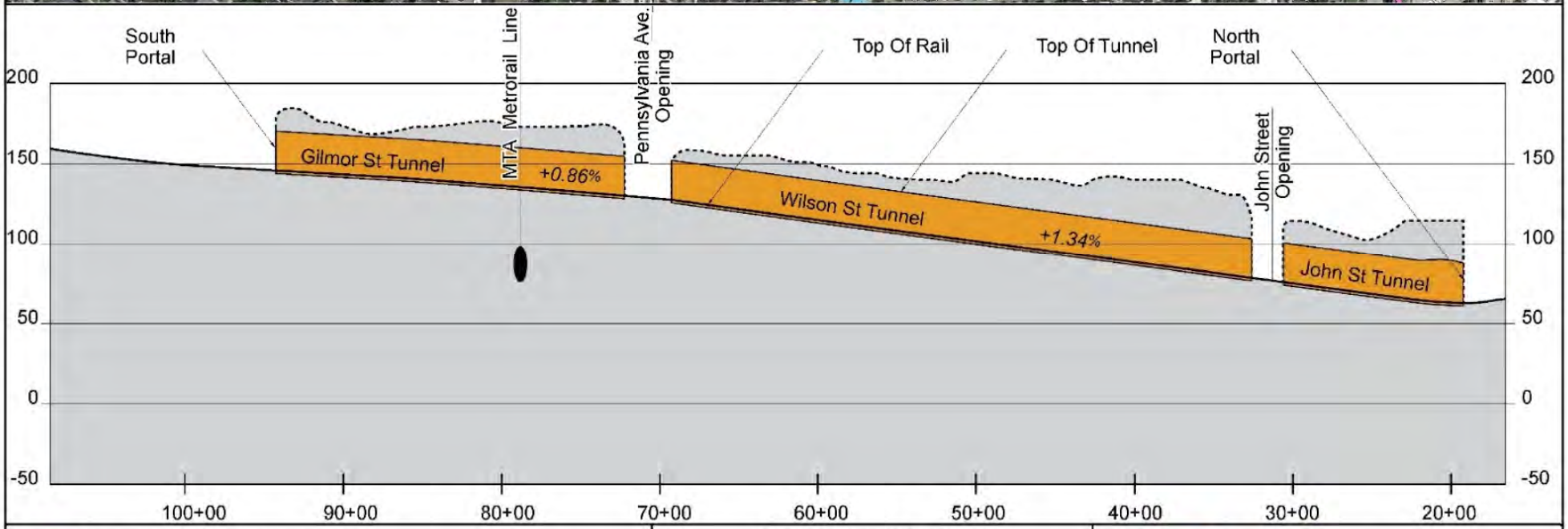
Alternative 2 includes the complete reconstruction of the tunnel in its current location and only partially meets the purpose and need for improving the tunnel (**Figure 3**). The reconstructed tunnel would be brought to a State of Good Repair (SOGR), accommodate two tracks with Plate H (double stack) clearance and provide Life/Safety improvements. It would not, however, address horizontal or vertical alignment problems that prevent high frequency, high speed passenger rail service. The vertical clearance of the tunnel would be increased by approximately 5 feet by increasing tunnel height from 21 feet to approximately 27 feet with a new top slab. The invert slab would be replaced in its current location. Horizontal clearance would be increased by approximately 18 feet, increasing tunnel width from approximately 27 feet to 45 feet. The new liner slabs would be approximately 9 feet wider on each side relative to the existing tunnel liner (**Plate 7**). The tunnel liner and track slab would be replaced to meet modern design standards and eliminate the deteriorating conditions of the existing tunnel. The reconstructed tunnel's top slab would be closer to the surface than the top of the existing tunnel, which ranges from 5 to 35 feet below the surface. The existing tunnel openings at Pennsylvania Avenue and John Street would remain in place. The tunnel's current maximum grade of 1.34 percent would remain.

Life/Safety features meeting current criteria would be provided in the reconstructed tunnel, including separation structures between the two tracks, and emergency egress and emergency ventilation such as jet fans. Cut-and-cover construction would be required along the full length of the existing Gilmor Street, Wilson Street, and John Street Tunnels in order to construct Alternative 2. This would close the existing tunnel to all rail traffic during construction estimated to be several years. It would also close approximately one mile of Winchester and Wilson streets for the duration of construction.

C. Alternative 3

Alternative 3 consists of three options, all of which would extend in a wide arc north of the existing B&P Tunnel. Each option provides universal interlocking to the NEC mainline and avoids the Metro Subway while servicing the West Baltimore MARC Station. Alternative 3 options would result in a four-track alignment in four individual tunnel bores through the study area to accommodate high frequency, high speed passenger rail and double stack container freight cars. Each includes "duck under" alignments to facilitate conflict free operations. To properly align the tracks, the SB MARC commuter train track would duck under the two Amtrak tracks to align as the west track at the SB platform of the West Baltimore MARC Station. All of these options would relocate a pier of the CSX (formerly B&O) Bridge Number 3. NEC service would continue through the existing tunnel while the new alignment of Alternative 3 options would be under construction. As the Alternative 3 options would be in a new location, each would include consideration for disposition of the existing tunnel.





Alternative 2 and Existing B&P Tunnel
Surface Excavation Area
Existing Light Rail
Metro Line

NORTH

0 250 500 1,000 Feet

Figure 3: Alternative 2 Plan & Profile

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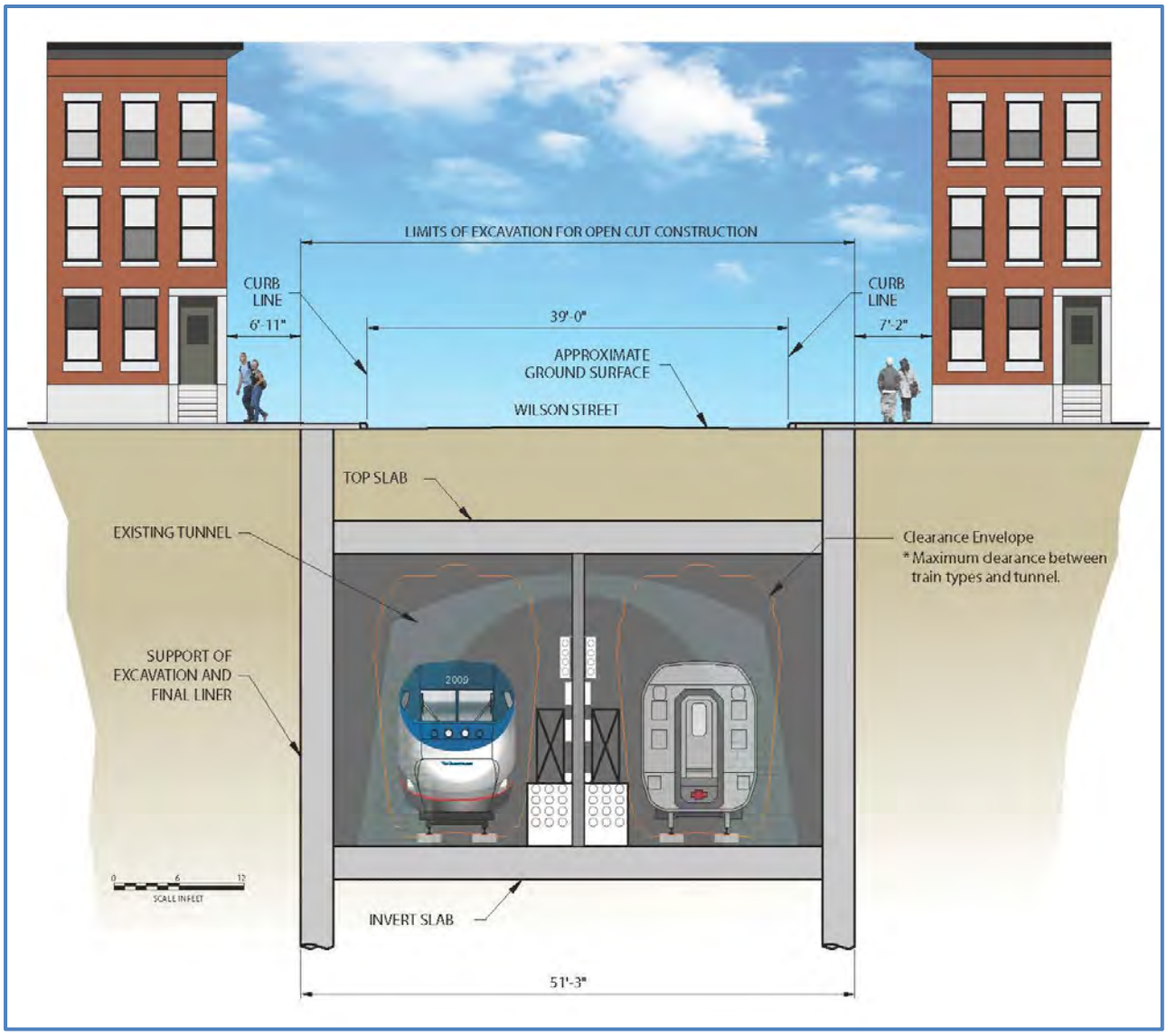


Plate 7: Alternative 2 Concept

Alternative 3 was developed, in part, as a way to bypass the tight curves that slow train traffic through the existing B&P Tunnel while still maintaining the existing platforms at Penn Station, which are situated nearly perpendicular to the overall orientation of the NEC. This is achieved by creating a wide, continuous arc so that trains can travel through the study area at higher speeds.

Alternative 3 Option A is nearly identical to the Great Circle Passenger Tunnel concepts originally envisioned through previous studies and the PASR. As the alternative underwent additional design and study, it was determined that the overall travel time between Gwynns Falls Bridge and Penn Station of what is now Option A would be increased by the tight curve where the West Baltimore MARC Station is currently located (referred to as Curve 381). Additionally, it was determined that building Option A would effectively preclude any measures to alleviate the tight curve for the life of the new tunnel. Options B and C were thus developed to retain the basic conceptual alignment of Alternative 3 while alleviating the speed restrictions imposed by Curve 381. This is achieved by shifting the alignment east (Option B) or west (Option C) to modify/improve the curve.

Each option under Alternative 3 would involve surface track work between the existing Penn Station platforms and an existing retaining wall adjacent to the MTA North Avenue LRT station. Each alignment would pierce the retaining wall to pass below the LRT tracks and station before entering into bored tunnels at the north portal.

Tracks in four separate tunnel bores extend between the north and south portals. The alignments would remain below ground until exiting through the south portals, where the tracks would transition back to the surface. Each option for Alternative 3 would involve open cut and cut-and-cover sections to bring the tracks back up to the surface after exiting the south mining portals. Tracks would pass through the south mining portals then through a cut-and-cover section, followed by an open cut (trench) section prior to tie-in with the existing NEC alignment.

Three ventilation plants would be required to ensure proper ventilation of the proposed tunnels for Alternative 3. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate tunnel ventilation plant would be connected to the bored portion of the tunnels. Additionally, emergency egresses would also be required, but the locations for each alignment option have yet to be determined.

1. Alternative 3 Option A

Alternative 3 Option A would result in a total travel distance of 3.66 miles between Penn Station and the Amtrak Gwynns Falls Bridge (as an average of the four tracks). The tunnel segment of the alignment comprises 1.91 miles of this total length. An overview of Alternative 3 Option A, including the horizontal alignment and vertical profile, is shown in **Figure 4**.

a. North Portal

Alternative 3 Option A follows the existing mainline tracks in the Jones Falls valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing track alignment (**Figure 5**). The alignment continues above-ground until it reaches its north portal at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the LRT station to begin its descent below ground. The north portal would include tunnel construction techniques that allow the four tracks to pass below the LRT facilities. A rendering of the north portal is shown in **Plate 8**.

The segment of the alignment below the MTA North Avenue LRT Station would require specialized construction such as ground improvement in advance of tunneling.

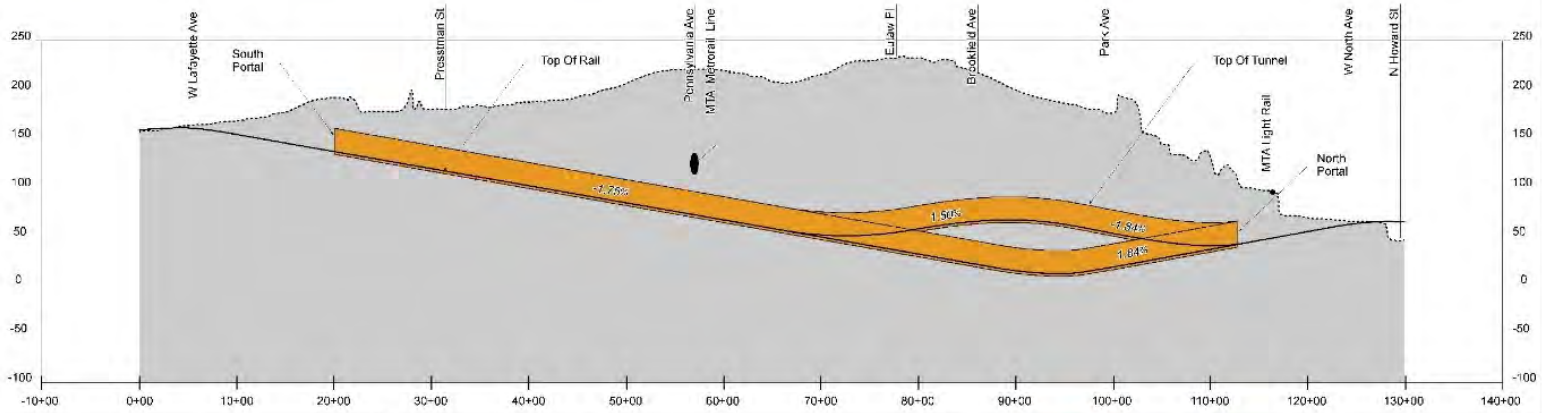
b. Tunnel Segment

Alternative 3 Option A continues below ground in a gradual arc for 1.91 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Sandtown-Winchester, Bridgeview/Greenlawn, Midtown-Edmondson, and Penrose/Fayette. From the north portal, the alignment crosses under I-83 (Jones Falls Expressway) north of the intersection of Reservoir Street and Mount Royal Terrace. The alignment then continues in a gradual curve north of Reservoir Street and Ducatel Street, and south of the east-west portion of Whitelock Street. The alignment continues to curve southwest, crossing Whitelock Street and then the intersection of North and Pennsylvania Avenues. The alignment begins to curve more directly to the south, as the western side of the alignment runs tangent to the east side of the Carver Vocational-Technical High School athletic field boundary.

Through the tunnel segment, the depth of the alignment would reach up to 185 feet, with an average depth of 130 feet (from ground level to top of tunnel).

c. South Portal

Alternative 3 Option A would include a south portal located at the existing P. Flanigan and Sons Asphalt plant, roughly a third of a mile west of the existing B&P Tunnel south portal (**Figure 6; Plates 9 and 10**). The cut-and-



Alternative 3 Option
Surface Limits of Disturbance
Existing B&P Tunnel
Existing Light Rail
Metro Line
Railroad

NORTH

0 500 1,000 2,000 Feet

Figure 4: Alternative 3 Option A Plan & Profile

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Figure 5: Alternative 3 Option A North Portal

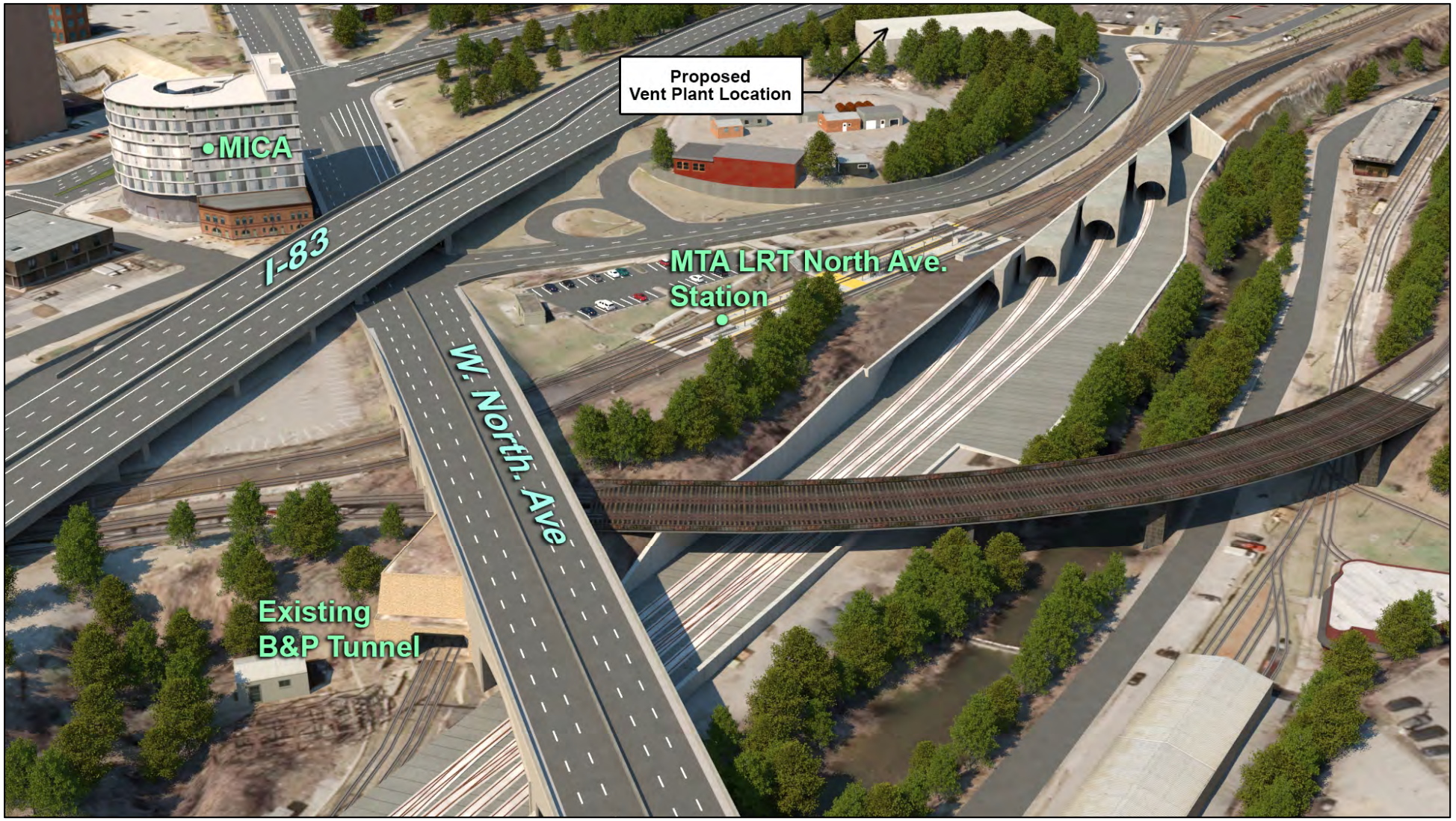

Plate 8: Alternative 3 Option A North Portal Rendering

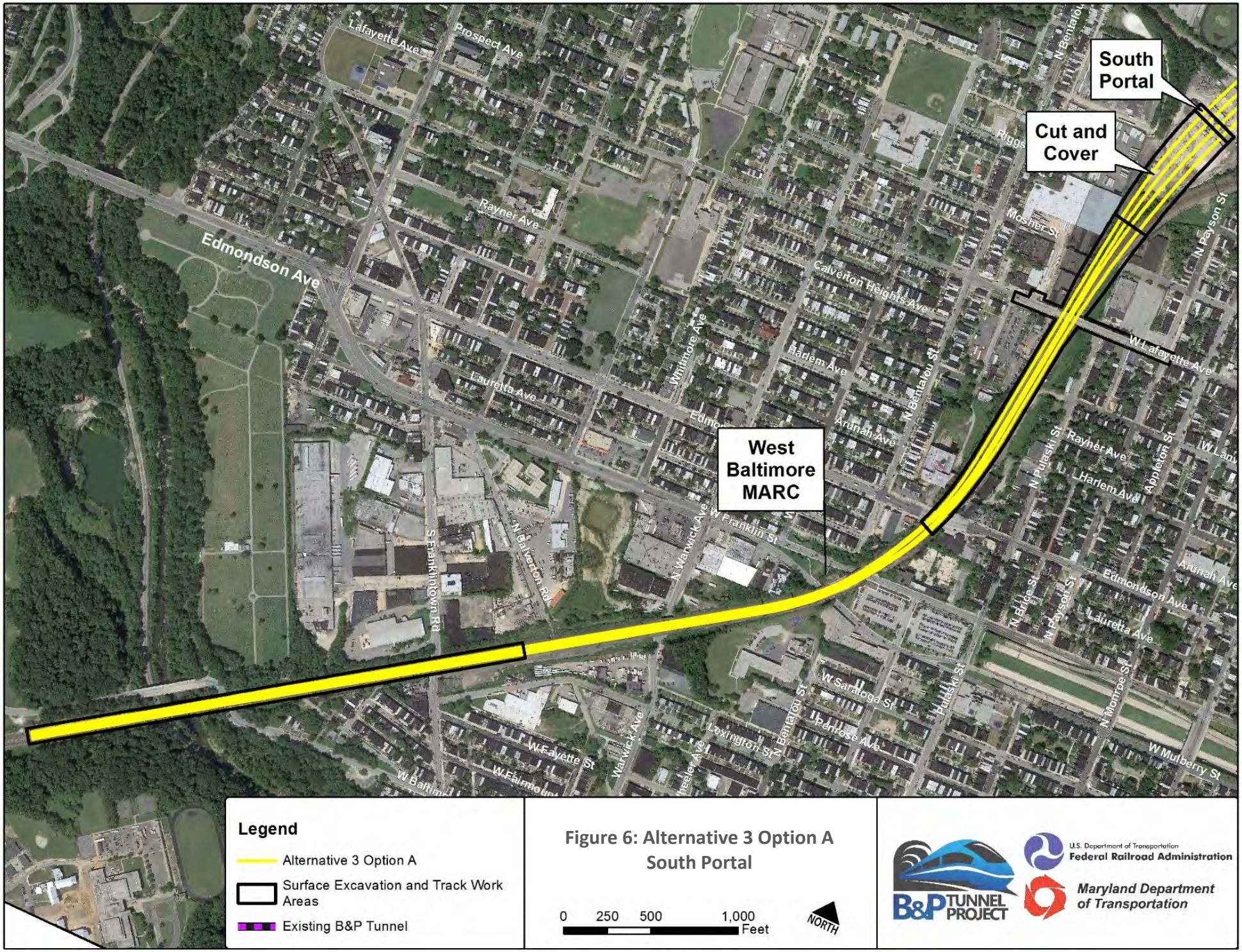

Figure 6: Alternative 3 Option A
South Portal

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Plate 9: Alternative 3 Option A South Portal Rendering

Plate 10: Alternative 3 Option A South Portal Rendering

cover and open cut sections would be located between the P. Flanigan and Sons property and Lafayette Avenue, with some additional at-grade track work located between Lafayette Avenue and Edmondson Avenue. Further at-grade track work within Amtrak right-of-way would be located between Mulberry Street and the Amtrak Gwynns Falls Bridge. A new "Fulton" Interlocking would be constructed south of the permanent south portal. No modifications to the West Baltimore MARC Station would be required, consequently, no high level platform for level boarding at the Station would be provided.

d. Ventilation Plants

Three ventilation plants would be required to ensure proper ventilation of the proposed tunnels. Two of the ventilation plants would be located at the north and south portals atop the cut-and-cover sections. A third intermediate ventilation plant would be located at street level, connected to the bored portion of the tunnels, splitting the tunnel into two unequal lengths in such a way as to balance anticipated transit times in each portion. An area suitable for locating an intermediate tunnel ventilation plant has been identified as part of the preliminary engineering. The area of consideration is shown in **Figure 7**. The area identified is roughly bounded by Whitelock Street to the north, Ducatel Street to the south, Brookfield Avenue to the east and Morris Street to the west. The vent plant would consist of a building, approximately 100 feet by 200 feet by 55 feet high (or smaller) housing the ventilation fan equipment and connected to the tunnel bores via vertical shafts. The proposed location for the intermediate vent plant is near the intersection of Whitelock Street and Brookfield Avenue, as shown on **Plate 11**.

2. Alternative 3 Option B

Alternative 3 Option B would result in a total travel distance of 3.66 miles between Penn Station and the Amtrak Gwynns Falls Bridge (as an average of the four tracks). The tunnel segment of the alignment comprises 2.03 miles of this total length. An overview of Alternative 3 Option B, including the horizontal alignment and vertical profile, is shown in **Figure 8**.

Alternative 3 Option B differs from Option A primarily in the location of the southern portal and the southern tie-in with existing tracks. The Option B alignment modifies the existing speed-limiting curve (referred to as Curve 381) located south of the existing B&P Tunnel along the existing NEC. This is achieved by shifting the existing NEC corridor east between Edmondson and Riggs Avenues in the vicinity of Pulaski and Payson Streets and slightly west in the vicinity of Franklin and Mulberry Streets.

a. North Portal

Alternative 3 Option B follows the existing railroad mainline track in the Jones Falls valley under the Howard Street Bridge to just before North Avenue, where the alternative leaves the existing track alignment to begin its gradual arc (**Figure 9**). The alignment continues above-ground until it reaches its north portal located at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the LRT rail station to begin its descent below ground. The north portal would include tunnel construction techniques that allows the four tracks to pass below the LRT facilities. A rendering of the north portal is shown in **Plate 12**.

The segment of the alignment below the MTA North Avenue LRT Station would require specialized construction such as ground improvement in advance of tunneling.

b. Tunnel Segment

Alternative 3 Option B continues below ground in a gradual arc for 2.03 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Sandtown-Winchester, Bridgeview/Greenlawn, Midtown-Edmondson, and Penrose/Fayette. From the north portal, the alignment crosses under I-83 (Jones Falls Expressway) north of the intersection of Reservoir Street and Mount Royal Terrace. The alignment then continues in a gradual curve north of Reservoir Street and Ducatel Street, and south of the east-west portion of Whitelock Street.

Figure 7: Alternative 3 Area of Consideration for Vent Plant Locations

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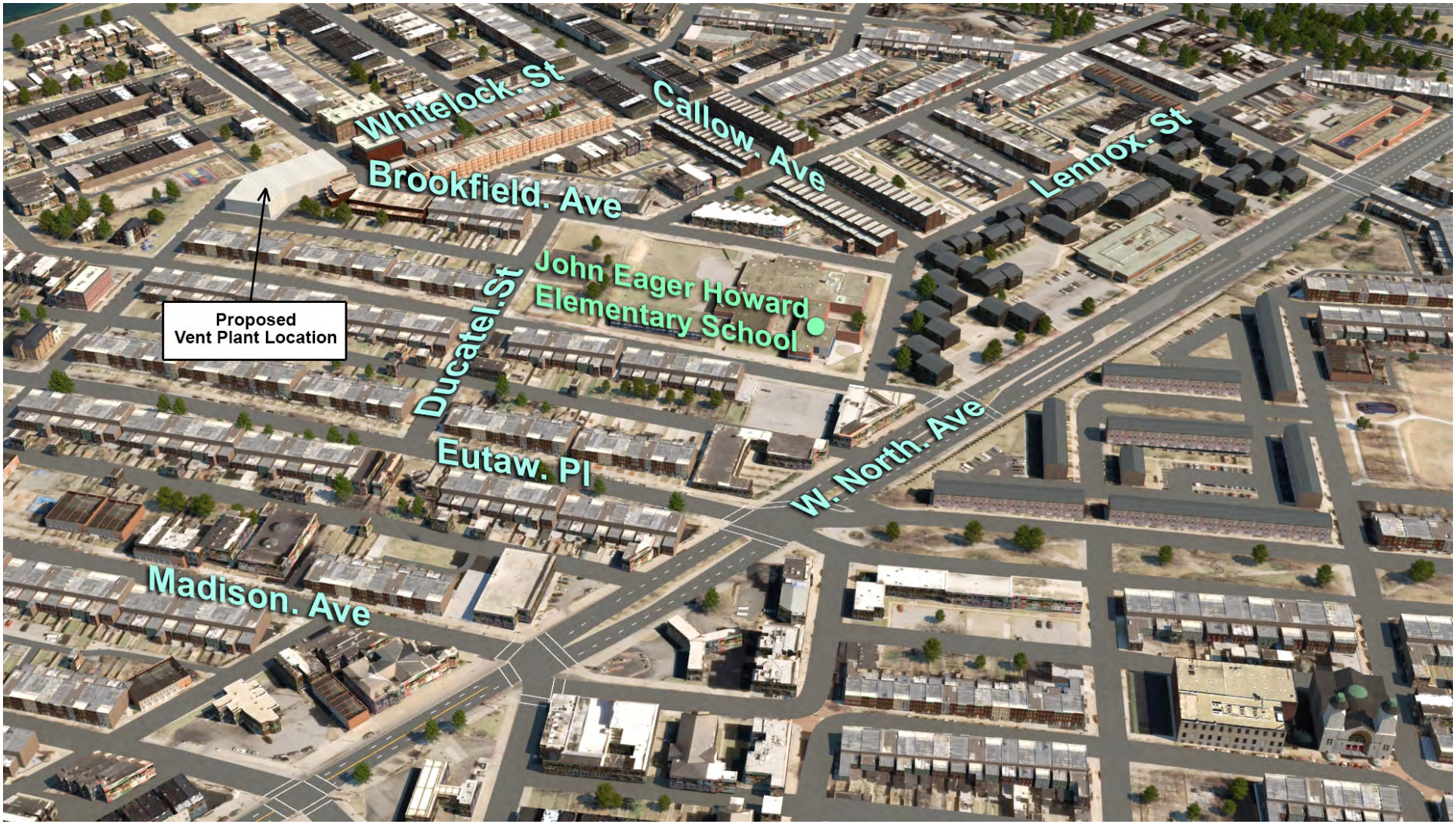
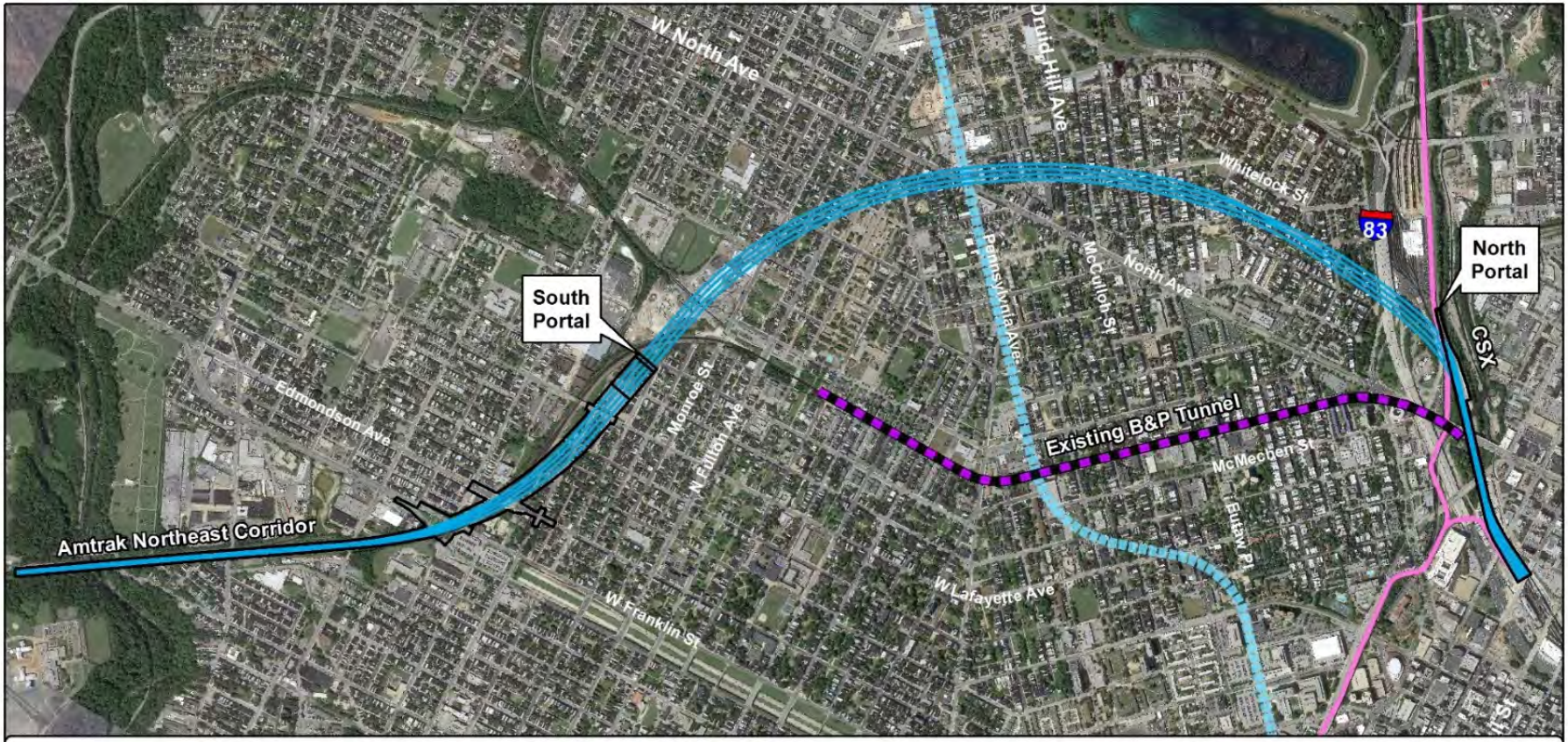
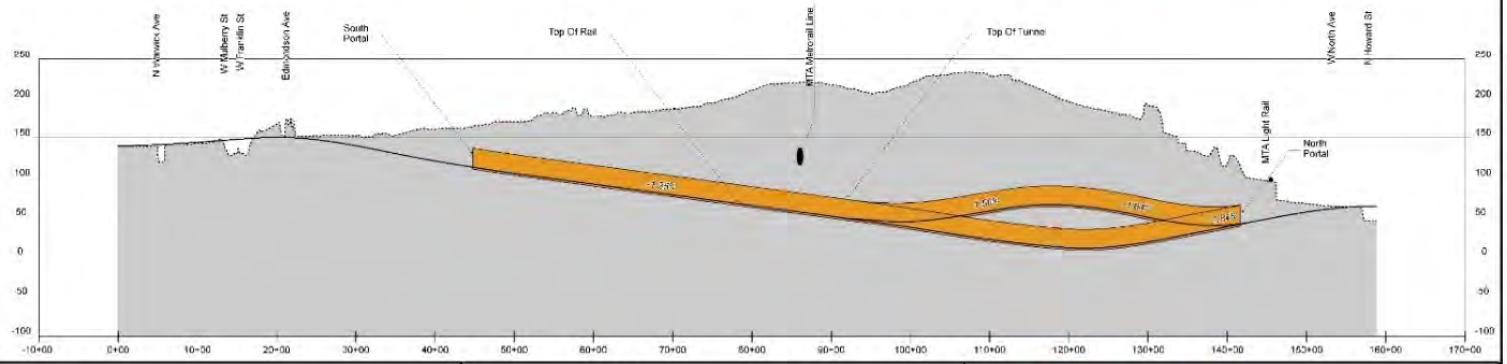


Plate 11: Alternative 3 Options A, B, and C Ventilation Plant Rendering





Alternative 3 Option B
Surface Limits of Disturbance
Existing B&P Tunnel
Existing Light Rail
Metro Line
Railroad

NORTH

0 500 1,000 2,000 Feet

Figure 8: Alternative 3 Option B Plan & Profile

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Figure 9: Alternative 3 Option B North Portal

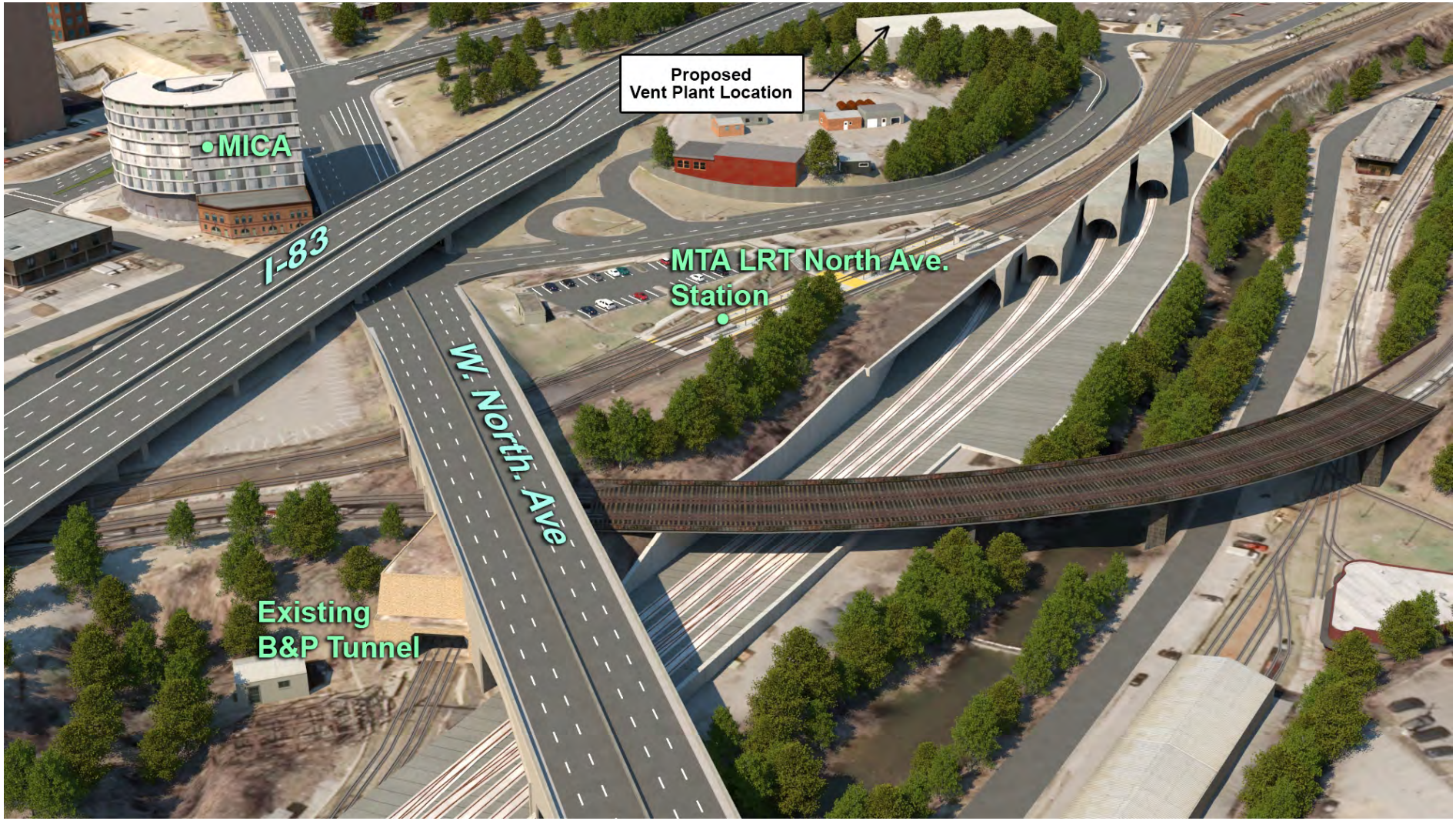


Plate 12: Alternative 3 Option B North Portal Rendering

The alignment continues to curve southwest, crossing the northeast-southwest portion of Whitelock Street and then the intersection of North Avenue and Pennsylvania Avenue. The alignment continues to curve southwest, running under the center of the industrial property at 1320 North Monroe Street; as opposed to Option A, the Option B alignment is shifted further east, away from the Carver Vocational-Technical High School athletic field. The alignment continues to curve more directly to the south, crossing under the Amtrak NEC railroad curve at North Payson Street. Through the bored tunnel segment, the depth of the alignment reaches up to 185 feet, with an average depth of 130 feet (from ground level to top of tunnel).

c. South Portal

Alternative 3 Option B would include a south portal located southeast of the P. Flanigan and Sons Asphalt plant, and approximately 200 feet east of the Option A south portal (**Figure 10**). The cut-and-cover and open cut sections would be located adjacent to the existing NEC between the proposed south portal and Edmondson Avenue, returning to the existing NEC right-of-way in the vicinity of Edmondson Avenue. At-grade track work within Amtrak right-of-way would occur between Edmondson Avenue and the Amtrak Gwynns Falls Bridge. An additional segment of track work within Amtrak right-of-way would occur just south of the Gwynns Falls Bridge. A new "Fulton" Interlocking would be constructed south of the permanent south portal. The West Baltimore MARC Station would be relocated slightly east to align with the new tracks. Some neighborhood streets in the vicinity of the new portal would be closed at the new rail right-of-way and others re-established after construction. **Plates 13 and 14** show a rendering of the south portal.

d. Ventilation Plants

As with Alternative 3 Option A, three ventilation plants would be required to ensure proper ventilation of the proposed Alternative 3 Option B tunnels. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate ventilation plant would be connected to the bored portion of the tunnels, splitting the tunnel into two unequal lengths in such a way as to balance the anticipated transit times in each portion. The area suitable for locating an intermediate tunnel ventilation plant for Alternative 3 Option B is the same as for Alternative 3 Option A, and is shown on **Figure 7** and **Plate 11**.

3. Alternative 3 Option C

Alternative 3 Option C would result in a total travel distance of 3.83 miles between Penn Station and the Amtrak Gwynns Falls Bridge (as an average of the four tracks). The tunnel segment of the alignment comprises 2.23 miles of this total length. An overview of Alternative 3 Option C, including the horizontal alignment and vertical profile, is shown in **Figure 11**.

Alternative 3 Option C differs from Options A and B in the location of the southern portal and tie-in and the alignment of the underground tunnels. The Option C alignment would modify the existing speed-limiting curve (Curve 381) located at the West Baltimore MARC Station. This would be achieved by shifting up to approximately 100 feet west of the existing NEC corridor between Lafayette and Warwick Avenues. The underground tunnel portion of the alignment would be shifted west relative to the other options under Alternative 3.

a. North Portal

Alternative 3 Option C follows the existing railroad mainline tracks in the Jones Falls valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing alignment (**Figure 12**). The alignment continues above-ground until it reaches its north portal located at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the LRT station to begin its descent below ground. The north portal would include tunnel construction techniques that allow the four tracks to pass below the LRT facilities. A rendering of the north portal is shown in **Plate 15**. The segment of the alignment

below the MTA North Avenue LRT Station would require specialized construction such as ground improvement in advance of tunneling.

b. Tunnel Segment

Alternative 3 Option C continues below ground in a gradual arc for 2.23 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Easterwood, Bridgeview/Greenlawn, Midtown-Edmondson, and Penrose/Fayette. From the north portal, the alignment crosses under I-83 (Jones Falls Expressway) north of the intersection of Reservoir Street and Mount Royal Terrace. The alignment's crossing under I-83 is located further to the north of the intersection than either Option A or Option B. The alignment continues in a gradual curve south of Chauncey Avenue and north of Newington Avenue and Whitelock Street. At the intersection of Madison Avenue and Brooks Lane, the alignment begins to arc to the southwest, running roughly in between Clifton Avenue and Retreat Street. The alignment curves more directly to the south, traveling below the intersection of Payson Street and Baker Street. Before entering the south portal, Alternative 3 Option C runs fully under the center of the Carver Vocational-Technical High School athletic field.

Through the tunnel segment, the depth of the alignment reaches up to 170 feet, with an average depth of 140 feet.

c. South Portal

Alternative 3 Option C would include a south portal located at the P. Flanigan and Sons Asphalt plant, just south of the athletic fields at Carver Vocational-Technical High School, roughly a third of a mile west of the existing B&P Tunnel south portal (**Figure 13**). The cut-and-cover and open cut sections would be located on the western edge of the P. Flanigan and Sons property, traveling south in a cut-and-cover section and returning to existing Amtrak right-of-way near Lafayette Avenue. The alignment continues in an open-cut section shifted west of the NEC south of Lafayette Avenue. The alignment would return to ground level and pass above Franklin and Mulberry streets on a structure, before rejoining the NEC near Warwick Avenue. At-grade track work within Amtrak right-of-way would occur between Warwick Avenue and the Amtrak Gwynns Falls Bridge. An additional segment of track work within Amtrak right-of-way would occur just south of the Gwynns Falls Bridge. A new "Fulton" Interlocking would be constructed south of the permanent south portal. The West Baltimore MARC Station platforms would be relocated west to align with the new tracks. Some neighborhood streets in the vicinity of the new portal would be closed at the new rail right-of-way and others re-established after construction. A rendering of the south portal is shown on **Plates 16 and 17**.

d. Ventilation Plants

Three ventilation plants would be required for Alternative 3 Option C to ensure proper ventilation of the proposed tunnels. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate tunnel ventilation plant would be located at street level, connected to the bored portion of the tunnels, splitting the tunnels into two unequal lengths in such a way as to balance the anticipated transit times in each portion. An area suitable for locating an intermediate tunnel ventilation plant has been identified as part of the preliminary engineering. The area identified is shown in **Figure 7**. The area suitable for locating an intermediate tunnel ventilation plant for Alternative 3 Option C is the same as for Alternative 3 Option A, and is shown on **Figure 7** and **Plate 11**.

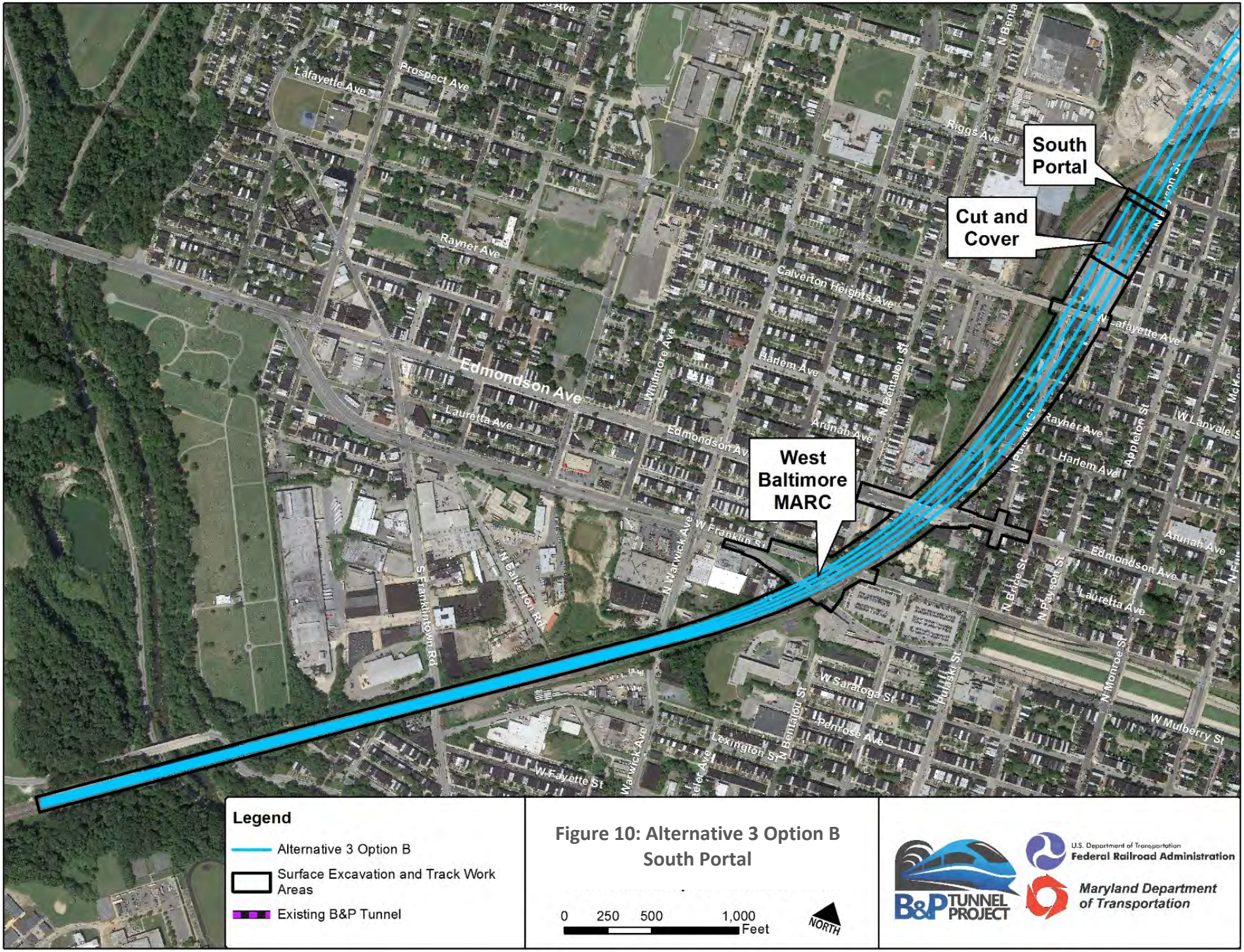


Figure 10: Alternative 3 Option B South Portal

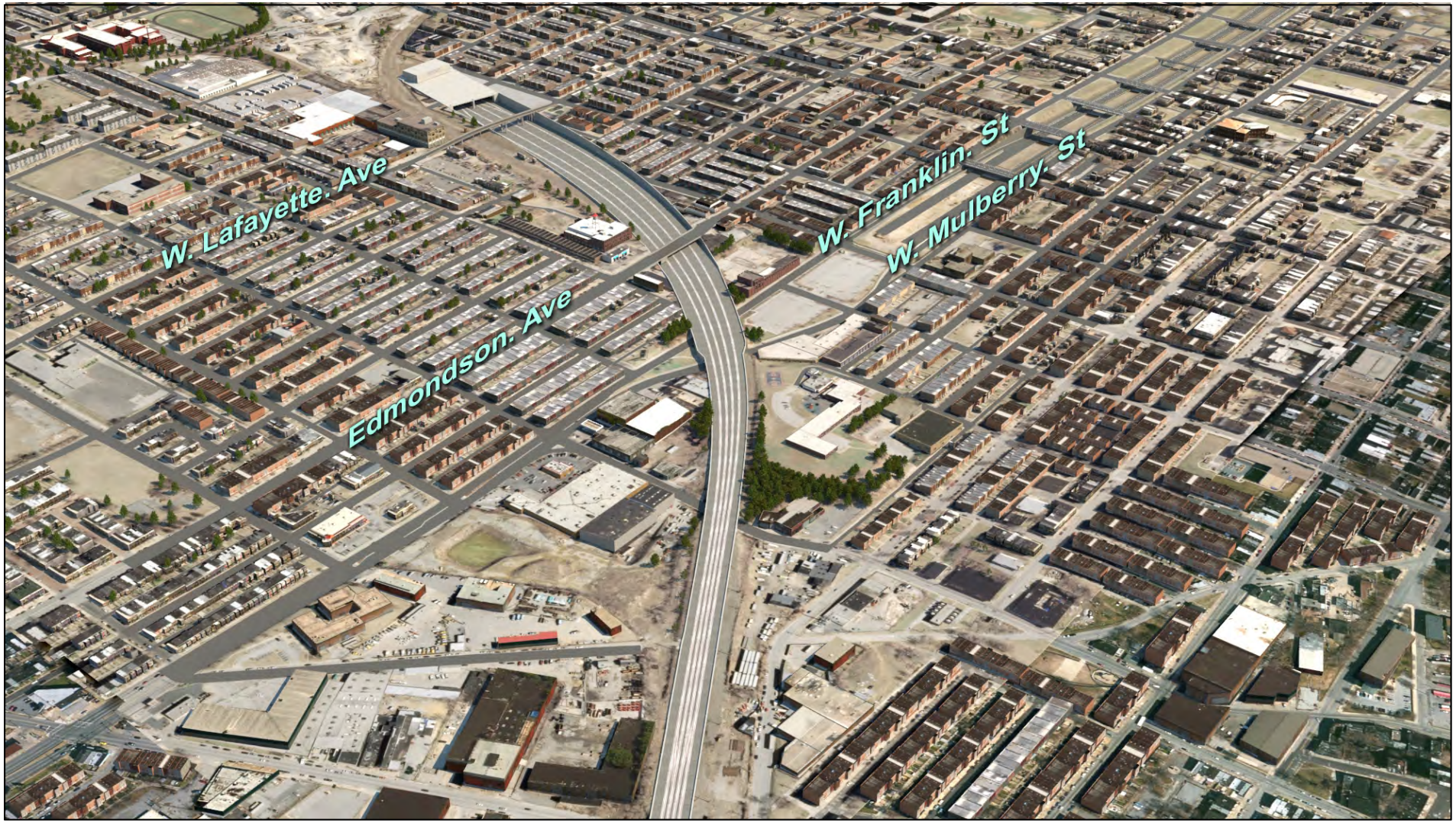


Plate 13: Alternative 3 Option B South Portal Rendering

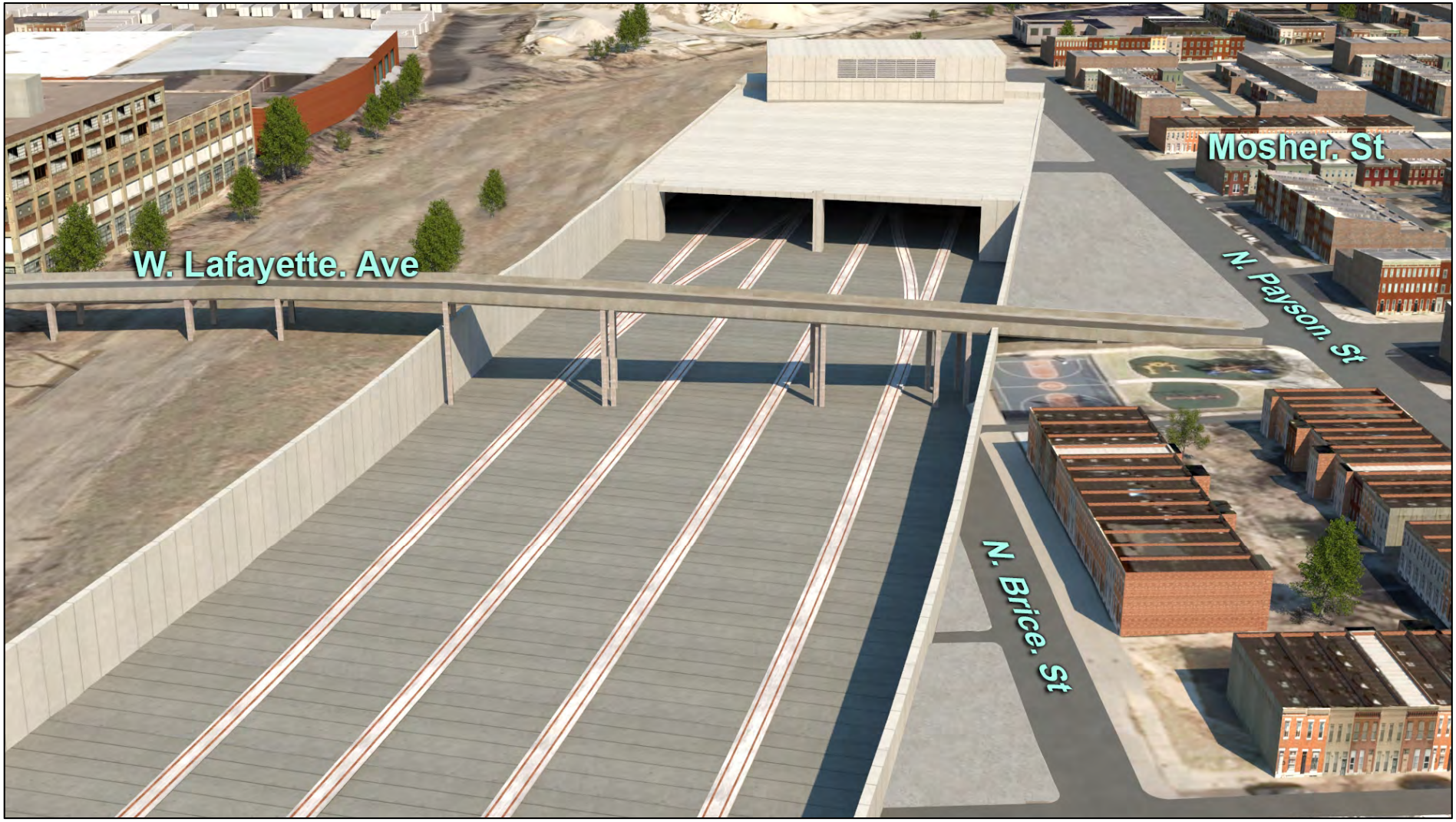
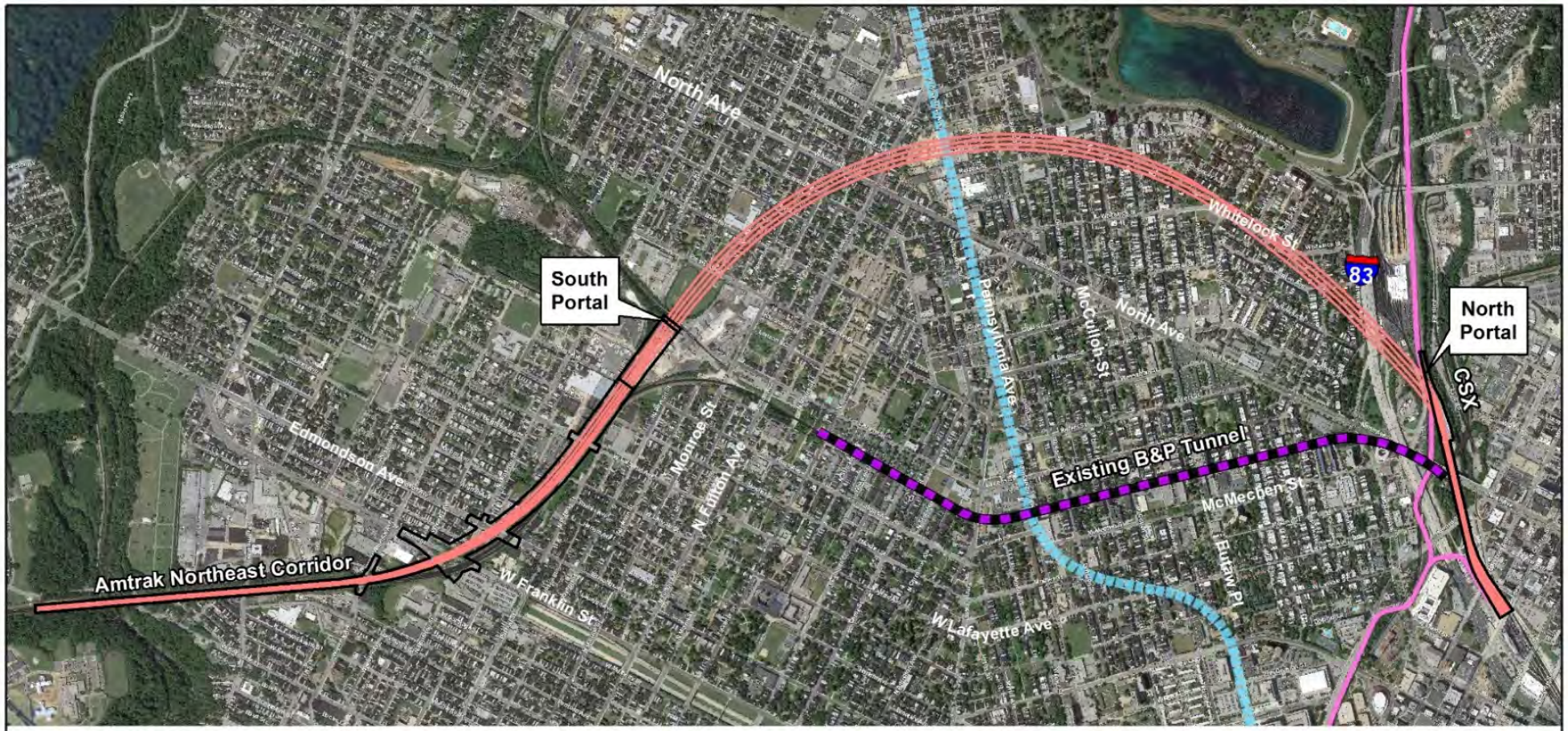
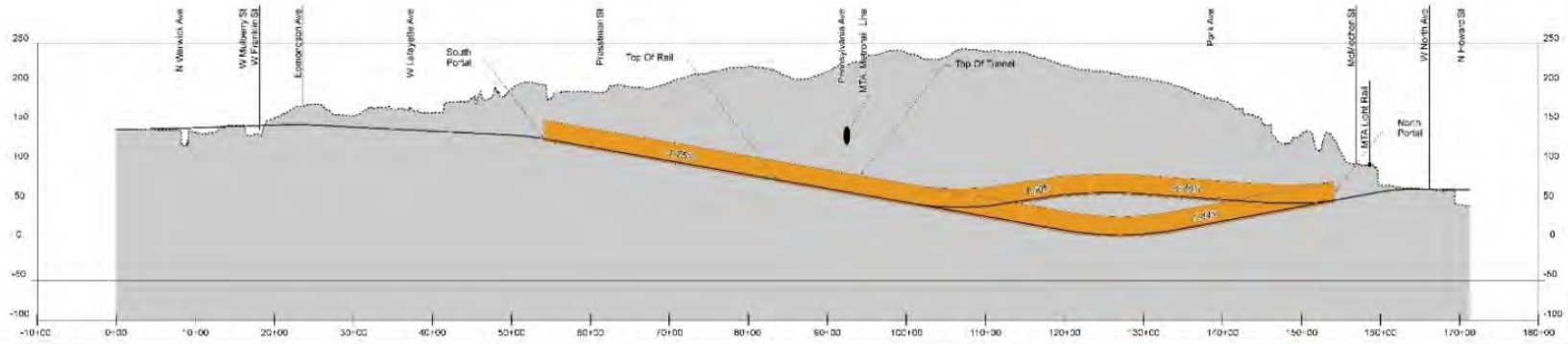


Plate 14: Alternative 3 Option B South Portal Rendering





Alternative 3 Option C
Limits of Surface Disturbance
Existing B&P Tunnel
Existing Light Rail
Metro Line
Railroad

NORTH

0 500 1,000 2,000 Feet

Figure 11: Alternative 3 Option C Plan & Profile

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Figure 12: Alternative 3 Option C North Portal

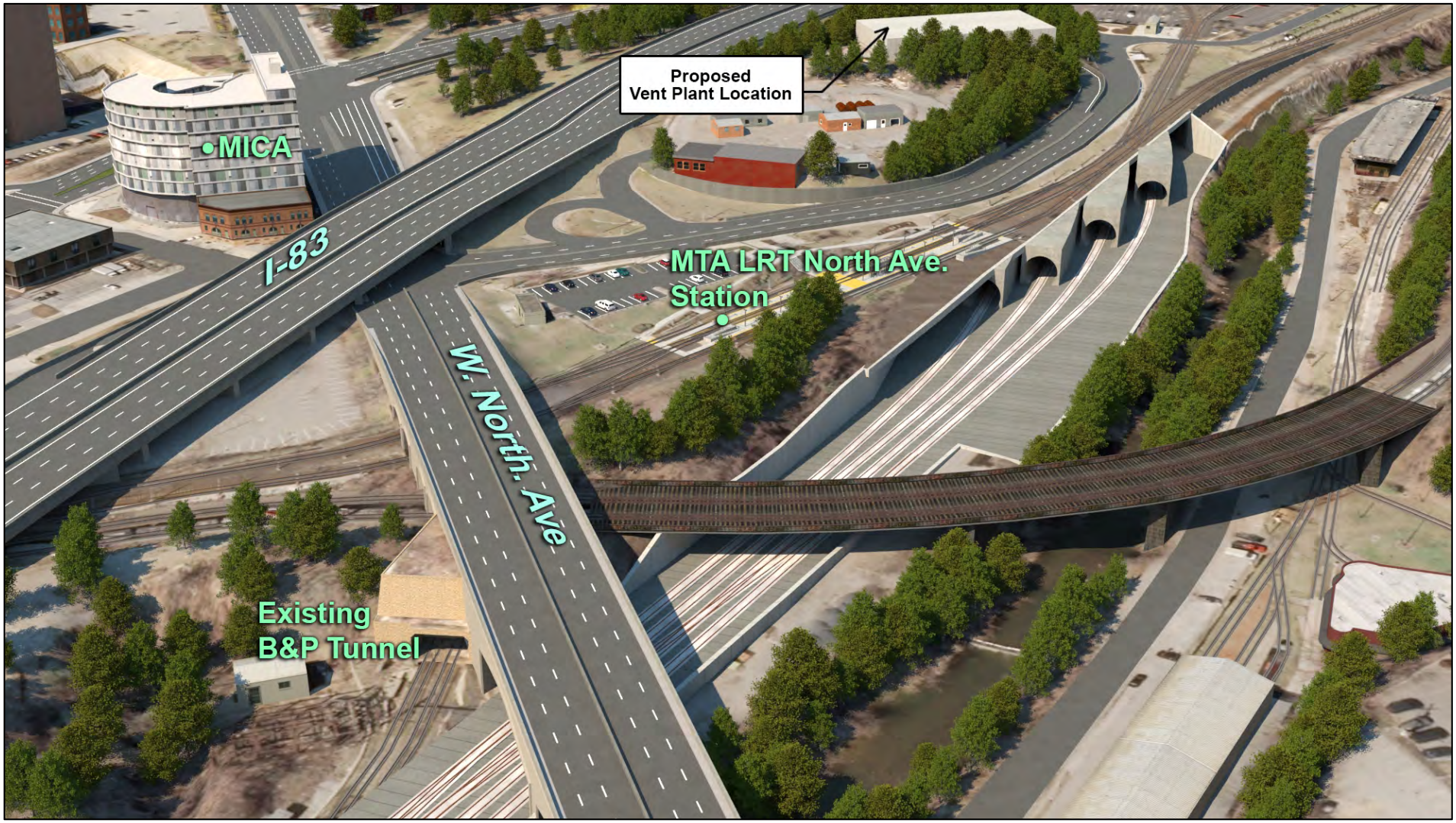


Plate 15: Alternative 3 Option C North Portal Rendering

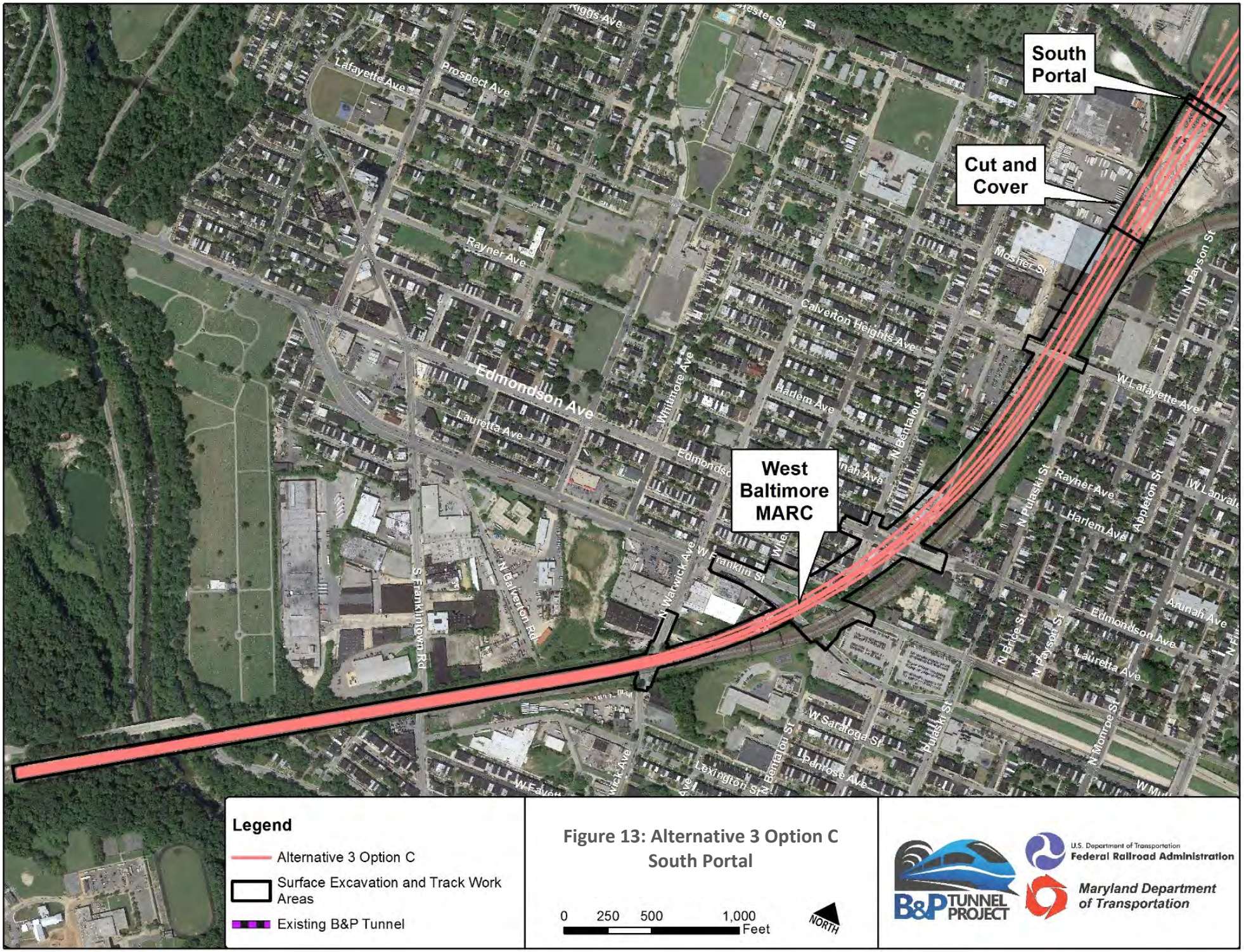


Figure 13: Alternative 3 Option C South Portal

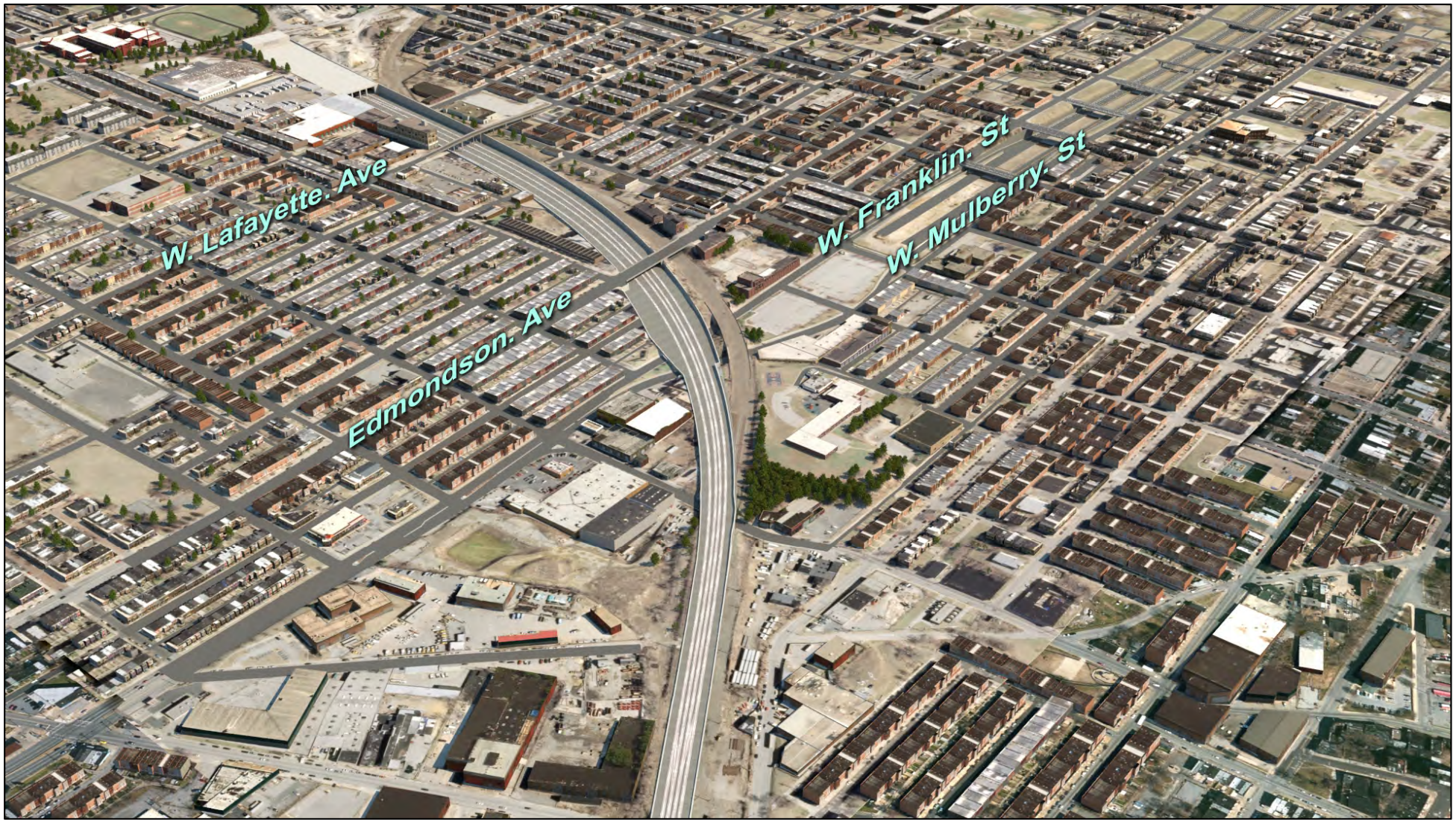


Plate 16: Alternative 3 Option C South Portal Rendering

Plate 17: Alternative 3 Option C South Portal Rendering

D. Alternative 11

Alternative 11 was developed as a straighter alternative to the large, gradual curve of Alternative 3. Two options for Alternative 11 would provide a straightened alignment that would cross diagonally underneath the existing B&P Tunnel. Each option provides universal interlocking to the NEC mainline and avoids the Metro Subway while servicing the West Baltimore MARC Station. Each option would provide four tracks in individual bores to accommodate high frequency, high speed passenger trains and double stack container freight trains. Alternative 11 would include duck under alignments to facilitate conflict-free operations; similar to Alternative 3, the SB MARC track would duck under the two Amtrak tracks to align as the west track at the SB platform at the West Baltimore MARC Station. Both options would relocate a pier of the CSX (formerly B&O) Bridge Number 3. NEC service would continue through the existing tunnel while Alternative 11 is under construction. As Alternative 11 would be on a new location, each would have to consider disposition of the existing tunnel.

Alternative 11 was initially developed during the scoping phase of the current B&P Tunnel Project, and was determined to offer some speed benefits relative to other alignments. Option A is the alignment as originally envisioned during preliminary alternatives development. As the alternative progressed into more detailed preliminary engineering, the project team determined that a high level of community impacts would likely occur in order to build what is now Option A. Option B was developed as an attempt to minimize the community impacts from the alignment while still capitalizing on the speed benefits inherent to the alignment. Alternative 11 Option B was thus developed by shifting the proposed southern portal south to the vicinity of Franklin and Mulberry Streets, and proposing to lower the existing NEC tracks in place south of Mulberry Street.

Each option under Alternative 11 would involve surface track work between the existing Penn Station platforms and an existing retaining wall adjacent to the MTA North Avenue LRT station. Each alignment would pierce the retaining wall to pass below the LRT tracks and station in bored tunnels at the north portal.

Tracks in four separate tunnel bores extend between the north and south portals. The alignments would remain below ground until exiting through the south portals, where the tracks would transition back to the surface.

Each option for Alternative 11 would involve open cut and cut-and-cover sections to bring the tracks back up to the surface prior to exiting the south portal. Tracks would pass through the south portals then through a cut-and-cover section, followed by an open cut (trench) section prior to tie-in with the existing NEC.

Three ventilation plants would be required to ensure proper ventilation of the proposed tunnels for Alternative 11. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate tunnel ventilation plant would be connected to the bored portion of the tunnels. Emergency egresses would also be provided with the locations yet to be determined.

1. Alternative 11 Option A

Alternative 11 Option A would result in a total travel distance of 3.31 miles between Penn Station and the Amtrak Gwynns Falls Bridge (as an average of the four tracks). The tunnel segment of the alignment comprises 1.90 miles of this total length. The short curve and straightened path of this alignment eliminates the existing speed-limiting curve at the West Baltimore MARC Station. An overview of Alternative 11 Option A, including the horizontal alignment and vertical profile, is shown in **Figure 14**.

a. North Portal

Alternative 11 Option A follows the existing mainline tracks in the Jones Falls valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing track alignment (**Figure 15**). The alignment continues above-ground until it reaches its north portal at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the MTA LRT station

to begin its descent below ground. The north portal would include specialized construction techniques that allow the four tracks to pass below the LRT facilities. A rendering of the north portal is shown in **Plate 18**. The segment of the alignment below the MTA North Avenue LRT Station would require specialized construction such as ground improvement in advance of tunneling.

b. Tunnel Segment

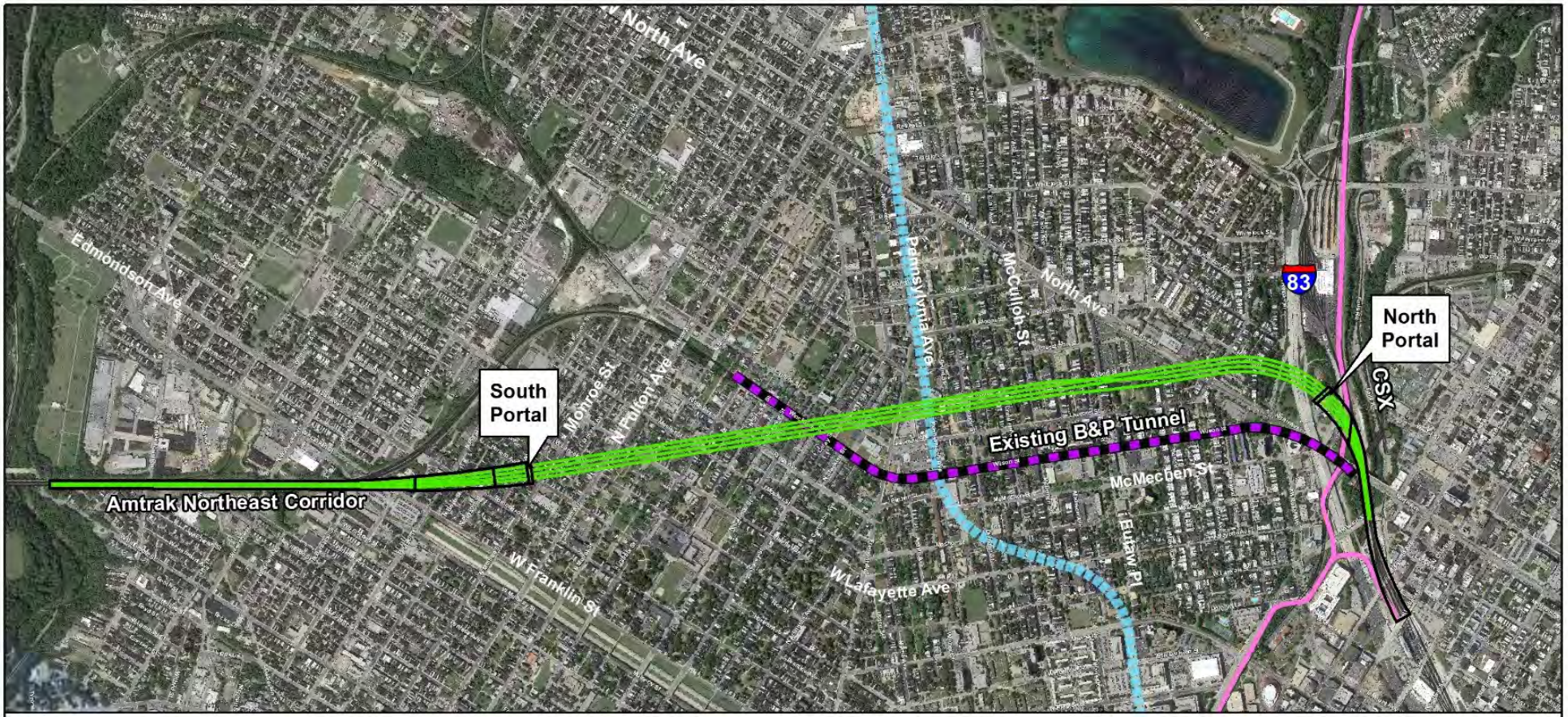
Alternative 11 Option A continues below ground— first in a short arc, then along a straightened path— for 1.90 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Bolton Hill, Madison Park, Druid Heights, Upton, Sandtown-Winchester, Harlem Park, Midtown-Edmondson, and Penrose/Fayette. From the north portal, the alignment curves to the southwest as it crosses under I-83 (Jones Falls Expressway) to run parallel below Robert Street. After crossing below North Fremont Avenue, the alignment continues in the same straightened southwest path below the neighborhood of Sandtown-Winchester.

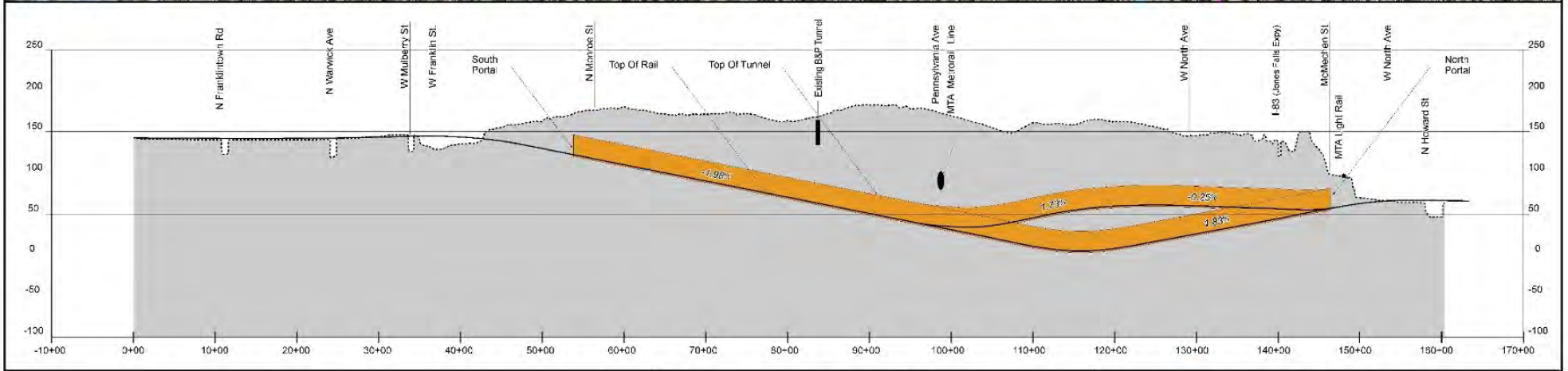
c. South Portal

Alternative 11 Option A would exit the bored tunnel portion at the south portal located just west of the intersection of Harlem Avenue and Appleton Street (**Figure 16; Plates 19 and 20**). Cut-and-cover and open-cut sections would then transition the tracks from the tunnel portal to the surface. The cut-and-cover section would be located, roughly, between Payson and Monroe Streets in the vicinity of Harlem and Edmondson Avenues. An open-cut section would extend from approximately Payson Street southwest to the American Ice Company building, just north of the existing West Baltimore MARC Station parking lot. Alternative 11 Option A would cross over Franklin and Mulberry Streets on an aerial structure (shifted east from the existing crossings) and tie-in to the Amtrak NEC south of Mulberry Street. At-grade track work within existing Amtrak right-of-way would extend south to the Gwynns Falls Bridge, with an additional track work segment just beyond the Gwynns Falls Bridge. A new "Fulton" Interlocking would be constructed south of the permanent south portal. This alternative would require relocating the West Baltimore MARC Station to between Warwick Avenue and Mulberry Street. Some neighborhood streets in the vicinity of the new portal would be closed at the new rail right-of-way and others re-established after construction.

d. Ventilation Plants

Three ventilation plants would be required by Alternative 11 (Options A and B) to ensure proper ventilation of the proposed tunnels. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate tunnel ventilation plant would be at street level, connected to the bored portion of the tunnels, splitting the tunnel into two unequal lengths in such a way as to balance the anticipated transit times in each portion. An area suitable for locating an intermediate tunnel ventilation plant has been identified as part of the preliminary engineering. The area identified is shown in **Figure 17**. The area identified is roughly bounded by Presstman Street to the north, Laurens Street to the south, Etting Street to the west and Morris Street to the east. The vent plant would consist of a building, approximately 100 feet by 200 feet (or smaller) by 55 feet high housing the ventilation fan equipment and connected to the tunnel bores via vertical shafts. The proposed location for the intermediate vent plant is near the intersection of Whitelock Street and Brookfield Avenue, as shown on **Plate 21**.





Alternative 11 Option
Suface Excavation and Track Work Areas
Existing B&P Tunnel
Existing Light Rail
Metro Line
Railroad

NORTH
0 500 1,000 2,000 Feet

Figure 14: Alternative 11 Option A Plan & Profile

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Figure 15: Alternative 11 Option A North Portal

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Plate 18: Alternative 11 Option A North Portal Rendering

Figure 16: Alternative 11 Option A South Portal

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Maryland Department of Transportation

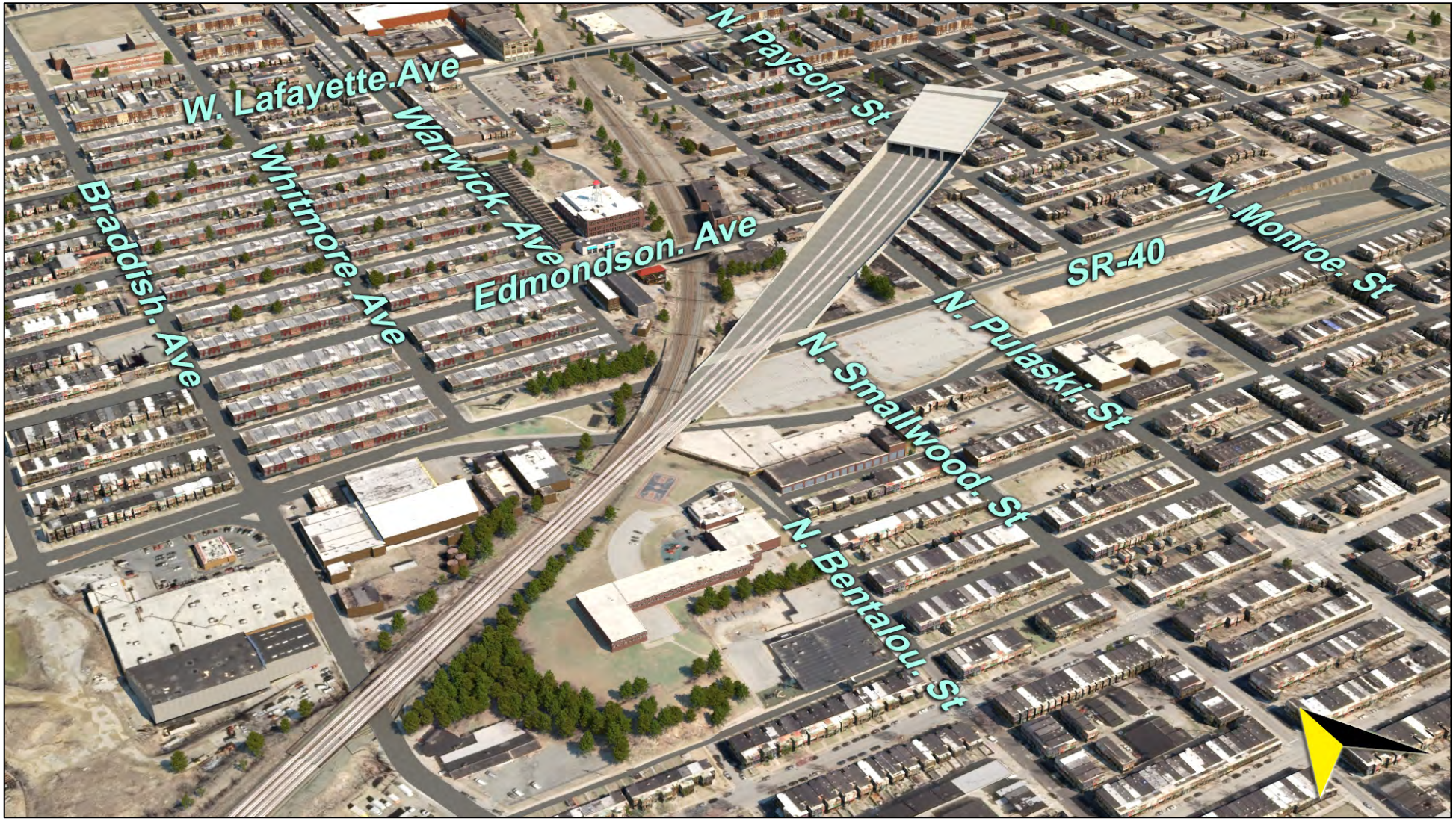

Plate 19: Alternative 11 Option A South Portal Rendering

Plate 20: Alternative 11 Option A South Portal Rendering

Figure 17: Alternative 11 Areas of Consideration for Vent Plant Locations

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Plate 21: Alternative 11 Options A and B

Ventilation Plant Rendering

2. Alternative 11 Option B

Alternative 11 Option B would result in a total travel distance of 3.35 miles between Penn Station and the Amtrak Gwynns Falls Bridge (as an average of the four tracks). The tunnel segment of the alignment comprises 2.26 miles of this total length. The short curve and straightened path of this alignment eliminates the existing speed-limiting curve at the West Baltimore MARC Station. An overview of Alternative 11 Option B is shown in **Figure 18**.

a. North Portal

Alternative 11 Option B follows the existing mainline tracks in the Jones Falls valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing track alignment (**Figure 19**). The alignment continues above-ground until it reaches its north portal located retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the MTA LRT station to begin its descent below ground. The north portal would include tunnel construction techniques that allow the four tracks to pass below the LRT facilities. A rendering of the north portal is shown in **Plate 22**.

b. Tunnel Segment

Alternative 11 Option B travels below ground for 2.26 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Bolton Hill, Madison Park, Druid Heights, Upton, Sandtown-Winchester, Harlem Park, Midtown-Edmondson, and Penrose/Fayette. From the north portal, the alignment curves slightly to the southwest to cross under I-83 (Jones Falls Expressway). The alignment straightens as it travels under North Avenue, just west of Park Avenue. It continues directly to the southwest, running parallel with the north side of Robert Street. After crossing below North Fremont Avenue, the alignment continues southwest below the neighborhood of Sandtown-Winchester. The tunnel portion of the alignment runs parallel with Option A, but shifted slightly north.

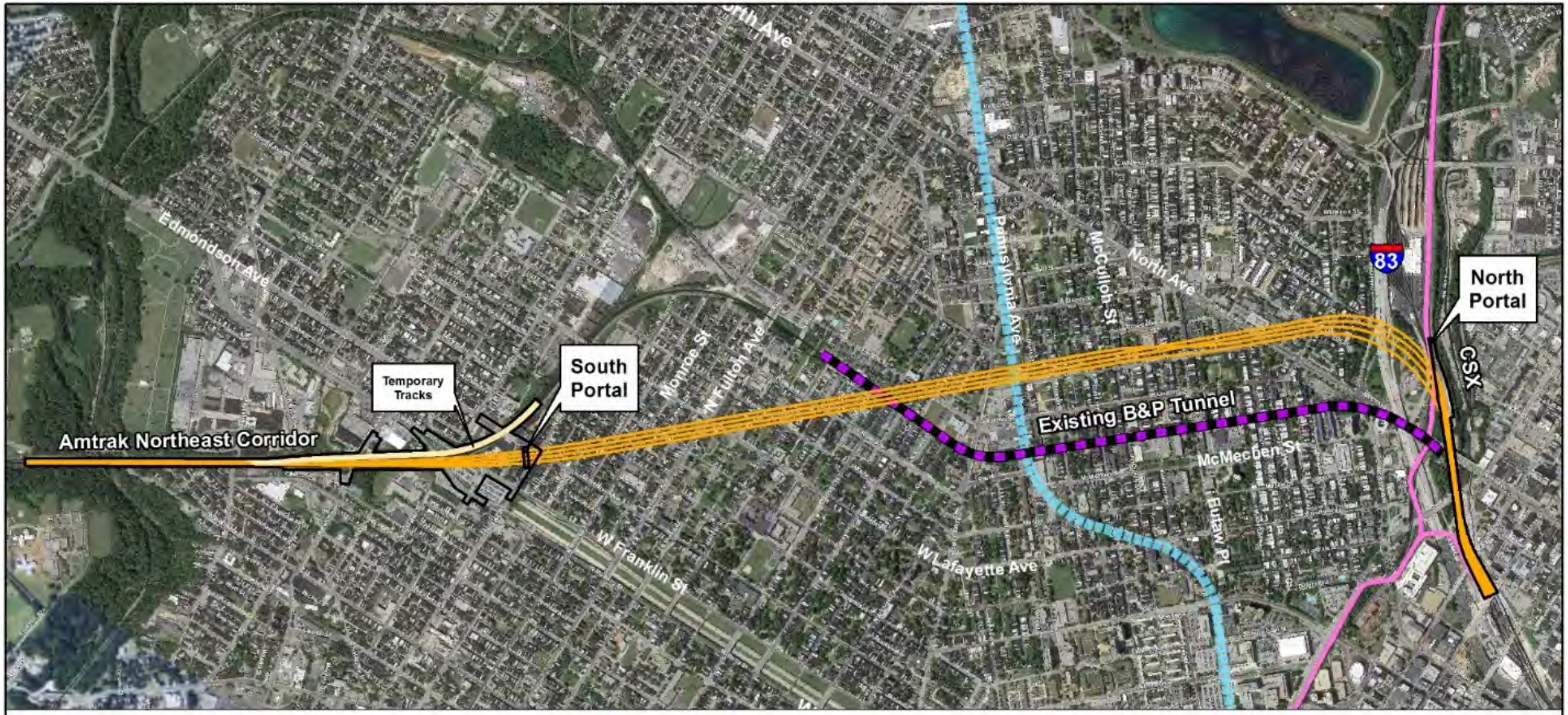
c. South Portal

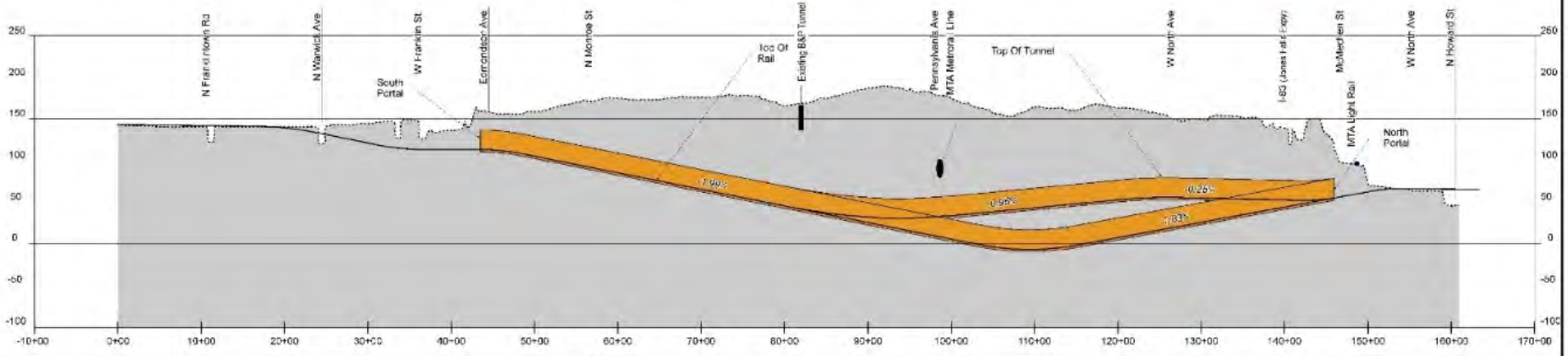
Alternative 11 Option B would exit the bored tunnel portion at the south portal located just southwest of the intersection of Edmondson Avenue and Pulaski Street (**Figure 20**). An open-cut section would then transition the tracks from the tunnel portal to the surface. The trackwork would return to grade north of Franklintown Road. Warwick Avenue, Mulberry and Franklin Streets that are currently overpassed by the NEC would be reconstructed in new viaducts over the new alignment. At-grade track work within existing Amtrak right-of-way would extend south to the Gwynns Falls Bridge, with an additional trackwork segment just beyond the Gwynns Falls Bridge. This alternative would relocate the West Baltimore MARC Station to an open-cut/below-grade in the existing parking area. Under this alternative, no new "Fulton" Interlocking would be constructed, therefore, if a track was shut down in the tunnel, the station could only be serviced by one track/platform. Some neighborhood streets in the vicinity of the new portal would be closed at the new rail right-of-way and others re-established after construction. **Plate 23** shows a rendering of the south portal.

Alternative 11 Option B would require a segment of four temporary tracks in order to maintain train service through the corridor during construction. This temporary segment would run parallel on the north and west side of the existing NEC tracks roughly between Franklintown Road and Franklin Street.

d. Ventilation Plants

Three ventilation plants would be required to ensure proper ventilation of the proposed tunnels. Two of the ventilation plants would be located near the north and south mining portals. A third intermediate tunnel ventilation plant would be at street level, connected to the bored portion of the tunnels, splitting the tunnels into two unequal lengths in such a way as to balance the anticipated transit times in each portion. The area identified for the intermediate vent plant would be the same as for Alternative 11 Option A, as shown on **Figure 17** and **Plate 21**.





Alternative 11 Option B
Surface Limits of Disturbance
Existing B&P Tunnel
Existing Light Rail
Metro Line
Railroad
NORTH
0 500 1,000 2,000 Feet

Figure 18: Alternative 11 Option B Plan & Profile

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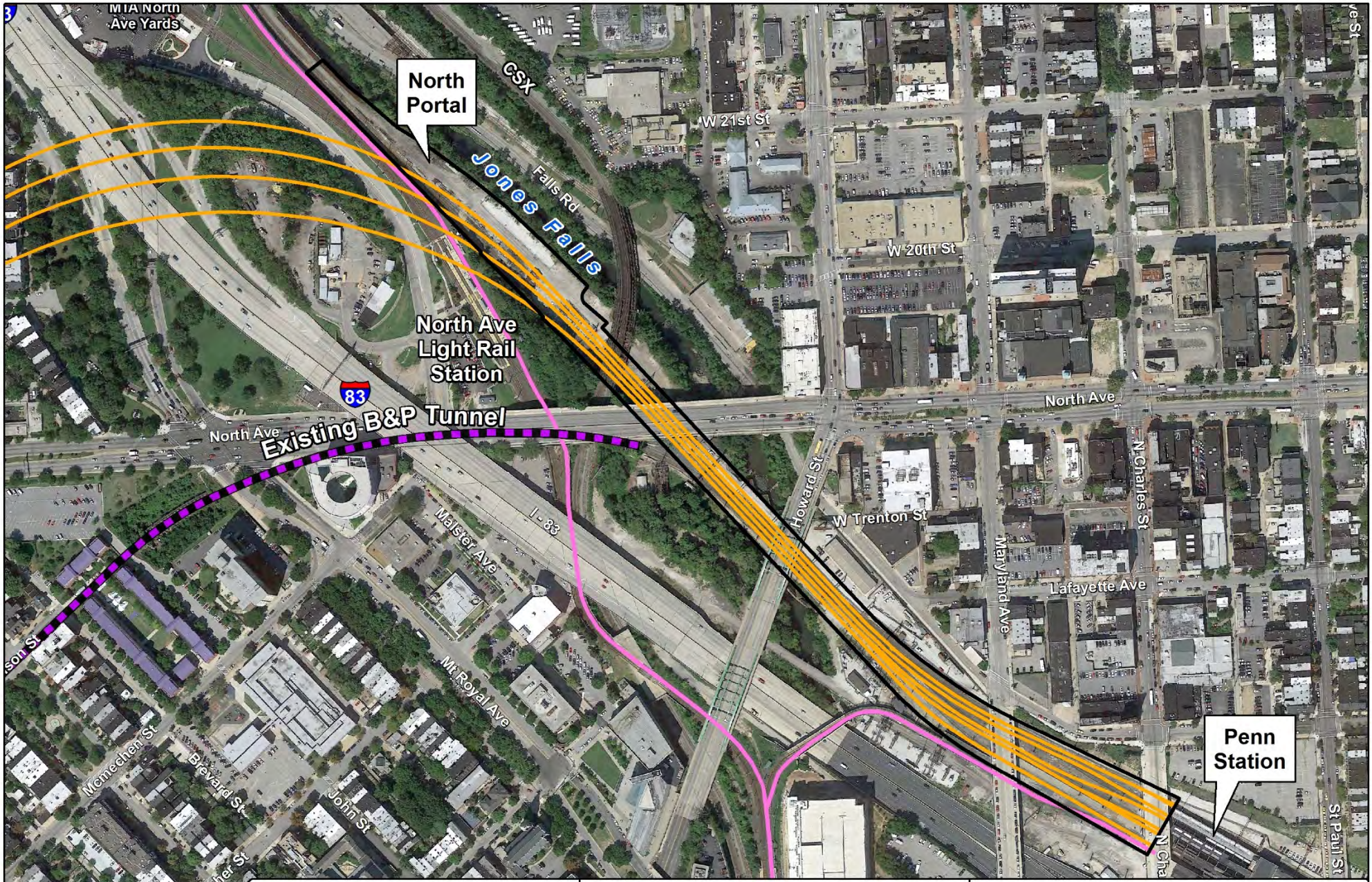

Figure 19: Alternative 11 Option B
North Portal

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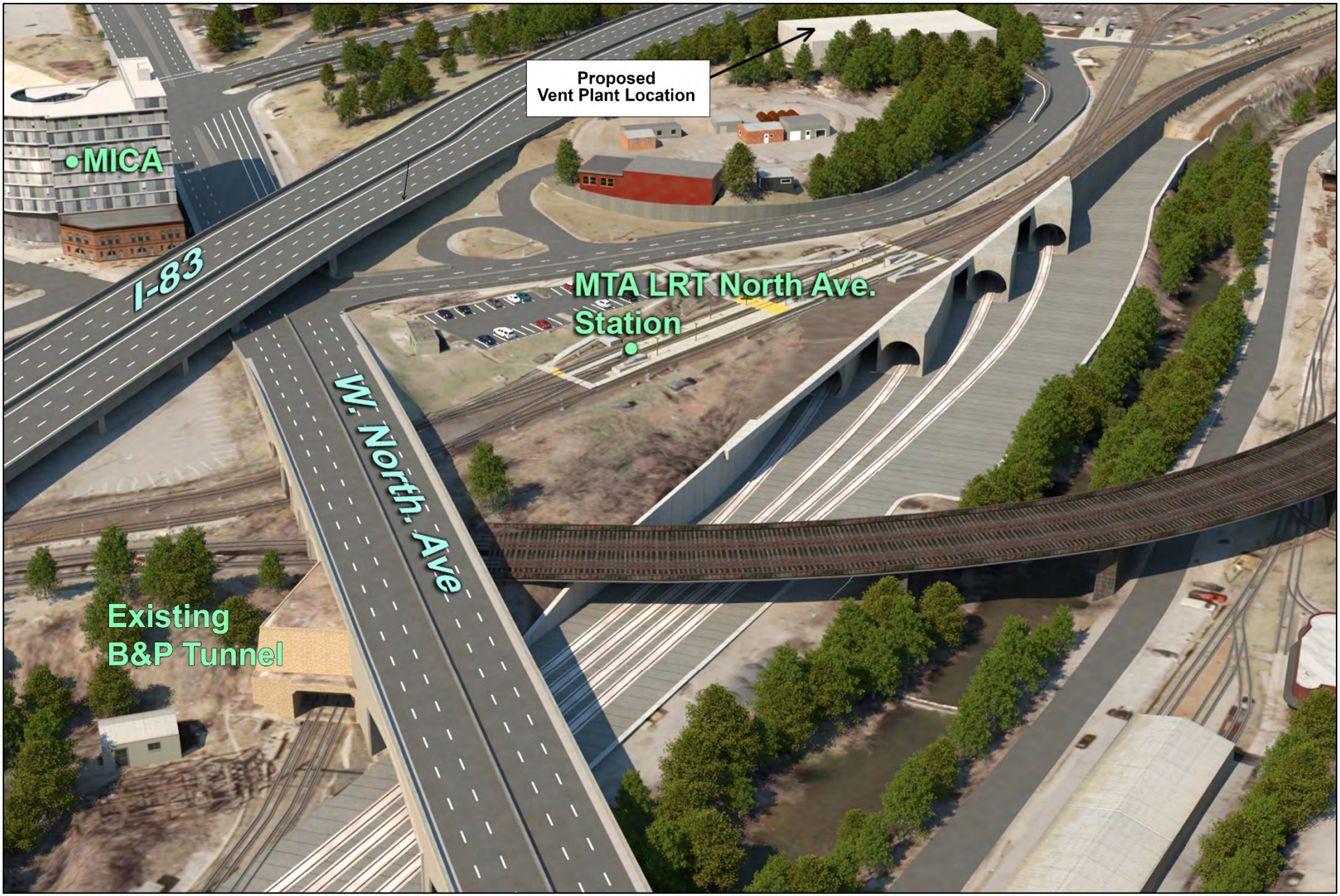

Plate 22: Alternative 11 Option B North Portal Rendering

Figure 20: Alternative 11 Option B South Portal

Plate 23: Alternative 11 Option B South Portal Rendering

IV. ALTERNATIVES EVALUATION METHODOLOGY

A. Methodology

This analysis developed 51 criteria to evaluate the feasibility and potential environmental impacts of the four alternatives selected for further study. These criteria and the input received from the public and agencies were used in evaluating each alternative.

Engineering criteria are based in part on accepted design criteria established to ensure the safety, efficiency, and functionality of railroad improvements in the United States. Environmental criteria are based on Council on Environmental Quality (CEQ) guidance (40 CFR §1502.16 and §1508.27).

The evaluation criteria considered in this evaluation are individually described below.

B. Evaluation Criteria

Criterion 1: Travel Time between Penn Station and Gwynns Falls Bridge

This criterion measures the travel time between the northern and southern project limits. The length of the new alignment in combination with speed of operation determines the segment travel time. Alignments that reduce travel time relative to the existing B&P Tunnel will better meet the Project's purpose and need. Travel times are estimated for Amtrak Acela, Amtrak Regional, and MARC commuter train services in both northbound (NB) and southbound (SB) travel directions. Freight travel time is not estimated as the stated Project need is to maintain current levels of service.

Criterion 2: Travel Time Savings over Alternative 1

In order to more clearly identify the relative value of each alternative in terms of travel time savings, this criterion presents the amount of travel time saved relative to Alternative 1: No-Build condition Alternative 1. This is based on the same northern and southern project limits as in Criterion 1. Travel time savings are presented in minutes and seconds saved relative to Alternative 1 for Amtrak Acela, Amtrak Regional, and MARC Commuter train services. Travel time savings are presented as an average of northbound and southbound directions.

Criterion 3: Value of Time Savings

The value of time savings is estimated to provide additional perspective on the monetary value of the travel time differences calculated. First, the travel time difference (relative to the existing NEC alignment) is multiplied by the number of riders per day in 2040 (based on Amtrak NEC Futures projections) to determine the cumulative travel time savings that would result from passengers utilizing NEC rail service. This cumulative travel time savings is then multiplied by dollar amounts established by the US Department of Transportation, for both business and personal travelers, to estimate the total monetary value of the time savings that would result from an alternative. Values are reported for a yearly basis in 2015 dollars.

Criterion 4: Lowest Design Speed within the Alignment

Criterion 4 is included to show what restrictions on train travel speed, in miles per hour (mph), would result from the alternative alignments. Tight curves, for example, require trains to travel at slower speeds through the curved sections. This criterion, along with Criterion 5 below (Maximum Design Speed along the Alignment), helps demonstrate how train speeds would be potentially limited by the geometry of the alternatives.

Criterion 5: Maximum Design Speed along the Alignment

This criterion presents the maximum speed, in miles per hour, allowable by the alternative alignment. Straighter track segments, gradual curves, and modest grades allow for relatively higher speeds, which can contribute to travel time savings relative to alignments with tighter curves or steeper grades (see Criterion 1).

Criterion 6: Average Operating Speed (SB/NB)

This is the average speed of operation for passenger trains traveling along the alternative alignments. Because the design speed on any alignment varies throughout the length of the alignment, this criterion accounts for speeds along the full length to determine an average. Averages for NB and SB travel are included.

Criterion 7: Operational Flexibility and Reliability

Operational flexibility and reliability are determined by factors such as the ability to transfer trains between tracks via interlockings, and grade-separated tracks to minimize conflicts at junctions. Alternatives with high operational flexibility and reliability would enable more efficient operations by allowing trains to be re-routed as needed, for example, to pass slower trains or avoid tunnels closed for maintenance.

Criterion 8: Meets Projected Year 2040 Level of Service for Amtrak/MARC/Freight

This criterion indicates whether an alignment can fully accommodate the projected future rail service needs along the NEC and not preclude the NEC FUTURE alternatives for the selection of a preferred investment program in the corridor through 2040. Projected year-2040 travel demand information provided by the Amtrak NEC FUTURE program, compared to the travel times and throughput capacity (number of trains through a given area) of the alternatives, determines whether future service requirements will be met. Projected bi-directional train frequencies for all types of rail service (i.e. express, regional, metropolitan commuter) needed at the B&P Tunnel are 386 trains per day with 35 per standard peak hour. All NEC FUTURE alternatives envision four tracks through the B&P Tunnel to meet existing and projected service needs while select alternatives would accommodate high speed rail and double stack container freight trains.

Criterion 9: Length of Alignment between Penn Station and Gwynns Falls Bridge

The length of the alignment between the Project endpoints will, in part, determine the travel time through the study corridor. This criterion represents the distance of the alignment between Penn Station and the Amtrak Gwynns Falls Bridge in miles, as an average of the two or four-tracks proposed for each alternative.

Criterion 10: Length of Tunnel

This criterion measures the length of underground tunnel alignment for each alternative in miles. This includes the length of bored tunnel plus the cut-and-cover sections. This criterion represents the distance of underground tunnel in miles, as an average of the two or four-tracks proposed for each alternative.

Criterion 11: Steepest Vertical Grade

This is the maximum vertical gradient along each alignment.

Criterion 12: Ability to Meet Current Design Criteria: Passenger and Freight

Each alternative is given a rating on its ability to meet current passenger and freight design criteria such as the number of tracks, clearance envelopes, security, Life/Safety, and other design elements. Alternatives are rated as high, medium, or low for both passenger and freight.

Criterion 13: Depth of Tunnel

This criterion presents the average depth of the tunnel in feet. The average depth was calculated by using a weighted average of depth within the tunnel.

Criterion 14: Major Utility Relocations

Each alternative is rated based on the relative extent of major utility relocations required. Major utilities are those which, based on size or complexity of design, may involve a significant cost or project element. Each alternative is

rated as minor, moderate, major, or severe. Ratings are based on early conceptual layout of utility relocations required to accommodate proposed rail alignments.

Criterion 15: Estimated Number of On-Street Parking Spaces Lost

Criterion 15 is an estimate of the number of on-street parking spaces that would need to be temporarily or permanently eliminated in order to construct each alternative. This criterion has been developed using desktop geographic information systems (GIS) analysis and has not been field-verified.

Criterion 16: Requires Reconstruction of West Baltimore MARC Station

This criterion indicates whether the alignment would require reconstruction of the existing West Baltimore MARC Station. Reconstruction would occur if an alternative requires relocation of the existing tracks along which the MARC Station platforms are currently aligned.

Criterion 17: West Baltimore MARC Station in Proximity to Existing MARC Parking

The West Baltimore MARC Station platforms are currently located adjacent to a parking lot that serves the station. This criterion indicates whether an alignment would require shifting the West Baltimore MARC Station away from its current location between Franklin and Mulberry Streets, where it would no longer be adjacent to the existing parking lot.

Criterion 18: Allows for High Level Platforms at West Baltimore MARC Station between Franklin and Mulberry Streets

The curvature of the existing NEC alignment at West Baltimore MARC currently precludes high level platforms, which provide benefits such as faster boarding and improved wheelchair accessibility. This criterion indicates for each alternative whether the proposed alignment would allow for new high-level platforms to be located in roughly the same location as the existing platforms, between Franklin and Mulberry Streets.

Criterion 19: Capital Cost Estimate

Criterion 19 presents an estimate of the capital cost required to build each alternative. Alternatives 3 and 11 are presented in year-of-expenditure dollars for 2023. Year 2023 is assumed as the midpoint of a 5-year construction process beginning in 2020. Escalation of 3.5% per year is factored in to account for inflation. Alternatives 1 and 2 are presented in 2015 dollars.

Criterion 20: Impacts to Existing Amtrak Operations during Construction/Rehabilitation

The degree to which Amtrak operations would be impacted by the construction of each alternative is evaluated under this criterion. Temporary disruptions to service, reduced speeds, and other operational impacts resulting from construction are considered. Operational impacts resulting from the alternatives are rated as minor, moderate, major or severe.

Criterion 21: Impacts to Existing MARC Operations during Construction/Rehabilitation

This criterion indicates the degree to which MARC operations would be impacted by the construction of each alternative. Temporary disruptions to service, reduced speeds, and other operational impacts resulting from construction are considered. Operational impacts resulting from the alternatives are rated as minor, moderate or severe.

Criterion 22: Impacts to Existing LRT Operations during Construction/Rehabilitation

Criterion 23 indicates the degree to which existing LRT operations would be impacted by the construction of each alternative. Temporary disruptions to service, reduced speeds, and other operational impacts resulting from

construction are considered. Operational impacts resulting from the alternatives are rated as minor, moderate or severe.

Criterion 23: Impacts to Existing NEC Freight Rail Operations during Construction/Rehabilitation

Criterion 24 evaluates the degree to which existing NEC freight rail operations would be impacted by the construction of each alternative. Temporary disruptions to service, reduced speeds, and other operational impacts resulting from construction are considered. Operational impacts resulting from the alternatives are rated as minor, moderate or severe.

Criterion 24: Temporary Community Impacts during Construction

This criterion provides a rating of the degree to which construction of the portal excavation areas for each alternative could result in temporary community impacts. Impacts such as traffic, noise, vibration, and visual impacts from construction are considered. Potential community impacts during construction are rated as high, medium, or low.

Criterion 25: Surface Right-of-Way Acreage Required, by Land Use Type

An estimate of the surface right-of-way acreage required to construct the portal areas for each alternative is provided. This includes excavation areas (open cut and cut-and-cover sections) as well as surface track areas required based on preliminary design. Construction occurring within existing Amtrak right-of-way, bored portions of tunnels, roadway modifications, and utility relocations are not included in this criterion.

The area impacted is categorized into four general land-use categories – residential, commercial, industrial, and other uses. This analysis is based on Baltimore City GIS data and field observation.

Criterion 26: Surface Acreage of Roadway LOD

Modification of existing roadways will be required to accommodate the proposed tunnel portal areas. This criterion provides an estimate of the acreage that would be disturbed to complete the necessary roadway modifications. Acreage estimates are based on limits of disturbance developed during preliminary engineering.

Criterion 27: Estimated Surface Parcels Affected

This criterion provides an estimated number of parcels potentially impacted by portal excavation and surface track construction for each of the alternatives. Estimates are developed using GIS parcel data from Baltimore City overlaid with preliminary design surface footprints. Both the estimated temporary and permanent right-of-way are included. Existing Amtrak right-of-way, utility relocations, roadway modifications, and bored portions of tunnels are not included in this criterion.

Criterion 28: Area of Excavation (Including Open Cut)

Criterion 28 calculates the estimated area that would need to be excavated, based on preliminary design, to construct the tunnel portals for each alternative. Prior to entering into an underground bored tunnel, areas of open cut and cut-and-cover construction will be required to transition the proposed tracks from the surface to deep below ground. This criterion provides an estimated area of surface excavation, reported in acres.

Criterion 29: Area of Permanent Open Cut

This criterion is the area of permanent open cut construction required based on preliminary design for each alternative. This area is included within the area of excavation reported above, and represents the portion of the excavated area that would remain permanently as open trench.

Criterion 30: Estimated Residential Building Displacements

An estimated number of residential buildings potentially displaced by excavation and surface track construction for each of the alternatives is provided. Estimates are developed using GIS parcel, land use, and building footprint data from Baltimore City (verified with field observation) overlaid with preliminary design surface footprints.

Criterion 31: Estimated Business Displacements

The estimated number of businesses potentially displaced by excavation and surface track construction is provided for each of the alternatives. Estimates are developed using GIS parcel, land use, and building footprint data from Baltimore City (verified with field observation) overlaid with preliminary design surface footprints.

Criterion 32: Estimated Community Facility Displacements

Criterion 32 estimates the number of community facilities potentially displaced by excavation and surface track construction for each of the alternatives. Community facilities considered include schools, places of worship, community centers, libraries, recreation facilities, hospitals, fire, and police stations. Estimates are developed using GIS parcel, facility, and building footprint data from Baltimore City (verified with field observation) overlaid with preliminary design surface footprints.

Criterion 33: Estimated Residential Properties Impacted, but Residence Not Displaced

This criterion provides an estimated number of residential parcels potentially impacted by excavation and surface track construction with no building displacements. Estimates are developed using GIS parcel, land use, and building footprint data from Baltimore City (verified with field observation) overlaid with preliminary design surface footprints.

Criterion 34: Estimated Non-Residential Properties Impacted with No Displacement

Criterion 34 estimates the number of non-residential parcels potentially impacted by excavation and surface track construction with no building displacements. Estimates are developed using GIS parcel, land use, and building footprint data from Baltimore City (verified with field observation) overlaid with preliminary design surface footprints.

Criterion 35: Right-of-Way Impacts within Minority Population Areas

The surface right-of-way located within minority population areas required to construct the alternatives is estimated in this criterion. This includes portal excavation areas (open cut and cut-and-cover sections) as well as surface track areas required based on preliminary design. Construction occurring within existing Amtrak right-of-way, utility relocations, intermediate tunnel vent plants, roadway modifications, and bored portions of tunnels are not included in this criterion. Areas are reported in acres.

Minority population areas are identified using US Census 5-Year American Community Survey (ACS) data from 2009-2013. For this project, a minority population area is identified based on census block group data. If 50 percent or more of residents within a census block group identify themselves as minority race and/or ethnicity, the block group is considered a minority population area.

Criterion 36: Right-of-Way Impacts within Low-Income Population Areas

Estimates of the surface right-of-way area required to construct the alternatives located within low-income block groups are provided. This includes portal excavation areas (open cut and cut-and-cover sections) as well as surface track approach areas required based on preliminary design. Construction occurring within existing Amtrak right-of-way, utility relocations, intermediate tunnel vent plants, roadway modifications, and bored portions of tunnels are not included in this criterion. Areas are reported in acres.

Census block groups with low-income populations are identified using US Census 5-Year ACS data from 2009-2013. For the purposes of this study, a census block group is considered a low-income population if its proportion of households living below the US Census Bureau's poverty level is 10 or more percentage points higher than the proportion of Baltimore City households living in poverty (22 percent). Therefore the block groups in which low-income households constitute 32 percent or more of the total are considered low-income and included in the area provided for this criterion.

Criterion 37: Impacts to Baltimore City's West Baltimore MARC Station Master Plan

The *West Baltimore MARC Station Master Plan*, adopted by the Baltimore City Planning Department in 2008, establishes a vision for future improvements to the West Baltimore MARC Station and redevelopment in its vicinity. The plan calls for transit-oriented development surrounding the West Baltimore MARC Station. The Master Plan recommends, as a centerpiece of this new development, conversion of the adjacent historic American Ice Company property into a community activity center with retail and office uses. The plan envisions new development in the surrounding Route 40 and Edmondson Avenue corridors, surrounding residential neighborhoods, and industrial areas along with improvements to streets and open spaces.

This criterion provides a rating of the degree to which each alternative would potentially impact the redevelopment laid out in the West Baltimore MARC Station Master Plan. Land that would be converted to rail transportation use (thus precluding future redevelopment) is considered along with potential changes to the West Baltimore MARC Station platforms or other impacts. Impacts are rated as minor, moderate, or severe.

Criterion 38: Parks Potentially Impacted

The estimated number of parks potentially impacted by portal excavation and surface track construction is provided for each of the alternatives. Estimates are developed using GIS data from Baltimore City overlaid with preliminary design surface footprints. Both the estimated temporary and permanent right-of-way are included. Bored portions of tunnels are not included in this criterion.

Criterion 39: Estimated Area of Parkland Impacted

The area of parkland potentially impacted by excavation and surface track construction for each alternative is provided. Estimates are developed using GIS parcel data from Baltimore City overlaid with preliminary design surface footprints. Both the estimated temporary and permanent right-of-way are included. Bored portions of tunnels are not included in this criterion. Areas are reported in acres.

Criterion 40: Likely Adverse Effects for Historic Properties

This criterion provides the estimated number of NRHP registered or eligible historic properties with likely adverse effects (per Section 106 regulations) resulting from construction of each alternative. Estimates are developed using GIS building and parcel data from Baltimore City (verified with field observation), historic information from Maryland Historic Trust (MHT), and additional research on historic properties and their potential National Register eligibility. Potential adverse effects are assessed based on preliminary design limits of disturbance. Also provided under this criterion is the estimated number of historic elements contributing to one or more NRHP registered or eligible historic districts that would be impacted by construction of each of the alternatives.

Criterion 41: Area of Surface Disturbance within Historic District

This criterion provides an estimated area within NRHP eligible or federally registered historic districts potentially impacted by excavation and surface track construction for each of the alternatives. Estimates are developed using GIS data from the MHT and additional research overlaid with preliminary design surface footprints. Bored portions of tunnels, intermediate tunnel vent plants, roadway modifications, and utility relocations are not included in this criterion. Areas are reported in acres.

Criterion 42: Known Archaeological Resource Sites Impacted

The estimated number of known archaeological sites potentially impacted by excavation and surface track construction is presented for each of the alternatives. Estimates are developed using GIS data from the MHT overlaid with preliminary alternative designs. Both the estimated temporary and permanent right-of-way are included.

Criterion 43: Stream Impacts

Criterion 43 provides an estimated length of streams potentially impacted by excavation and surface track construction for each of the alternatives. Estimates are developed using stream centerline GIS data from the National Hydrography Dataset overlaid with preliminary alternative designs. Both the estimated temporary and permanent right-of-way are included. Impacts are reported in linear feet.

Criterion 44: Wetland Impacts

Area of wetlands potentially impacted by excavation and surface track construction is provided for each of the alternatives. Estimates are developed using National Wetlands Inventory GIS data overlaid with preliminary alternative designs. Both the estimated temporary and permanent right-of-way are included. Impacts are reported in acres.

Criterion 45: Street Trees Impacted

This criterion provides an estimated number of street trees potentially impacted by portal excavation and surface track construction for each of the alternatives. Estimates are developed based on field observation and preliminary alternative designs. Utility relocations, intermediate tunnel vent plants, and roadway modifications are not included in this assessment.

Criterion 46: Forested Land Impacted

Criterion 46 provides an estimated area of forested land potentially impacted by portal excavation and surface track construction for each of the alternatives. Estimates are developed using GIS Data from Baltimore City and verified with aerial imagery overlaid with preliminary alternative designs. Impacts are reported in acres. Utility relocations, intermediate tunnel vent plants, and roadway modifications are not included.

Criterion 47: Section 4(f) Properties Impacted

This criterion presents a count of Section 4(f) regulated historic resources and parks that could be impacted by the alternatives. Section 4(f) of the Department of Transportation Act of 1966 requires federally funded or approved transportation projects to demonstrate there is no feasible or prudent alternative to the use of protected resources such as historic sites important for preservation in place, public parks and recreation areas, and wildlife refuges. The number of Section 4(f) resources includes NRHP listed or eligible historic districts, individually listed or eligible historic properties, and public parks. Historic resources that are contributing to a historic district but not individually eligible for listing on the NRHP are not included in this criterion. Impacts which are estimated to be De Minimis are included in this count; potential impacts that do not quality as a Section 4(f) "use" are not included.

Criterion 48: Hazardous Materials Sites Identified

The number of potential hazardous materials sites are identified for each alternative. Hazardous materials sites, generally, are locations with history of storage, contamination, dumping, or spills of hazardous materials. The sites identified are classified into high, medium, and low priority sites based on factors such as type of hazardous materials, location and gradients relative to the alignment corridors, documented cleanup work at the sites, and other factors.

Criterion 49: Number of Buildings with Potential Noise Impacts

Criterion 49 estimates the number of buildings potentially impacted by noise resulting from each of the alternatives. Noise impacts to residential and institutional buildings from construction or operation of the alternatives are included in this measure. Noise impacts are modeled by using established FTA methodology to generate noise contours, which are overlaid with GIS land use and building footprint data to determine impacts. Impacts are categorized as moderate or severe based on guidance from FTA. A severe impact means "A significant percentage of people would be highly annoyed by new noise." A moderate impact means "The change in noise level is noticeable to most people, but may not cause strong adverse reactions."

Criterion 50: Number of Sites with Potential Vibration Impacts

Potential vibration impacts from operation of the alternatives were evaluated using the guidelines set forth by the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment [May 2006]. In addition, temporary construction vibration levels were also evaluated using both the FTA guidelines as well as standard industry practices for evaluating vibration due to tunnel boring and other tunnel excavation activities. This analysis was conducted using currently available information absent of vibration monitoring data that describes the ground-propagation characteristics or the building coupling losses.

Criterion 51: Permanent Negative Visual Impacts

Potential permanent negative visual impacts resulting from the alternatives are assessed based on preliminary designs and ranked as none, minor, moderate, or severe. The potential visibility of the above-ground constructed improvements associated with each alternative is considered, along with the surrounding land uses and existing visual context in close proximity.

V. EVALUATION OF ALTERNATIVES

A. Overview

The evaluation of alternatives forms the basis in which to narrow down alternatives and ultimately reach a Preferred Alternative. Each of the four alternatives, Alternatives 1, 2, 3 and 11, as well as the options to Alternative 3 and 11 are evaluated through the 51 criteria established and shown in **Table 3.** These criteria collectively address all major categories of interest to agencies, stakeholders, and the general public. The overall categories are Operations, Engineering, Transportation, Cost, Construction, Right-of-Way, Community Resources, Cultural Resources, Natural resources, and other Environmental.

Application of the evaluation criteria does not include weighting of the individual criteria. The evaluation table is a tool to collectively assess each alternative. In comparing alternatives, it is extremely rare that one alternative will be "best" or "worst" with regard to all criteria. Typically, a comparison of alternatives will lead to elimination of the overall worst alternatives as part of a process that ultimately results in the best overall alternative.

This Alternatives Report documents the conclusion that Alternatives 2, 11 Option A, and 11 Option B are eliminated from further consideration and that Alternatives 1, 3 Options A, B, and C are still under consideration. The alternatives still under consideration will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

B. Alternatives Eliminated from Further Consideration

1. Alternative 2

Alternative 2 would reconstruct and modernize the existing tunnel. The Alternative 2 evaluated in this study would be on existing alignment and would continue to carry only two tracks, as described earlier in this report. Alternative 2 would only partially meet purpose and need for the Project by returning the tunnel to a good state of repair and satisfying current Life/Safety requirements. However, it would not meet a number of key purposes of the project and would require closure of Amtrak's NEC through Baltimore during construction. Closure of the NEC is not considered a feasible option. Furthermore it would not improve travel time, not accommodate projected travel demand, not eliminate impediments to existing and proposed operations along the NEC, and not provide operational flexibility. It would not accommodate the high frequency, high speed, and double stack container freight cars needed to expand capacity and provide operational reliability needed for the NEC.

Specific reasons for the elimination of Alternative 2:

- The construction of this alternative would require the complete cessation of rail service in NEC corridor, including all Amtrak service, as well as MARC service north of this location, and freight service currently using the B&P Tunnel, for an extended period of time, as long as several years.
- Design speeds for this alternative would be the same as the current tunnel, as the horizontal geometry would remain effectively unchanged. Design speed would be as low as 30 mph, significantly lower than the other build alternatives.
- This alternative would provide no travel time savings over the existing conditions.
- This alternative, as defined, can only accommodate two tracks, which does not accommodate future growth in rail service in the corridor. The provision of four tracks could be accommodated by more significantly widening the existing alignment. This option was not analyzed because there is no available right-of-way and the widening to four tracks would require significant residential takes for the entire length of the alignment. An option to build four new tracks under the existing tunnel (in a two-by-two arrangement) is not feasible due to the clearances needed from the MTA Metro Subway line and infeasible geometry to bring the tracks together in a four track arrangement transitioning from the tunnel portals.

Table 3: Alternatives Evaluation

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3 Option A (4 Tracks)	Alt 3 Option B (4 Tracks)	Alt 3 Option C (4 Tracks)	Alt 11 Option A (4 Tracks)	Alt 11 Option B (4 Tracks)
Operations	1. Travel Time Between Penn Station and Gwynns Falls Bridge (SB/NB)	Minutes: Seconds	Amtrak Acela 5:43/6:10 Amtrak Regional 5:50/6:19 MARC 5:50/6:14	Amtrak Acela 5:43/6:10 Amtrak Regional 5:50/6:19 MARC 5:50/6:14	Amtrak Acela 3:59/4:02 Amtrak Regional 4:19/4:19 MARC 4:56/4:17	Amtrak Acela 3:24/3:25 Amtrak Regional 3:43/3:34 MARC 4:22/3:56	Amtrak Acela 3:27/3:27 Amtrak Regional 3:46/3:37 MARC 4:33/4:04	Amtrak Acela 3:16/3:11 Amtrak Regional 3:31/3:25 MARC 4:09/3:25	Amtrak Acela 3:20/3:16 Amtrak Regional 3:34/3:29 MARC 4:16/3:28
	2. Travel Time Savings over Alternative 1 (SB/NB)	Minutes: Seconds	Not Applicable	Amtrak Acela 0:00 Amtrak Regional 0:00 MARC 0:00	Amtrak Acela 1:56 Amtrak Regional 1:46 MARC 1:26	Amtrak Acela 2:32 Amtrak Regional 2:26 MARC 1:53	Amtrak Acela 2:30 Amtrak Regional 2:23 MARC 1:44	Amtrak Acela 2:43 Amtrak Regional 2:37 MARC 2:15	Amtrak Acela 2:39 Amtrak Regional 2:33 MARC 2:10
	3. Value of Time Savings for All Passengers[1]	Dollars per year	Not Applicable	$0 per Year	$32.5 Million per Year	$43.4 Million per Year	$42.3 Million per Year	$46.8 Million per Year	$45.5 Million per Year
	4. Lowest Design Speed within the Alignment	MPH	30 mph	30 mph	50 mph	50 mph	50 mph	50 mph	50 mph
	5. Maximum Design Speed along the Alignment	MPH	75 mph	75 mph	100 mph	100 mph	100 mph	110 mph	110 mph
	6. Average Operating Speed (SB/NB)	MPH	Amtrak Acela 35/34 mph Amtrak Regional 34/34 mph MARC 34/34 mph	Amtrak Acela 35/34 mph Amtrak Regional 34/34 mph MARC 34/34 mph	Amtrak Acela 54/56 mph Amtrak Regional 50/52 mph MARC 44/52 mph	Amtrak Acela 63/66 mph Amtrak Regional 57/63 mph MARC 49/57 mph	Amtrak Acela 65/68 mph Amtrak Regional 59/65 mph MARC 49/57 mph	Amtrak Acela 60/65 mph Amtrak Regional 56/60 mph MARC 47/60 mph	Amtrak Acela 59/64 mph Amtrak Regional 55/60 mph MARC 46/60 mph
	7. Operational Flexibility and Reliability	High Medium Low	Low – only two tracks in common bore	Low – only two tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	Medium – four tracks in individual bores; can only platform at West Baltimore from one tunnel track
	8. Meets Projected Year 2040 Level of Service for Amtrak/ MARC/ Freight	Yes/No	No – two tracks does not accommodate projected level of service; does not accommodate double-stack freight	No – two tracks does not accommodate projected level of service	Yes	Yes	Yes	Yes	Yes
Engin-eering	9. Length of Alignment between Penn Station and Gwynns Falls Bridge	Miles	3.5 Miles	3.5 Miles	3.66 Miles	3.66 Miles	3.83 Miles	3.31 Miles	3.35 Miles
	10. Length of Tunnel	Miles	1.42 Miles	1.42 Miles	1.91 Miles	2.03 Miles	2.23 Miles	1.90 Miles	2.26 Miles

[1] 2040 Projected ridership, 2015 dollars

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3 Option A (4 Tracks)	Alt 3 Option B (4 Tracks)	Alt 3 Option C (4 Tracks)	Alt 11 Option A (4 Tracks)	Alt 11 Option B (4 Tracks)
Engineering	11. Steepest Vertical Grade	% Grade	1.3%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%
	12. Ability to Meet Current Project Design Criteria: Passenger (P) and Freight (F)	High Medium Low	Low (P) Low (F) Two tracks in a single bore, does not accommodate double-stack freight	Low (P) High (F) Two tracks in separate bores, accommodates double-stack freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight
	13. Depth of Tunnel	Average Depth in Feet	15 foot average depth	10 foot average depth	130 foot average depth	130 foot average depth	140 foot average depth	95 foot average depth	105 foot average depth
	14. Extent of Major Utility Relocations	Minor Moderate Major Severe	None	Major – Relocations along entire existing tunnel alignment	Major – Relocations in the general vicinity of tunnel portals	Severe – Relocations extend significant distances outside of tunnel portal areas	Major - Relocations in the general vicinity of tunnel portals	Severe – Relocations extend significant distances outside of tunnel portal areas	Severe – Relocations extend significant distances outside of tunnel portal areas
Transportation	15. Estimated Number of On-Street Parking Spaces Lost	# Spaces	0	310	0	150	40	120	10
	16. Requires Reconstruction of West Baltimore MARC Station	Yes/No	No	No	No	Yes	Yes	Yes	Yes
	17. West Baltimore MARC Station in proximity to Existing MARC Parking	Yes/No	Yes	Yes	Yes	Yes	Yes	No – Shifts West Baltimore MARC Station south	Yes
	18. Allows for High-Level Platforms for West Baltimore MARC Station between Franklin and Mulberry Streets	Yes/No	No	No	No	Yes	Yes	No	Yes
Cost	19. Capital Cost Estimate	YOE $	$0	$700 Million	$ 3.7 Billion	$ 4.0 Billion	$ 4.2 Billion	$ 3.7 Billion	$ 4.2 Billion
Construction	20. Impacts to Existing Amtrak Operations during Construction/ Rehabilitation	Minor Moderate Major Severe	Minor – Scheduled maintenance would continue during off-peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no detours for Amtrak service; no service between Washington and Baltimore; limited regional service between Baltimore and Philadelphia; and no Acela service between New York and Washington for duration of construction.	Minor – Most work would be performed without affecting NEC operations; only final cutover would cause minor impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Major – Most work would be performed without affecting NEC operations once temporary runaround tracks are in place; however, low speed of runaround would cause major impacts.

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3 Option A (4 Tracks)	Alt 3 Option B (4 Tracks)	Alt 3 Option C (4 Tracks)	Alt 11 Option A (4 Tracks)	Alt 11 Option B (4 Tracks)
Construction	21. Impacts to Existing MARC Operations During Construction/ Rehabilitation	Minor Moderate Severe	Minor – Scheduled maintenance would continue during off-peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no detours for MARC service; MARC would be shut down between West Baltimore and Baltimore Pennsylvania Station.	Minor – Most work would be performed without affecting NEC operations; only final cutover would cause minor impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations once temporary runaround tracks are in place; low speed of runaround would moderately impact MARC.
	22. Impacts to Existing LRT Operations During Construction/ Rehabilitation	Minor Moderate Severe	None – Construction would be contained within existing tunnel.	Severe – Construction requires open cut through North Avenue and LRT track bed.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Moderate – Minimal ground cover between proposed tunnel and LRT track requiring off- peak shutdown of LRT.	Moderate – Minimal ground cover between proposed tunnel and LRT track requiring off- peak shut down of LRT.
	23. Impacts to Existing NEC Freight Rail Operations During Construction/ Rehabilitation	Minor Moderate Severe	Minor – Scheduled maintenance would continue during off peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no convenient detours for freight service; local freight trains could not traverse B&P Tunnel to serve customers' sidings.	Minor – Most work would be performed without affecting freight operations; only final cutover would cause minor impacts.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations once temporary runaround tracks are in place.
	24. Temporary Community Impacts During Construction	High Medium Low	None	High – Extensive cut-and-cover construction would result in street closures and major impacts to communities.	Low – The portal construction area is mostly located in either existing Amtrak ROW or industrial property.	Medium – Portal construction would impact residential and industrial areas east of the existing NEC.	Medium – Portal construction would impact residential and industrial areas west of the existing NEC.	High – Portal construction would require extensive excavation in residential areas.	High – Portal construction would primarily industrial areas and existing Amtrak ROW, with some impacts to residences. Requires reconstruction of Franklin and Mulberry Streets over NEC.
ROW	25. Surface Right-of-Way Acreage Required, by land use type[2]	Acres	Residential: 0 Acres Commercial: 0 Acres Industrial: 0 Acres Other: 0 Acres **Total: 0 Acres**	Residential: 4.8 Acres Commercial: 0.7 Acres Industrial: 0 Acres Other: 3.9 Acres **Total: 9.4 Acres**	Residential: 0 Acres Commercial: < 0.1 Acres Industrial: 2.5 Acres Other: 4.2 Acres **Total: 6.7 Acres**	Residential: 1.9 Acres Commercial: 3.1 Acres Industrial: 5.1 Acres Other: 5.9 Acres **Total: 16.0 Acres**	Residential: 0.9 Acres Commercial: 1.7 Acres Industrial: 6.2 Acres Other: 6.0 Acres **Total: 14.8 Acres**	Residential: 5.1 Acres Commercial: 0.4 Acres Industrial: 0.1 Acres Other: 6.6 Acres **Total: 12.2 Acres**	Residential: 1.2 Acres Commercial: 1.7 Acres Industrial: 0.8 Acres Other: 8.6 Acres **Total: 12.3 Acres**
	26. Surface Acreage of Roadway LOD	Acres	0 Acres	0 Acres	1.4 Acres	4.0 Acres	5.4 Acres	Undetermined	6.5 Acres
	27. Estimated Surface Parcels Impacted	# of Parcels	0	130	10	100	40	160	40
	28. Area of Excavation (including open cut)	Acres	0 Acres	8.23 Acres	8.6 Acres	16.1 Acres	20.0 Acres	8.9 Acres	12.2 Acres

[2] Does not include existing Amtrak ROW. Includes temporary and permanent

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3 Option A (4 Tracks)	Alt 3 Option B (4 Tracks)	Alt 3 Option C (4 Tracks)	Alt 11 Option A (4 Tracks)	Alt 11 Option B (4 Tracks)
ROW	29. Area of Permanent Open Cut	Acres	0 Acres	Existing openings as they are today; no other permanent open cut	2.8 Acres	9.6 Acres	9.5 Acres	4.1 Acres	4.6 Acres
Community Resources	30. Estimated Residential Building Displacements	# Displaced	0	< 10	0	48	24	139	22
	31. Estimated Business Displacements	# Displaced	0	< 5	< 5	10	10	20	15
	32. Estimated Community Facility Displacements[3]	# Displaced	0	1	0	6	1	2	2
	33. Estimated Residential Properties Impacted, but Residence Not Displaced[4]	# of Parcels	0	100	< 5	15	< 5	10	< 5
	34. Estimated Non-Residential Properties Impacted with No Displacement[2]	# of Parcels	0	20	< 5	10	10	15	5
	35. Right-of-Way Impacts within Minority Population Areas	Acres	0 Acres	7.5 Acres	5.8 Acres	15.1 Acres	13.9 Acres	12.2 Acres	11.4 Acres
	36. Right-of-Way Impacts within Low Income Population Areas	Acres	0 Acres	4.1 Acres	0.9 Acres	2.4 Acres	5.0 Acres	5.0 Acres	8.8 Acres
	37. Impacts to Baltimore City's *West Baltimore MARC Station Master Plan*	Minor Moderate Severe	None – Compatible with West Baltimore MARC Station Master Plan	None – Compatible with West Baltimore MARC Station Master Plan	None – Compatible with West Baltimore MARC Station Master Plan	Moderate – Excavation would impact portions of industrial land proposed for redevelopment. MARC Station could remain between Franklin and Mulberry Streets.	Moderate – Excavation would impact portions of industrial land proposed for redevelopment. MARC Station could remain between Franklin and Mulberry Streets.	Severe – Requires demolition of American Ice Co. and adjacent buildings proposed as central hub of redevelopment efforts. Relocates W. Baltimore MARC station platforms	Severe – Requires demolition of American Ice Co. and adjacent buildings proposed as central hub of redevelopment efforts.
	38. Parks Potentially Impacted	# of Parks	0	4 – Eutaw Pl Median Park, Park Ave Median Park, Mt. Royal Median Park, Fitzgerald Park	0	1 – Lafayette and Payson Park	0	0	1 – Winterling Elementary Recreation Facilities
	39. Estimated Area of Parkland Impacted	Acres	0 Acres	0.1 Acres	0 Acres	< 0.1 Acres	0 Acres	0 Acres	0.3 Acres
Cultural Resources	40. Likely Adverse Effects for Historic Properties	Number of Properties (No. of Contrib. Elements)	0	4 (2 contributing historic elements impacted)	5 (4 contributing historic elements impacted)	9 (82 contributing historic elements impacted)	9 (40 contributing historic elements impacted)	6 (144 contributing historic elements impacted)	8 (42 contributing historic elements impacted)

[3] Includes schools, churches, community centers, libraries, hospitals, police and fire stations

[4] Permanent or temporary impacts to property

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3 Option A (4 Tracks)	Alt 3 Option B (4 Tracks)	Alt 3 Option C (4 Tracks)	Alt 11 Option A (4 Tracks)	Alt 11 Option B (4 Tracks)
Cultural Re-sources	41. Area of Surface disturbance within Historic District	Acres	0 Acres	8.6 Acres – Bolton Hill, Old West Baltimore, and Baltimore & Potomac Railroad Historic Districts	12.0 Acres – Monroe-Riggs, Baltimore & Potomac Railroad, and Midtown-Edmondson Historic Districts	25.3 Acres – Edmondson Avenue, Baltimore & Potomac Railroad, Greater Rosemont, Midtown-Edmondson, and Monroe-Riggs Historic District	20.3 Acres – Baltimore & Potomac Railroad, Edmondson Avenue, Greater Rosemont, Midtown-Edmondson, and Monroe-Riggs Historic Districts	16.0 Acres – Baltimore & Potomac Railroad, Midtown-Edmondson, and Monroe-Riggs Historic Districts	16.4 Acres – Baltimore & Potomac Railroad, Edmondson Avenue, Midtown-Edmondson, and Monroe-Riggs Historic Districts
	42. Known Archaeological Resource Sites Impacted	# of Sites	0	0	0	0	0	0	0
Natural Resources	43. Stream Impacts	Linear Feet	0 Feet	0 Feet	0 Feet	0 Feet	0 Feet	0 Feet	0 Feet
	44. Wetland Impacts	Acres	0 Acres	0 Acres	0 Acres	0 Acres	0 Acres	0 Acres	0 Acres
	45. Estimated Street Trees Impacted	# of Trees	0	80	< 10	< 10	< 10	30	< 10
	46. Forested Land Impacted	Acres	0 Acres	0.1 Acres	1.5 Acres	2.5 Acres	3.7 Acres	1.1 Acres	2.8 Acres
Other Environmental	47. Section 4(f) Properties Impacted	Number of Properties	0	8	4	10	10	5	7
	48. Hazardous Materials Sites Identified	# of Low, Medium, and High Priority Sites (and Total #)	N/A	38 Low, 24 Med, 11 High (73 Total)	60 Low, 28 Med, 8 High (96 Total)	72 Low, 34 Med, 9 High (115 Total)	92 Low, 51 Medium, 12 High (155 Total)	73 Low, 28 Med, 8 High (109 Total)	73 Low, 28 Med, 9 High (110 Total)
	49. Estimated Number of Buildings with Potential Noise Impacts	# of Buildings, Moderate or Severe	0 Severe 0 Moderate	260 Severe 1,300 Moderate	< 10 Severe 250 Moderate	180 Severe 1,080 Moderate	110 Severe 980 Moderate	210 Severe 70 Moderate	30 Severe 240 Moderate
	50. Estimated Number of Sites with Potential Vibration Impacts	# of Sites	24	0	69	138	92	476	320
	51. Permanent Negative Visual Impacts	Minor Moderate Severe	None	None – Streets restored to original condition after construction	Moderate – would create visible new railroad trench near proposed south portal, located in primarily industrial area	Severe – would create visible new railroad trench near proposed south portal, located in primarily residential area	Severe – would create visible new railroad trench near proposed south portal, located in primarily residential area	Severe – would create visible new railroad trench near proposed south portal, located in primarily residential area	Severe – would create visible new railroad trench near proposed south portal, located in primarily residential area

- Due to the shallow depth of the existing tunnel, the only viable construction approach is open excavation along the entire tunnel length. This excavation would have significant impacts on the community, highlighted by the following impacts:
    - Full or partial closure of Wilson street and numerous cross streets to Wilson Street throughout construction.
    - Loss of all parking along Wilson Street during construction.
    - Impacts to access for all residences and businesses along Wilson Street during construction.
    - Impacts to four parks – Eutaw Place Median Park, Park Avenue Median Park, Mt. Royal Median Park, and Fitzgerald Park.
    - Substantial residential property impacts.
    - Severe impacts to Central Light Rail Line operations. Alternative 2 requires open cut construction through light rail track bed.

2. Alternative 11 Option A

Alternative 11 Option A would meet project purpose and need. However, overall, the impacts associated with this alternative would not result in commensurate benefits when compared to the alternatives still under consideration.

Specific reasons for the elimination of Alternative 11 Option A:

- Extensive excavation required within a residential area, with the following resulting impacts:
    - Highest number of historic buildings impacted at 140, more than any other build alternative.
    - Highest number of parcels impacted at 160, more than any other build alternative.
    - Highest number of residential displacements at 140, more than any other build alternative.
    - Highest number of business displacements at 20, more than any other build alternative.
    - 120 on-street parking spaces lost.
    - High level of community impacts during construction.
    - Potential Environmental Justice considerations – impacts within minority communities and partially within low income communities.
    - Highest number of buildings with potential noise impacts at 210, more than any other build alternative.
    - Permanent closure of some sections of local streets.
- Shifts West Baltimore MARC Station further south, a less desirable location for the station and access to parking lots and bus lines.
- Requires demolition of the Ice House building, a key historic resource.
- This alternative could also have a severe impact to the West Baltimore MARC Station Master Plan because it would relocate the station away from planned redevelopment properties capitalizing on proximity to MARC services, and demolish the American Ice Company building that is a centerpiece of the plan.
- Impacts the Winterling Elementary School.

3. Alternative 11 Option B

Alternative 11 Option B would meet project purpose and need. However, overall, the impacts associated with this alternative would not result in commensurate benefits when compared with the alternatives still under consideration.

Specific reasons for the elimination of Alternative 11 Option B:

- Requires taking of the entire block bounded by Edmondson Avenue, Franklin Street, Pulaski Street, and the Amtrak NEC. Due to the construction required, the entire block is lost to excavation and the needs of the B&P Project. There is no opportunity to use cut-and-cover construction and gain back any of the property for potential other uses.
- Potential Environmental Justice considerations - All of the residences and businesses taken are within minority and low income communities.
- This alternative would have severe impacts to the West Baltimore MARC Station Master Plan by displacing the American Ice House and other nearby properties proposed for redevelopment.
- Requires demolition of the Ice House building, a key historic resource. Also has impacts to other historic resources in the Midtown Edmondson Historic District.
- Impacts the Winterling Elementary School.
- Requires the reconstruction of Franklin and Mulberry Streets at a higher elevation to accommodate the new B&P Tunnel alignment to pass underneath. This higher elevation would raise Franklin and Mulberry Streets to between 10 and 20 feet, with resultant impacts, including visual, to adjacent residences.
- Has the highest capital cost among build alternatives, estimated at $4.2 Billion.
- Requires a MARC Station to be constructed below surface grade, in a cut section. Also requires taking of a portion of the existing West Baltimore MARC Station parking lots.
- Medium, as opposed to high, operational flexibility when compared with other build options:
    - During construction, most work would be performed without affecting NEC operations once temporary runaround tracks are in place. However, the runaround tracks require a lower operating speed, thereby affecting speeds during the construction of the project.
    - This alternative does not accommodate a new “Fulton” Interlocking. If one of the two tracks that would be allocated for MARC service were to be out-of-service due to maintenance, repairs, or other reasons, one MARC platform would not be accessible during the outage.

C. Alternatives Still Under Consideration

The following Alternatives are still under consideration. These alternatives still under consideration will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

1. Alternative 1

Alternative 1 would not meet the purpose and need for the project. However, it is retained because it is the baseline in which the impacts of the build alternatives are compared. The characteristics of Alternative 1 are provided in the Evaluation Criteria **Table 3**.

2. Alternative 3 Options A, B, and C

Alternative 3 Options A, B, and C are still under consideration and are continuing to be evaluated and discussed with agencies and the public. These alternatives still under consideration will be evaluated and compared in full detail in the DEIS. A Preferred Alternative will be determined after the DEIS and associated Public Hearing and Public Comment period.

Some major highlights of the Alternative 3 options are:

- All three of these alternatives meet project purpose and need. All three improve travel time over existing conditions, accommodate existing and projected travel demand for passenger services, eliminate impediments to existing and projected operations along the NEC, and provide operational flexibility.
- All three alternatives have identical maximum and minimum design speeds.
- All three alternatives have similar tunnel depths and vertical grades.
- Alternative 3 Option B and Option C require a new West Baltimore MARC Station that could be rebuilt with high level platforms in the same geographic area as the existing station. Alternative 3 Option A leaves the MARC station as is, and would require the MTA to rebuild the station as a separate project to provide for high level platforms. This would require the platforms to move several hundred feet further south.
- The construction, right-of-way, community, cultural resource, and other environmental impacts vary among the three alternatives, both in terms of number of impacts and the specific resources impacted. These comparisons can be viewed by resource in **Table 3**.

VI. AGENCY AND PUBLIC COORDINATION

Agency and public input into project development has been encouraged throughout the project process. The purpose of this coordination is to provide information on the project to stakeholders, become aware of public and agency concerns and interests, and consider that input in project development. Information obtained from agency and public input has been used during the engineering development and environmental evaluation of the alternatives. The purpose of this chapter is to provide an overview of the public involvement process during the alternatives development.

A. Agency Coordination

Federal and state agencies have been kept informed of project updates via the project website, www.bptunnel.com, and regular Interagency Review Meetings (IRM). The B&P Tunnel Project was presented at IRMs held on May 20, 2015, and June 17, 2015. Representatives from the following federal and state agencies were in attendance:

- Amtrak
- Baltimore Metropolitan Council
- Federal Highway Administration
- Federal Railroad Administration
- Maryland Critical Area Commission
- Maryland Department of Natural Resources
- Maryland Department of Planning
- Maryland Department of Transportation
- Maryland Department of the Environment
- Maryland Historical Trust
- Maryland State Highway Administration
- Maryland Transit Administration
- United States Army Corps of Engineers
- United States Environmental Protection Agency
- United States Fish and Wildlife Service

At both IRMs, MDOT and FRA provided a PowerPoint presentation that presented updates on the B&P Tunnel Project. Topics were presented with associated maps and other graphics, and included the following:

- Project funding and project team;
- Schedule and status;
- Purpose and need;
- Preliminary alternatives and screening;
- Track and operation requirements;
- Alternative 1: No-Build description;
- Overview maps, profiles, north and south portal maps, and renderings for Alternatives 2, 3 Option A, B, and C, 11 Option A and B;
- Tunnel ventilation information and areas of consideration for intermediate tunnel ventilation plants;
- Evaluation table; and
- Continuing activities and contact information.

At the May 20, 2015 IRM, agencies were invited to attend the upcoming Public Open House. Agencies were also provided an overview of the Public Open House during the June 17, 2015 IRM.

At the meetings, agencies provided comments which are summarized below. Agencies were encouraged to provide continual input as the project advances.

At the meetings, agencies asked questions and provided comments on the project and alternatives. Agency comments were typically related to their resource management. Maryland DNR requested information on stormwater management, Indirect and Cumulative Effects (ICE) analysis, and vibration analysis as they became available. The USACE inquired about captured groundwater, hydrogeology, and cut material, and the USFWS commented on streams and wetlands and the presence of the endangered Northern Long-Eared Bat in the Study Area.

The Project Team provided responses to the agency comments, and encouraged the agencies to continue to provide input as the project advances. Agency comments are taken into consideration throughout the project process.

B. Public Coordination

The public has been kept informed of project activities and deliverables related to alternatives development via community meetings, updates to the project website, and the Alternatives Public Open House.

1. Alternatives Public Open House

The Alternatives Public Open House, the third Public Open House for the B&P Tunnel Project, was held by FRA and MDOT on June 16, 2015 at Carver Vocational-Technical High School, from 5:00 pm to 8:00 pm. The purpose of the Alternatives Public Open House was to provide details on alternatives, present engineering and environmental information, provide evaluation criteria, and gain public input on alternatives. The Public Open House was advertised via a variety of other methods, including the following:

- Letter Invitations— sent directly to 52 elected officials and 84 community associations, federal, state, and city officials, and other community stakeholders (May 19, 2015);
- Postcard Invitations— sent to 18,000 residences within five zip codes surrounding the project study area: 21201, 21202, 21217, 21218, and 21223 (May 28, 2015);
- Newspaper Advertisements— featured in the *Grace and Glory* Magazine (May publication); the *Baltimore Sun* (April 16, 2015); the *City Paper* (April 22, 2015); and the *Afro-American* (April 24, 2015);
- Flyers— posted at 23 locations surrounding the existing B&P Tunnel, including community organizations, local businesses, post offices, and schools (May 28, 2015); and
- E-mail Blast— announced the Public Open House and the release of the Advanced Materials to the project mailing list (June 2, 2015).

The June 16, 2015 Public Open House was also announced via the project website (www.bptunnel.com). The project website featured Advanced Materials that updated the public on project background information, tunnel terminology, and track and operation requirements prior to the Public Open House.

At the Public Open House, representatives from the FRA, MDOT, the MTA, Amtrak, and the Baltimore City DOT were available to converse with attendees and answer questions. The Alternatives Public Open House was attended by 66 persons, including 59 citizens and 7 elected officials/representatives.

Three identical, 15-minute PowerPoint presentations were delivered to attendees by Project Team members at 5:30, 6:15, and 7:00 pm. The PowerPoint presentations served as a broad introduction to the information presented on the display boards, and the Project Team members who spoke encouraged attendees to browse the display boards in the neighboring cafeteria and discuss questions with other available Project Team members.

Display boards provided an overview of the B&P Tunnel Project, specifically the alternatives engineering development and environmental evaluation. Information presented included the following:

- Project purpose and need;
- Preliminary alternatives development and screening;
- Tunnel terminology;
- Track and operation requirements;
- Alternative 1: No-Build description;
- Overview maps, profiles, north and south portal maps, and renderings for Alternatives 2, 3 Option A, B, and C, 11 Option A and B;
- Tunnel ventilation information and areas of consideration for intermediate tunnel ventilation plants;
- Considerations for the future of the existing B&P Tunnel;
- Description of the alternatives evaluation and the Evaluation Table;
- Environmental resources map;
- Study schedule; and
- Contact information and solicitation of input.

Downloadable versions of these display boards were made available on the project website prior to the meeting.

Written comment forms were available at the Public Open House. Fourteen written comments were received at the meeting. A comment period for the Public Open House extended until July 16, 2015.

2. Community Meetings

In addition to the Public Open House, the Project Team has hosted a number of project community meetings that provide an opportunity for the public to become acquainted with the project. A series of four project community meetings were held in April 2015 in order to provide a status update on the engineering activities and environmental evaluation that had occurred since the *Preliminary Alternatives and Screening Report*. Over 25 persons attended the meetings. These meetings were intended to prepare the public for the new information to be released at the Alternatives Public Open House. A 30-minute PowerPoint presented by members of the Project Team provided project background, purpose and need, an overview of the preliminary alternatives screening process, the alternatives carried forward and continuing project activities. The project community meetings were held from 6:00 pm to 8:00 pm on the following dates:

- April 13, 2015, at Gilmor Elementary School;
- April 14, 2015, at Mount Royal Elementary/Middle School;
- April 20, 2015, at Westside Elementary School; and
- April 21, 2015, at Lockerman Bundy Elementary.

Another series of three project community meetings were held in July 2015 in order to provide a recap of information presented at the Alternatives Public Open House and opportunities for additional public input and questions. A total of 76 persons attended the three meetings. During these meetings, a 30-minute PowerPoint was presented by members of the Project Team. The presentation highlighted the major topics of the June 2015 Public Open House, including the latest engineering and environmental information on Alternatives 1, 2, 3 Option A, B, and C, Alternative 11 Option A and B. The project community meetings were held from 6:00 pm to 8:00 pm on the following dates:

- July 7, 2015, at Perkins Square Baptist Church;
- July 14, 2015, at Mount Lebanon Baptist Church; and
- July 16, 2015, at Mount Royal Elementary/Middle School.

Upon request, the Project Team also attended several local community association meetings to present information on the project and respond to public questions in smaller, neighborhood-focused settings. The Project Team attended the regularly held meeting of the Alliance of Rosemont Community Organizations (ARCO) on June

17, 2015, at St. Edwards RCC; the regularly held meeting of the Western District Community Council Meeting on August 27, 2015 at First Mount Calvary Baptist Church; as well as the regularly held meeting of the Reservoir Hill Improvement Council, Inc. (RHIC) on September 1, 2015, at John Eager Howard Recreation Center.

C. Comments

The IRMs, community meetings, Alternatives Public Open House, project website, and telephone access to a project team representative have served as opportunities for agencies and the public to provide input that aided the alternatives development process. Concerns and questions from agencies and the public have been considered throughout engineering development, as documented in this and previous study reports. Public comments received during alternatives development are listed in **Appendix A.**

Table 4 summarizes the comments received during the June 2015 Public Open House and its associated comment period which are relevant to the most recent alternatives development. The table also provides preliminary general responses on how the comments have been and/or will be considered as the project advances.

Table 4: Summary of Comments and Preliminary Project Team Responses

Comment Summary	Project Team Response
Potential impacts from noise and vibration on historic residential structures	Potential noise and vibration impacts are being evaluated using the guidelines set forth by the FTA *Transit Noise and Vibration Impact Assessment*. In addition, temporary construction vibration levels are being evaluated using both the FTA guidelines as well as standard industry practices for evaluating vibration due to tunnel boring and other tunnel excavation activities. An analysis has been conducted using currently available information absent of vibration monitoring data that describes the ground-propagation characteristics or the building coupling losses. The results will, therefore, be limited to the quality and accuracy of the available data much of which is based on default assumptions from the FTA guidelines. Additional, more detailed information, as well as potential mitigation measures, will be considered and presented in the Environmental Impact Statement (EIS), and as the project advances through engineering design.
Potential impacts to community from ventilation plant, including air quality and noise concerns	Tunnels require ventilation for safe operation. Ventilation occurs through vent plants that are above-ground buildings that contain fans, operation and control equipment, fire protection equipment, and emergency exits. The purpose of a vent plant is to pull fresh air into the tunnel and ventilate the tunnel air to the outside; this is done through both passive and active ventilation. The proposed B&P Tunnel vent system includes three above-ground structures: one at the north portal, one at an intermediate tunnel location, and one at the south portal. The location of the intermediate vent plant must be located above the tunnels being ventilated, but some offset is permitted to accommodate buildings at the surface. The vent plants will be designed with input from the community to complement and blend with the surrounding built environment. The B&P Tunnel ventilation system, including vent plant equipment and operations, will be designed and

	implemented in accordance with National Fire Protection Association (NFPA) 130 fire/life/safety codes. In general, vent plants are relatively quiet. During normal operations, they emit a low hum (around 45 decibels) that is approximately as loud as a quiet urban street at night. Because noise decreases quickly with distance from its source, surrounding residents will generally not hear the noise of a vent plant when fans are running; only a person standing at the louvers would hear the machinery in operation. Under emergency operation, when the fans run at their highest speed, a louder humming sound and the whooshing of air exiting the louvers could be heard at a greater distance from the plant. The Project Team has not yet identified the predicted noise level of the vent plants for the B&P Tunnel Project. Noise attenuators in the vent plant would be able to reduce the noise to Baltimore City noise criteria levels (or below). Under normal operation, the ventilation system will dilute all emissions so that pollutant concentrations are well below regulatory thresholds. Vent plants eject tunnel air into the surrounding sky, at a height that (accounting for wind currents and particle dispersion) would not have any measureable effect on air quality. In the very rare event of a tunnel fire, the path from a tunnel fire to the exhaust louvers is long and circuitous, with many bends that retard the ability of particles to travel through the fans and louvers. During an extreme event, if the emitted air is determined to be unsafe, evacuation of the areas surrounding the vent plant may be required. A qualitative assessment of vent plant impacts, including noise, air quality, and other community impacts, will be included in the Environmental Impact Statement.
Concern over impacts to property values in neighborhoods surrounding potential ventilation plant locations	A qualitative assessment of community and economic impacts / benefits of the project will be included in the Environmental Impact Statement. However, it is not reasonable for the Project Team to make a quantitative assessment of property value given that specific characteristics of the individual properties as well as unknown market influences have a substantial influence on property value.
Suggestions for public involvement initiatives	The Project Team considers each suggestion related to community coordination and continually updates its public involvement strategy to best involve and communicate with the potentially affected communities. A summary of all public involvement efforts to date are featured in this Alternatives Report, as well as in the Preliminary Alternatives Screening Report, and Project Scoping Report (all available on www.bptunnel.com).
Concern over the frequency of and materials carried by freight trains through tunnel	The B&P Tunnel Project would not preclude freight travel. Freight train usage of the tunnel will be determined by Norfolk Southern and CSX and be market-driven to the extent that it does not interfere with passenger train operation. Please note that there are no plans to alter the current rights of freight trains on the

	Amtrak-owned NEC, and that the priority for the NEC will remain passenger service. The two local Norfolk-Southern Corp freight trains that operate through the B&P Tunnel serve customers south of the tunnel. The cargo that is carried/shipped is at the request of local businesses for their particular operations. Currently, cargos to/from specific railroad customers through the B&P Tunnel include, but are not necessarily limited to: vegetable oil, plastic pellets, paper, lumber, and produce.
Inquiries related to Amtrak easements and their right to inspect land	Amtrak has conducted engineering assessments of the existing tunnel and related infrastructure as part of this project. Amtrak has also conducted and will be continuing field reconnaissance along the alignments of the alternatives being carried forward in the NEPA process; this effort has been typically from the street and other public property. More extensive field inspections, possibly on private land, may occur later in the project process as more detailed information is required for the alternatives carried forward. Advanced notice of these field inspections will be provided, particularly to the property owners or those proximate to the project.
Inquiries related to compensation for potential damage to building foundations due to vibration	Compensation to property owners would occur if a determination is made that the property would be physically damaged by the project. A determination of whether compensation is appropriate would not occur until later stages of the project design, if the project is funded.
Parking at West Baltimore MARC Station	The alternatives affect the parking at West Baltimore MARC Station to varying degrees. Alternatives 1 and 2, and Alternative 3 Options A, B, and C would not result in the permanent loss of any parking spaces at the parking lots. Alternative 11 Options A and B would result in the permanent loss of parking spaces. Refer to Section III for additional details.
Future of the existing tunnel	The future disposition of the existing tunnel has not yet been determined. Should a tunnel on a new alignment be chosen, the Project Team is exploring options such as converting the tunnel to a different use, modifying it to accommodate single-track train use, or abandoning it. Refer to Section II.C for additional details.
Preference or opposition for specific alternatives	Comments regarding support for or objection to specific alternatives will be taken into account as the alternatives are evaluated. These comments will also be considered by FRA and MDOT when identifying a preferred alternative.

D. Future Agency and Public Coordination

FRA and MDOT will provide additional opportunities for citizens, community associations, agencies, elected officials, and other stakeholders to learn about the Project and provide input as the Project advances. Federal and state/regional agencies will be updated on the Project via regular correspondence and meetings. Additional community meetings will be held in the future and announced on the Project website and via other notifications. A formal Public Hearing and associated Public Comment period will be held after the completion of the Draft Environmental Impact Statement, anticipated in winter 2015. Project comments submitted via the Public Hearing, the online comment form at the project website, www.bptunnel.com, and/or postal mail, will continue to be considered by FRA and MDOT.

VII. ACRONYMS

ACS	American Community Survey
AM	"Ante meridiem" or before noon
B&P	Baltimore and Potomac
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB(A)	A-weighted sound decibels
DEIS	Draft Environmental Impact Statement
DNR	Department of Natural Resources
DOT	Department of Transportation
EIS	Environmental Impact Statement
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
HSIPR	High Speed Intercity Passenger Rail
ICE	Indirect and Cumulative Effects
IRM	Interagency Review Meetings
LOD	Limits of Disturbance
LRT	Light Rail
MARC	Maryland Area Regional Commuter
MDOT	Maryland Department of Transportation
MHT	Maryland Historical Trust
MPH	Miles per hour
MTA	Maryland Transit Administration
MPWG	NEC Master Plan Working Group
NB	Northbound
NEC	Northeast Corridor
NEPA	National Environmental Policy Act
NS	Norfolk Southern Railway
NRHP	National Register of Historic Places
PASR	Preliminary Alternatives Screening Report
PM	"Post Meridiem" or afternoon
PRIIA	Passenger Rail Investment and Improvement Act
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SB	Southbound
SDP	Service Development Plan

SOGR	State of Good Repair
USC	United States Code
YOE	Year of Expenditure

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Appendix A

Public Comments Received During Alternatives Development

The following table provides the written public comments associated with alternatives development and the June 2015 Public Open House that were submitted via written comment card, online comment form, or e-mail to the Project Team.

Date	Method Received	Comment
3/16/2015	E-mail	[…] I am from New York City. As someone who frequently rides Amtrak, I strongly agree that the Baltimore and Potomac Tunnel should get replaced. Thus, I would like to know: 1. When will construction likely begin and end? 2. Who would pay for this major construction project?
3/20/2015	E-mail	I understand that the four April dates will each include a formal presentation as well as the opportunity for questions. I also understand that the May meeting will be an "open house" without a formal presentation. However, the format of the June meeting is not clear ... Presentation, no presentation, q&a, etc. What is it? Also, what are the dates and locations for the May and June meetings? Thanks in advance for providing the requested information.
3/24/2015	E-mail	We are the owners of the Dollar General at 1620 Pennsylvania Ave which was built over the tunnel. In addition we own the bed of the railroad back to Argyle Street and the land alongside the tracks toward Pitcher Street. Please see the attached plan. I am interested in meeting to see how these proposals effect our property. Would you be available sometime next week to meet and review? Please let me know.
3/25/2015	E-mail	Thank you for getting back to me. If I understand correctly, then it is likely that construction will not begin until several years after 2017?
4/9/2015	E-mail	Hello, Thankfully, we were just notified through our Bolton Hill Calendar of Events that was emailed to us today, that there will be a meeting at Mount Royal Elementary Middle school on Tuesday April 14, 2015 concerning the Wilson St. Tunnel (information session). Our question is...why haven't we received any information about the tunnel study from any of you since the last meeting (last year)? We happen to live a half a block from Wilson Street, which by the way collapsed several years ago because of the train traffic going through the tunnel, taking with it a few of the homes walls that faced Wilson Street. Don't you think you have an obligation to keep those of us living so close to the tunnel informed of your studies, and don't you think it would be helpful to interview those of us that any changes would impact the most? We have noticed a huge increase in the noise and vibration from passing trains over the past year which we are not happy about, and are opposed to any increase in the number of trains using the tunnel, and any being allowed to increase their speeds. Are you aware that our neighborhood is a registered Historic District with homes built in 1885 on both sides of this tunnel, and that many of us have invested hundreds of thousands of our hard earned dollars restoring them, and we do not wish to have our 126 year old foundations shaken repeatedly day after day? Nor, do we want the train noise that comes through our walls. Are you also aware that this Bolton Hill neighborhood provides the city with substantial property tax revenue because of the high property values, and that our values could be jeopardized by an increase in tunnel activity? During the last meeting

Date	Method Received	Comment
		at Mount Royal School (last year) there was a promise made that our concerns would be considered and that we would be included in the research, but to date not a single person has come by our neighborhood or sent out a single notice or phone call...even though our contact information was left with you at the meeting. Please get back to us with any relevant information concerning this project.
4/12/2015	E-mail	Hello, I checked our email and we have not received any correspondence about the Tunnel Project until we received this reply. Please be sure to update your email list so that our email address is included in all future mailings. Could you please sign your emails with the name of who is replying to us...not just the project name?
4/13/2015	Comment card	I'd encourage alternative uses for the existing tunnel. The trains need a tunnel that will allow higher (highest possible) speed.
4/13/2015	Comment card	Will they check the Amtrak land in my backyard? I was told this when I moved into my home in October 1992.
4/13/2015	Comment form	If you are interested in including community names on the map, where is Sandtown? Where is Midtown Edmondson? The maps need to be MUCH clearer and more transparent. It seems like you are trying to be misleading and deceptive. Don't indict the community for lack of involvement when you are not transparent about what is happening where and when.
4/13/2015	Comment form	Next time you are hosting at Gilmor Elementary state 'Stricker Street entrance' on the notice. Everybody was going to Gilmor Street Side--this is a mobility issue.
4/14/2015	Comment card	Please provide us with a detailed and accurate cross section of the terrain and the proposed tunnel to grade. Please mark off at ALL major streets for alternative 11 (in particular) and 3. What provisions are being made on a contingency basis to address possible damage or negative effects on communities above the tunnel?
4/14/2015	Comment card	If the speed through the tunnel is limited to 30mph, what will be the speed limit for Alternatives 3 and 11? With both alternatives 3 and 11, what will be the change in passenger travel for a trip from Baltimore to Washington? MARC? Amtrak? Will MARC trains utilize this tunnel? With Alternative 3 and 11, how will the existing tunnel be used? How does this project relate to Amtrak's long term plan for high speed rail in the Northeast Corridor, which includes a 6-mile tunnel under Baltimore? Will Norfolk Southern contribute to the cost of a new tunnel?

Date	Method Received	Comment
4/14/2015	Comment card	What's the impact of speed and capacity in RLT & BLT neighborhoods? What are the vibration impacts due to speed and increased capacity?
4/14/2015	Comment card	The concept of 4 bores is new. It seems that once 2 tunnels are finished, the old Baltimore and Potomac Tunnel can be retrofit. The impact of design for a freight tunnel seems as an appropriate consideration for the Environmental Impact statement (EIS). It certainly is MDOT's responsibility to do this kind of planning.
4/14/2015	Comment card	Please give a detailed profile of alternatives 3 and 11 (i.e. in depth). Talk more about ideas for funding of the tunnel and not just the planning. Discuss consequences for residents whose houses the tunnel will pass under.
4/14/2015	Comment card	Q1: What will the restrictions on hazardous materials be, especially in regard to crude oil freight? Q2: Is there an economic impact study available for public scrutiny, describing the benefits expected from the new tunnel construction?
4/15/2015	Comment card	What benefit in time will the new construction be- if the trains are going faster, it will take longer to stop mitigating in part the need to slow down for the eastbound track coming into Penn Station anyway.
4/15/2015	Online comment form	I recently bought a home less than 1/4 miles away from Penn Station, and I'm really excited about the new Amtrak tunnel. I think it will make the commute between Baltimore and DC better, and increase the value of my house. So yeah, let's do this!
4/23/2015	E-mail	I am a McCulloh street resident, I live in the 2300 block and am a home owner. I would like to know will residents be asked to relocate, and what impact will the project have on homeowners?
5/2/2015	E-mail	I attended the community event at Gilmore Elementary School a few weeks ago regarding the BP Tunnel. At the session, I asked to be provided the addresses of where the soil drilling has taken place so I can better identify the locations being considered for the tunnel. I was told that someone would email me this data. I even was approached by an engineer afterwards to make sure he had my name and email address so he could connect the request to me. Can you help me understand why I haven't received this information and when I can expect it? Also, I learned in the Baltimore Sun today that the meeting on 5/5 would be postponed to "June" but no date was specified. It is very important to me to be able to attend that meeting and to be sure my neighbors are also informed. Can you please send me the June date/time/location for this meeting so we can start planning our schedules to attend?

Date	Method Received	Comment
5/4/2015	E-mail	My home [address redacted] is frighteningly close to your proposed build site. I would like to see a more exact location for your design as it appears that this project could affect the value of my all original 1843 Victorian home or even worse cause damage to my home during your build or by the tunnel itself. This house is the oldest standing home in Reservoir Hill and most valuable homes in the area and largely irreplaceable.
5/7/2015	E-mail	I didn't see any clarification of my questions in this response. The map you present in your website is vague at best and without further information this just becomes more concerning by the week. Please respond in a meaningful way.
6/2/2015	E-mail	A basic need is for CSX to be able to use the new B&P Tunnel. The easiest access for CSX would be to use the Amtrak line. What degree of impediment to double stacking is presented by the Hoffman Street Tunnels? Can their floors be lowered to permit the required additional height? If there is a true problem with those Hoffman tunnels, how does CSX gain access from their current alignment to the western-most bore of the new B&P Tunnel?
6/2/2015	E-mail	Friends: Is this a repeat of the previous Open Houses on this subject- or will "new" information be presented. I have been to two— which were very similar.
6/3/2015	E-mail	Would you kindly tell me whether the May 5th meeting that was set for Mt. Royal Elementary will be rescheduled? Or will this be the only opportunity for this stage of public input?
6/14/2015	E-mail	Thank you for beginning to use email! This is the first email I have received from you all, and is the best way for me to get and spread information to the community. See you Tuesday.
6/16/2015	Comment card	1. Route 3 is the best option— less of an impact on the lives of people; 2. What ever happened to the B&O train stop on Edmondson Avenue— 2100 Edmondson Avenue
6/16/2015	Comment card	It seems as if the least destructive, most cost efficient option here is to reconstruct the existing tunnel (option 2). It is the most direct route into Penn Station. Option 3 is not only the most detrimental plan to the historic communities it will undermine but undoubtedly it is the most expensive option. Why would you route the tunnel so far north of Penn Station? Trains will have to turn south to reach Penn Station and then turn back north. I am concerned about the noise levels with these tunnels and trains. How will it be addressed and what data are you using to gauge it? What requirements do you have to meet to put this project through? What standards are used concerning the vent plants in residential areas?

Date	Method Received	Comment
6/16/2015	Comment card	STRONG preference for #11A or 11B. Much less apparent disruption to residences at the north and south portals. And, shorter route= fewer homes dealing with construction vibration/noise and possibly ongoing vibration/noise. Third choice: 3C. What can I expect for vibration and noise both during and after construction if the tracks are, say, 100' below my house? What can I expect for compensation if I own a house that isn't demolished but is severely impacted-- a few houses away from the wall/tracks?
6/16/2015	Comment card	Consult with the Opportunity Collaborative, opportunitycollaborative.org
6/16/2015	Comment card	There is negligible speed difference between any of the 3 and 11 alternatives sufficient to choose one over another. 3C is best in my view: allows high platforms at W. Balt MARC and preserves American Ice which would be a prime TOD structure. 11B is second best, except for losing American Ice. 11A is worst: No Red Line interchange and moves W Balt MARC away from the parking lots which would have severe impact on adjacent neighborhoods.
6/16/2015	Comment card	All of this seems to place my house in a precarious place. The threat of contamination from the water into the Jones Falls is not environmentally helpful. My house is over a hundred years old and already [unknown] the effect just from regular [unknown] traffic. Does anyone think about the effect of constant rail traffic juggling my house's foundation continually? None of this seems like a useful direction for homosapiens and structures in which they live. If there were a democratic vote, I think we would all be forced to oppose.
6/16/2015	Comment card	11A (1) It moves the MARC Train Station. What are you going to do with the 660 parking spots at the existing station? Have you notified commuters of this alternative? Have you considered the impact on the community you're moving the station to (as far as people parking in their neighborhood?) (2) Portal comes up near Ice House, but cuts into the Business district of Edmondson Avenue (the economic engine of the neighborhood). Not a good thing. 11B: No. It comes up in the middle of my neighborhood and cuts through the business district of the community. It essentially destroys the community. This is not a viable option from the community perspective. 3 Option A: Yes. This is the best option. It does not wipe out the Midtown-Edmondson neighborhood, and uses part of the existing rail. Easy. 3B and 3C: No. They both take swaths out of the neighborhood. BUT if you give real development money directly to the community (money that is majority-controlled by the community-- in coordination with the city), and put it in a legal agreement, then we can talk.
6/16/2015	Comment card	(1) I just wanted to thank you for finally reaching out via email. Please keep using email along with the postal mail. (2) Also, if you need volunteers please reach out to people and ask! There are more people than you think who are willing to volunteer for flyering (for example). (3) I appreciated all the visual maps; very helpful in understanding the potential impacts.
6/16/2015	Comment card	Take #2 off the table now!!! Option #3 would be my choice, but it would depend on how much $ is available for development in the Midtown-Edmondson community. If you have a negative impact, it has to be countered with development $.
6/16/2015	Comment card	I very much like a lot of the ideas that have gone into this project. I do think that 11A is measurably worse in terms of impact to residential property, and I would strongly urge that that consideration were to outweigh 30 seconds or so of headway time. 9Since all trains begin/end at Penn Sta., it seems natural to have trains going slightly slower when that close to the station.) Again, some great ideas, and I look forward to seeing what happens! Thanks!

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6/16/2015	Comment card	Alternative 11-A may cause a problem if the MARC Station is relocated from its present location. Over 500 commuters park their cars on the lots located off Mulberry & Franklin Sts. If the MARC Station is relocated would the commuters be willing to park elsewhere or would you provide rides for them from one (parking) location to the MARC train?
6/16/2015	Comment card	We are opposed to a new route for this tunnel, especially the northern circle route. It would go under 2 historic districts— Mount Royal Terrace and Upper Eutaw Madison. The vibrations from these trains would destroy our 100-150 year old homes. The noise and vibration would destroy our quality of life. It would also severely reduce our property values. We do not want any tunnels and ESPECIALLY not 4 tunnels. We do not want freight trains carrying oil or dangerous chemicals and explosives to run under our homes ("bomb trains"). This is a heavily populated area-- we do not want this danger under our homes. This is a total nightmare. We are also opposed to the route under the Bolton Hill District.
6/16/2015	Comment card	As a 30-year resident, community activist, and 20-year liaison for the Commission on Historical and Architectural Preservation (CHAP), I strongly oppose a tunnel that will run under my 1890 house which we have worked years to preserve— and to work with our community to preserve all our historic neighborhoods and homes. We see this as a destruction of property values-- and possibly a destruction of lives.
6/16/2015	Comment card	Proposed Circle Route is to go under 2 historic districts! This is unacceptable! I am strongly against this project!
6/17/2015	E-mail	I attended yesterday's open house and visited both the posters and the auditorium presentation. Here are the questions/concerns that I continue to have that do not seem to be being disclosed: (1) At the April meeting, the project was presented as being related to commuter travel only. However, subsequent reports suggest this will be a frequently traveled commercial route with double-decker container cars. What is true? Will the tunnel be used for commercial interests? What hazardous items could be transported through the tunnel? What protections will be in place if there is a chemical or nuclear spill from cargo in the tunnel? To what extent are the ""venting plants"" prepared to handle various levels of hazards? Please disclose this information publicly. (2) What are the risks to people who live in homes in the path of the tunnel? Some of the people who work on this project have said there will be no impact whatsoever (arguing that the soil/environmental reports have demonstrated this), others have said there is no way the impact could be tested or known. The risks need to be better explicated in these public settings. When I spoke individually with someone on the project, he admitted that it would not be an unexpected side effect that homes will have foundation problems, cracks, reverberations, shaking and noise issues. Where have you disclosed this in any of your materials? (3) Some people (allegedly not affiliated with your group but advocating this project) have suggested that the ills of West Baltimore could be solved by the tunnel forcing the disruption and community dissolution of Sandtown. How do you respond to this? What are you doing to insure this project doesn't destroy communities by lowering quality of life as well as tearing down homes? (4) When I expressed concerns about potential damage to my home (located directly on the path of Alt 11), I was told that if I had to choose between a crack in my basement vs. having my home razed, wouldn't I prefer the crack in the basement? I think this kind of persuasive argument is in poor taste. Why should I have to deal with damage to my foundation and the subsequent costs to repair as well as the degraded property value? The upside is that my house is likely to be still standing; the reality is that the quality of life due to noise, vibrations and damage will be significantly diminished to the point that who would want to live there? For folks like myself who have spent years investing in

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		community development in this neighborhood, your project will negate all of our work in a way that is more invasive than even the worst crime or drug problem. No one will want to live in a neighborhood where having only cracks in the basement and shaking is seen as the upside.
6/25/2015	E-mail	Hi there, I was at a tunnel meeting at Mt. Royal Elementary a couple months ago, and received notice of the Open House being postponed, but did not receive the rescheduled meeting date, or this email noting upcoming meetings. Was I dropped from the list? July 7 is the night of our community meeting, and July 16 has already filled up for community events here in Reservoir Hill, so our staff may not be able to attend the event that evening. Might there be the possibility of a presentation at one of our community meetings? Our residents are very concerned about the implications of a train tunnel running beneath their homes.
7/2/2015	E-mail	Please consider the comments below: (1) Route NEC Through Downtown (New Baltimore Penn Station near Lexington Market) via tunnel under Route 40) – Alternative 5 (2) Abandon Baltimore Penn Station and transfer Unused NEC to Freight/CSX/NS (3) Rehab Current B&P/Union Tunnels (Low Cost when no rail traffic is present) (4) Transfer Howard Tunnel to MTA (5) Rehab Howard Tunnel for Express LRT or MARC or Heavy Rail (6) Route Downtown Portion of New Red Line Alternative with NEC Tunnel Map Link: https://www.google.com/maps/d/edit?mid=zQQBCxHd6New.kaQfCWXvG8gk The main reason to build the NEC tunnel through downtown is economic development. There is potential for multiple 20+ story buildings on top of the new NEC station. The new station could be build using a Public-Private Partnership. The current Baltimore Penn Station should be abandoned as it provides little economic benefit because it is too far from the downtown core. The Red Line could be added to the tunnel through downtown and run on the surface along Route 40 or adjacent road east of downtown.
7/8/2015	E-mail	How extensive will the blasting be for options 3 and 11? What level of vibrations will be experienced day-to-day if these options are implemented? I live in Historic Mount Royal Terrace and some of these options will result in lines being built close to or directly under my house, option 11 being more dramatic than option 3. The house itself is around 120 years old and I am already worried about the foundation over the next decade - without a train line running underneath or near it. What will happen if these lines are run under my house? What will happen if the trains or their construction effectively ruin my houses foundation? Will I be evacuated during construction? I am not opposed to this project and understand that renovations are necessary but I believe that there are other parts of West Baltimore that are not historic and could be helped in their improvement by this line removing some of their abandoned properties. In short I am providing this input to attempt to steer the decision away from Option 11, as I am concerned that it will effect my neighbors and my own living circumstances dramatically and believe that options 2 and 3, or other alternatives, will effect less populated areas. I understand that renovating the existing tunnel may be painful and take longer but I think this may help with concerns over the existing tunnel being abandoned and left to decay. Thank you for taking the time to understand and consider my concerns.

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7/7/2015	E-mail	Option 11 A seems to have too large a residential impact considering that 11B could avoid them. However, both would destroy the Ice House. Not a deal killer but I'm not seeing the major advantages in comparison to the Option 3.
7/14/2015	Comment card	We were told this is for passenger rail— so why is the track being designed to accommodate commercial transport including hazardous materials? I sent an email on 6/17/15 with several questions. I received an email back from "info@bptunnel.com" on 6/19/15 saying that the team was developing a thorough response to my questions. Will I ever get a response?
7/16/2015	Comment card	The option Alternative 3 Option B would be less disturbance on P. Flanigan and Sons' business operation or its recycle center operation. Alter[native] option 3A and 3C go thru the Flanigan operations. Not acceptable!!
7/16/2015	Comment card	Concerned about impact on year 1895 structure of house. How much consistent vibration will be expected on a house constructed in 1895? All other ramifications i.e. insurance, saleability of house, taxes, etc.
7/16/2015	Comment card	I believe ability to accommodate high speed rail should be an evaluater.
7/16/2015	Comment card	(1) Baltimore remains a port city. Freight HazMat is a major risk. How will this tunnel mitigate our HazMat risks, i.e. will this compromise a freight train fix. Will this tunnel be used for frieght through downtown Baltimore when the CSX tunnel fails, e.g. 2003 fire
7/16/2015	Comment card	Prefer Alts 3B or 3C. Let's build some infrastructure already!
7/16/2015	Comment card	Reconstruction or modernization of the existing B&P Tunnel in place 18 ft. increase vertical in tunnel clearance all tracks along cover between wall and tracks options to Alt 3 and 11 impact 11A Green/minor modification needed to Red Line/ Acternation 3 Option A. South Portal Rendering to Red Line Light Rail system and Green Line Bus on Charles St. also in Baltimore City also parts of Balto County
7/16/2015	Comment card	Thank you for organizing this community meeting. The concerns that I hear many people raise are hyperbole given that the tunnel will be roughly three times as deep as the current tunnel. Options 11 appear to have more negative impacts than Options 3. Above all, I'd like to see Baltimore's historical heritage preserved as much as possible, which means I would not like to see the demolition of the Ice House to accommodate option 11.

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7/16/2015	Comment card	What are the residential impacts for North Portal for Reservoir Hill- Eutaw Place homeowners/ residents? What is/has the impact of the ventilation system to residents long term?
7/16/2015	Comment card	Alternative 11 (both A and B) will have a tremendous negative impact through 9 historic neighborhood with historic homes. Will the homeowners be compensated for the damage that will occur during and after[?] construction of tunnel will devastate these homes. We put our life savings into these homes. The liability will be on Amtrak! Be ready for litigation, because historic homes on the National Registry will be affected.
7/16/2015	Comment card	All studies arc north. Why was no study arc South? [Illustration included on comment sheet.]
9/1/2015	Comment card	When will final design be selected?
9/1/2015	Comment card	Vent shaft location in any scenario is unacceptable. You must find an alternate solution.
9/1/2015	Comment card	We have serious concerns about the tunnels running under our street. We are especially troubled by the placement of the vent shaft on Whitelock St. The impact on property values will be severe. We will oppose this proposal (3A, 3B, 3C).
9/1/2015	Comment card	(1) I wish more information could be presented on the following [illegible]: 1. Noise level (decibel) 2. Emissions (diesel); (2) Could you list the emails for the senior members of this project (Vice President)? Thank you.
9/1/2015	Comment card	Depth of tunnel of opt 3 & 11 under Mount Royal Terrace
9/1/2015	Comment card	—Get over your need for exact figures. Engineers know the value of estimates and community members need them. Sound is a major concern. — You mentioned the federal statute prohibiting impact on historic properties and all parks if at all avoidable. Is a community garden considered a park under this statute? If not, what are the requirements to be a "park," and what is the process/responsible agency to receive such designation? ---Reservoir Hill is regularly one of Baltimore's shining stars in terms of attracting residents, development, property values, historic

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		character, etc. This is absolutely the worst place for a vent shaft. ---There was clearly much more demand for Q+A. --- You stated the design requirement is 2 trains in a bore at the same time and are not questioning that. You need to back up and question the assumption that that is a requirement. It is only [illegible] with at least 3 trains traveling in a single direction. Fine. Settle for 2, and eliminate the mid-point vent altogether. It is not addressing the concern or question at all to state that it is an absolute, unquestioned requirement to have two at a time.
9/2/2015	E-mail	Thank you very much for your time at the meeting last night in Reservoir Hill (September 1). You and the team from the architectural firm, MDOT and Amtrak gave a very informative presentation that seems to have crystallized several uncertainties surrounding the study. This is a very exciting project that has the potential to benefit the citizens of Baltimore and all those that use Amtrak along the northeast corridor. That being said, I was wondering if you could find answers to a few questions that remained unanswered (or were answered a bit vaguely) during the presentation and question and answer session: • How many diesel locomotives use the BP tunnel every day? o What is the projected use of diesel in the 2020-2040 time period? • What type of freight cargo passes through the tunnel? o Is there any oil or hazardous/flammable materials included on these freight trains? o Will there be (are there currently) restrictions on the type of cargo that is allowed to be transported through the tunnel? o Do future forecasts anticipate an increase in freight trains through the tunnel? • What is the approximate decibel level of the exhaust fans for the new NYC vents installed? o Would it be accurate to assume a similar decibel level for the current system envisioned? • Are any alternatives to a central vent stack available or may any ""workarounds"" be engineered, thereby avoiding locating a central vent stack in Reservoir Hill? o A two mile tunnel is not extremely long, and as I mentioned in my question last evening, there are several examples of lengthy tunnels without a central vent stack, including the Channel Tunnel, several in the EU (which have similar safety standards to the US), many examples in the Western portion of the United States and even in the Appalachians. • As a part of your assumptions you noted that you must engineer the tunnels so that one of the four tunnels can accommodate two trains simultaneously. Does this assume that the other three tunnels are closed or otherwise inoperable? o Would a middle vent stack be necessary if only one train were in the tunnel at a time? How would this affect train time tables? o What is the probability of more than two of the four planned tunnels being inoperable at any one time? • In the event of an emergency would the ventilation shaft have fire suppression equipment to prevent burning embers and other hazardous material from escaping into the surrounding historic neighborhood? • Would the ventilation system contain any environmental remediation equipment (i.e. scrubbers) that would reduce airborne particulates? • Will the neighborhood impact statement include an analysis of the effect of the placement of the ventilation shaft on nearby property values? o Will the neighborhood impact statement include an estimate on the cost to residents of the use and enjoyment of the Whitelock corridor as a park and garden (or future commercial development)? o As this is currently a study, are you considering the cost of ""uncertainty"" that this study is creating for potential investors and homeowners in the neighborhood?

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		There are over 5,000 people (2010 census) living in the two census tracts that constitute Reservoir Hill and the proposed location of the ventilation shaft would displace a park and garden and limit/curtail potential commercial and residential redevelopment along the Whitelock corridor. The presence of such a ventilation unit in Reservoir Hill is potentially burdensome, disruptive and damaging the improving quality of life for its residents and may curtail individuals and investors from investing in this capital starved community. I look forward to the answers to the above questions and further conversations and public meetings.
9/8/2015		I just want to find out how to enter some public comments. We bought a home @ 2020 Madison Ave. last November and are in the Madison Park Historic District and have the CHAP credit on our home until 2024. It seems counter-intuitive that the city of Baltimore would attract folks into historic districts with CHAP credits only to destroy the neighborhood with this tunnel project. So please let me know how to make my comments known. Thanks so much.
9/12/2015		I attended the Sept. 1 RHIC meeting where you presented an update on the BPTunnel Project. I reviewed the website pages and did not see the renderings of the version (2 routes) that was presented at that time. The routes in Reservoir Hill appeared to lie under Lennox St and farther north under Whitelock Street. 1. Where are these referenced images for Reservoir Hill? 2. On either route, what blocks of houses in Reservoir Hill only streets are affected by the presented options? 3. Do I understand correctly that as stated that most of the tunnel will be at the lowest point be buried 150' under level ground at the lowest point with a unknown height of the tunnel which may mean the highest point of the tunnel would be120' from the basement of housing? 4. When the tunnel reaches Mount Royal Terrace and begin its slope upward to meet the ground level tracks heading to Penn Station, what is the lowest depth of the base of the tunnel? At Park Ave? Thanks