

POTOMAC YARD METRORAIL STATION ENVIRONMENTAL IMPACT STATEMENT



Initial Screening of Alternatives

October 25, 2011

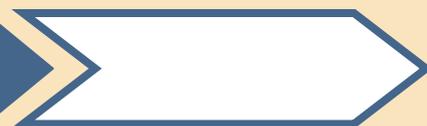


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1.0 INTRODUCTION

The Federal Transit Administration (FTA), as the federal lead agency, and the City of Alexandria, as the project sponsor and joint lead agency, in cooperation with the Washington Metropolitan Area Transit Authority (WMATA), and the National Park Service (NPS), is preparing an Environmental Impact Statement (EIS), under the National Environmental Policy Act (NEPA), for the proposed Potomac Yard Metrorail Station (or “the project”).

The project consists of construction of a new Metrorail Station located at Potomac Yard within the City of Alexandria along the existing Metrorail Blue and Yellow line between the Ronald Reagan Washington National Airport Station and the Braddock Road Station. **Figure 1-1** shows the location of the project in north Alexandria and depicts the alternative station sites under consideration as part of this initial screening of alternatives. The project would serve existing neighborhoods and retail centers as well as high-density, transit-oriented development planned by the City of Alexandria. The project would provide access to the regional Metrorail system for the U.S. Route 1 corridor of north Alexandria, which is currently without direct access to the Metrorail system.

The planning process for the Potomac Yard Metrorail Station began with the *Potomac Yard Metrorail Station Concept Development Study*, which was completed in 2010. All of the alternatives considered in that study were advanced into the scoping phase of the EIS for consideration as part of the NEPA environmental review. During scoping, a number of additional alternatives were suggested by the public. All alternatives are described in detail in Section 1.3 of this report.

The scoping process resulted in a wide range of alternatives. To develop a reasonable range of alternatives to be fully evaluated in the EIS, these alternatives are being refined as part of a two-step process. This document outlines the first stage of the screening and refinement of alternatives process, which is a feasibility analysis of all alternatives suggested during the scoping phase. The results of this feasibility analysis are presented in **Table 3-1**.

This document is organized into four sections:

- **Introduction:** This section provides a description of the project, describes the alternatives screening process, and introduces the initial alternatives considered.
- **Initial Screening Criteria and Analysis:** This section describes the criteria used to screen the initial range of alternatives and evaluates each alternative based on the screening criteria.
- **Initial Screening Results:** This section presents the screening results for each of the alternatives in a matrix format. The section identifies the alternatives to be considered in the EIS, and those alternatives eliminated from further consideration.
- **Next Steps:** This section describes the next steps in the EIS process.

1.1 Screening and Refinement of Alternatives

The purpose of the screening and refinement of alternatives is to develop a reasonable range of alternatives to be fully evaluated in the EIS, including the size, location and configuration of the station and associated facilities.

This initial review assesses the feasibility of each alternative based on responsiveness to project purpose and need; consistency with land use and development plans; and technical feasibility. This evaluation results in “technically feasible zones,” which are generalized areas within which a station could be located successfully from a technical feasibility standpoint, based on current understandings.

After this screening, the project team will identify specific station design and configurations within each technically feasible zone that maximize the potential for project benefits while minimizing the potential for adverse environmental impacts based on regulatory, social, environmental and economic considerations.

The detailed station alternatives resulting from the second phase will be evaluated in detail as part of the Draft EIS. **Figure 1-2** shows the evaluation framework that will be used to refine the alternatives for the Potomac Yard Metrorail Station EIS.

1.2 Initial Alternatives Considered

The alternatives considered for the initial screening emerged from an earlier study or were suggested during the project scoping process. The *Potomac Yard Metrorail Station Concept Development Study* identified eight possible Metrorail Station locations (shown in **Figure 1-1**) referred to as Alternatives A, B1, B2, B3, C1, C2, D1, and D2. The study also identified a No Build Alternative. These alternatives were presented to governmental agencies and the general public for review and comment during the scoping process. The scoping participants suggested several new alternatives including: Metrorail Station Alternatives D3, E1, and E2; the Virginia Railway Express (VRE) Station Alternative; the Bus Alternative; and the Parking Garage Alternative. All of these alternatives were advanced for consideration in the initial screening. The alternatives reviewed are described in more detail in the following sections.

1.2.1 No Build Alternative

The No Build Alternative includes the existing transportation network, plus committed improvements included in the regional Constrained Long-Range Transportation Plan (CLRP). The No Build Alternative includes the planned Crystal City/Potomac Yard (CCPY) Transitway but does not include a Metrorail station at Potomac Yard. The CCPY Transitway will connect the Braddock Road and Crystal City Metrorail stations and will traverse the core of Potomac Yard, with an operating plan designed to match Metrorail service levels. Current and future year conditions for the No Build Alternative will be used as a basis for identifying the transportation, environmental, and community impacts of the proposed Potomac Yard Metrorail Station Build Alternatives and will be used as a baseline from which to compare each proposed action alternative. Therefore, the No Build Alternative was not evaluated as part of the initial screening.

1.2.2 Metrorail Station Location Alternatives

All Metrorail Station Location Alternatives include an underground, at-grade, and aerial option. Platform configurations will be determined at a later stage of design. The Metrorail Station Alternatives include:

- **Metrorail Station Location Alternative A** would be located between the CSXT Railroad tracks and the Potomac Greens neighborhood, at the north end of the neighborhood. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative B1** would be located between the George Washington Memorial Parkway and the CSXT Railroad, north of Alternative A. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative B2** would be located between the George Washington Memorial Parkway and the CSXT Railroad, north of Alternative A and south of Alternative B1. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative B3** would be located between the George Washington Memorial Parkway and the CSXT Railroad, east of Alternative B2. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative C1** would be located between the CSXT Railroad and U.S. Route 1. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative C2** would be located between the CSXT Railroad and U.S. Route 1, southeast of Alternative C1. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative D1** would be located between the CSXT Railroad and U.S. Route 1, east of Alternative C2. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.

Figure 1-1: Potomac Yard Metrorail Station EIS Initial Alternatives

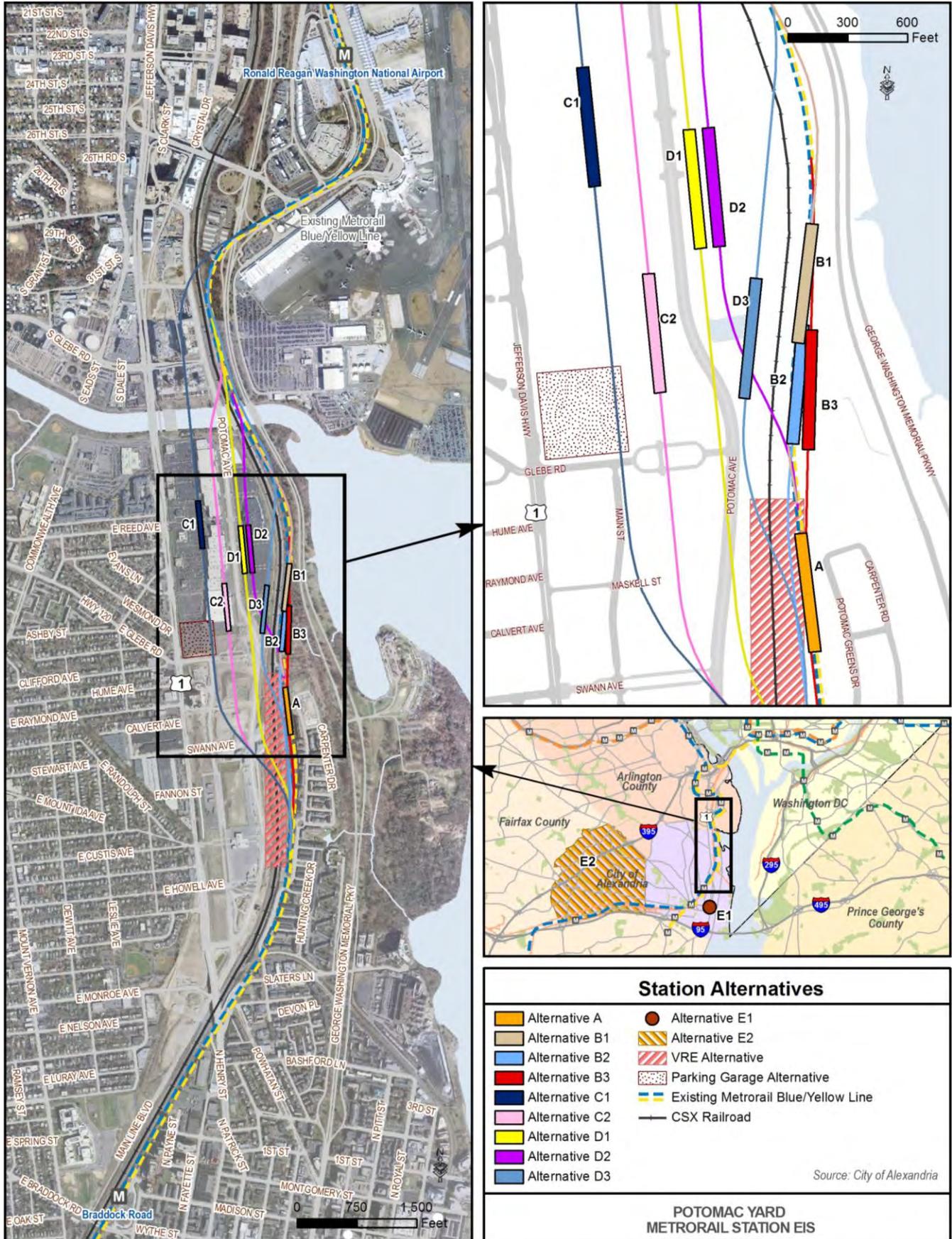
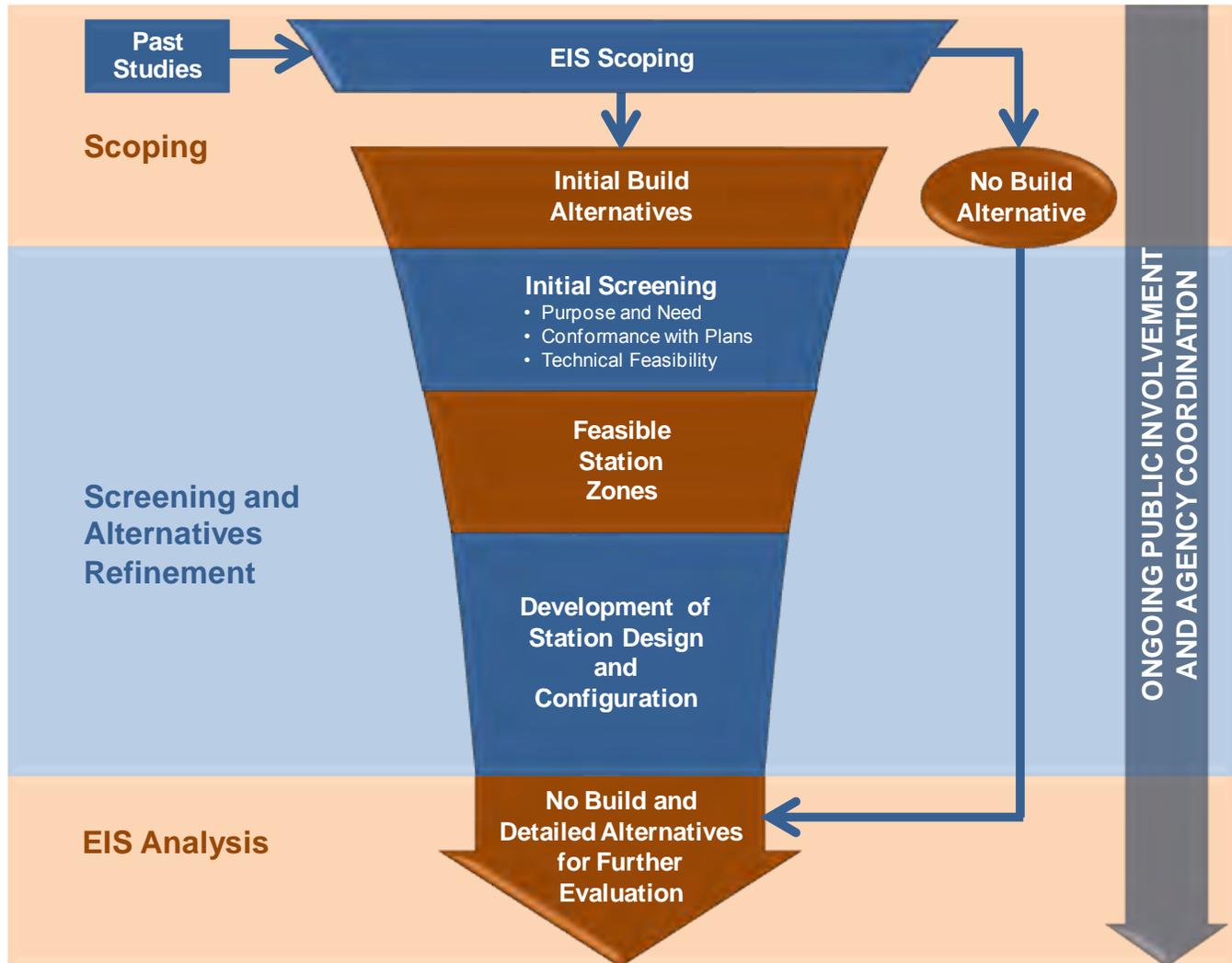


Figure 1-2: Refinement of Alternatives



Source: AECOM

- **Metrorail Station Location Alternative D2** would be located between the CSXT Railroad and U.S. Route 1, east of Alternative D1. This alternative was included in the 2010 *Potomac Yard Metrorail Concept Development Study*.
- **Metrorail Station Location Alternative D3** would be located between the CSXT Railroad and the existing movie theater. This alternative was suggested during scoping.
- **Metrorail Station Location Alternative E1** would be located in Old Town Alexandria. This alternative was suggested during scoping.
- **Metrorail Station Location Alternative E2** would be located in the West End of Alexandria. This alternative was suggested during scoping.

1.2.3 VRE Station Alternative

The VRE Station Alternative would involve construction of a new VRE station at Potomac Yard. The alternative resulted from the scoping process. The station would be located at-grade along the existing CSXT tracks. VRE is a commuter rail service that operates almost exclusively during peak periods and in the peak direction. Unlike Metrorail, it does not provide service during the midday (except for a single midday departure on each line), after 7:00 pm, holidays, or weekends. The VRE system has two lines that extend further into suburban Virginia than Metrorail but with fewer stations than Metrorail. Transfer service

between Metrorail and VRE is available at the King Street, Crystal City, L'Enfant Plaza, and Union Station Metrorail stations.

1.2.4 Bus Alternative

The Bus Alternative, which resulted from suggestions by participants during the scoping process, is a non-Metrorail alternative including changes to area bus routes and improvements to the transportation network intended to support increased trips within the corridor and provide direct access to the regional Metrorail system. This alternative would include enhancements beyond those included in the No Build Alternative. The alternative would provide enhanced transit service from the Potomac Yard area to the Crystal City and Braddock Road Metrorail stations. It would supplement the planned CCPY Transitway service by increasing the overall service frequency along the U.S. Route 1 Corridor and would provide direct service between the Metrorail stations and multiple points within Potomac Yard. The operations would correspond to Metrorail frequencies and hours of service.

1.2.5 Parking Garage Alternative

The Parking Garage Alternative would include construction of a parking deck located off of U.S. Route 1 and is intended to accommodate trips with a destination in Potomac Yard. The alternative resulted from the scoping process.

2.0 INITIAL SCREENING CRITERIA AND ANALYSIS

This section describes the criteria used to screen the initial range of alternatives. As noted in Section 1.1, the initial screening analysis evaluates each alternative based on the screening criteria and evaluation measures described in detail in the following sections. The screening criteria and order of evaluation are as follows:

1. Responsiveness to project purpose and need;
2. Consistency with land use and development plans; and
3. Technical feasibility.

For the initial screening, if an alternative is clearly inconsistent with a criterion or does not meet the basic feasibility requirements for a criterion, it will not be evaluated further against the subsequent criteria and will not pass the initial screening.

2.1 Responsiveness to Project Purpose and Need

This criterion evaluates whether or not each alternative addresses the project purpose and need as well as the goals and objectives established for the project. The project purpose and need is described below. The goals and objectives established for the project are outlined in **Table 2-1**.

The alternatives were reviewed for consistency with the project purpose and need. If an alternative was potentially consistent with or had some potential to achieve each of the specific goals of the project, then it was considered responsive to the purpose and need for screening purposes. Only those alternatives which were contrary to or had no potential to achieve the goals and objectives were considered inconsistent with the purpose and need and screened out for further analysis.

The results of the initial screening of alternatives based on consistency with the purpose and need are presented in **Table 2-2**.

Project Purpose and Need

The purpose of the project is to improve accessibility of the Potomac Yard area and provide more transportation choices for current and future residents, employees, and businesses by establishing a new access point to the regional Metrorail system. This additional access point is needed to address existing and future travel demand in the area resulting from the City of Alexandria's planned development of Potomac Yard—a major transit-oriented, mixed-use activity center in the vicinity of the proposed station.

The project area in Alexandria, Virginia, is located in the Northern Virginia portion of the Washington metropolitan region, which is expected to see approximately 30 percent population growth in the next 30 years. The project area is located adjacent to existing residential neighborhoods to the west and southeast and an approximately 600,000 square-foot retail center to the north. The existing retail center is approved for redevelopment, with 2.25 million square feet of total mixed-use development including office, retail, residential and hotel uses, assuming no Metrorail station is in place. If a Metrorail station is in place, a total of 7.5 million square feet of development may be built. Other properties in the Potomac Yard redevelopment area are approved for a total of approximately four million square feet of development. The Coordinated Development Districts (CDDs) in the Potomac Yard redevelopment area are shown in **Figure 2-1**. This additional development will impact the existing roadway network with increased travel demand resulting in additional vehicle and transit trips. The transportation network in the project area is limited by the heavy rail tracks to the east and limited east-west connectivity west of U.S. Route 1.

Table 2-1: Project Goals and Objectives

Project Goals	Project Objectives
Goal 1: Improve access to the regional Metrorail system	<ul style="list-style-type: none"> • Support WMATA's current system expansion plans for the Metrorail system • Support regional long-range transportation plans • Maximize access and minimize travel times for regional transit trips to and from existing and planned development in the Potomac Yard area
Goal 2: Serve population and employment growth in the Potomac Yard area	<ul style="list-style-type: none"> • Maximize accessibility of transit to existing and planned population and employment within the project study area • Support the City of Alexandria's redevelopment plans and transportation plans and policies for Potomac Yard and the U.S. Route 1 corridor
Goal 3: Accommodate projected travel demand and improve regional air quality	<ul style="list-style-type: none"> • Increase transit ridership to and from the Potomac Yard area • Increase overall transit mode share for trips in the Potomac Yard area • Reduce automobile vehicle miles traveled
Goal 4: Provide a cost-effective and financially feasible transportation investment	<ul style="list-style-type: none"> • Maximize ridership for existing transit infrastructure • Minimize capital and operating costs • Provide financially feasible transportation choices • Provide opportunities for private sector funding
Goal 5: Enhance transportation and pedestrian safety	<ul style="list-style-type: none"> • Minimize walking distances from the station to residential and commercial development • Maximize direct connections with surface transit services and planned pedestrian and bicycle facilities • Minimize potential for conflicts between pedestrians, transit users, and automobile traffic

Note: Consistency with Goal 4 regarding cost-effectiveness and financial feasibility was not considered as part of this screening. The alternatives are not yet developed to a sufficient level of detail to assess their cost-effectiveness or financial feasibility.

Currently, the project area is not served by Metrorail or any other rapid transit services which provide regional connectivity. The project area is located between two Metrorail stations that are 3.1 miles apart. This gap between the Ronald Reagan Washington National Airport Station and the Braddock Road Station is the longest for the portions of the Metrorail system that serve urban residential and commercial corridors. This area is currently served by local bus services that operate in mixed traffic along the congested U.S. Route 1 corridor. These bus routes have numerous local stops resulting in slow transit travel speeds, resulting in relatively long transit travel times to access the site. The Crystal City/Potomac Yard Transitway, which will provide bus priority lanes on nearby U.S. Route 1, will improve reliability and travel times of local transit services along the U.S. Route 1 corridor; however, direct access to the Metrorail system is still needed to accommodate regional transit trips.

A potential Potomac Yard Metrorail Station was included in WMATA's 1999 *Transit Service Expansion Plan*, the 2010 *Financially Constrained Long-Range Transportation Plan for the National Capital Region (CLRP)*, and earlier WMATA and regional transportation plans, in addition to the City of Alexandria's 1992 and 2008 Transportation Master Plans and 2010 *North Potomac Yard Small Area Plan*. Establishing a new access point to the regional Metrorail system would promote more transit-friendly development patterns close to the urban core supported by improved access to transit as well as a safe and reliable alternative to automobile travel to and from the Potomac Yard area. Improved access to the regional system is also needed to accommodate a greater share of travel to and from the site on transit, potentially reducing reliance on single-occupant vehicle use, decreasing automobile emissions, and improving regional air quality.

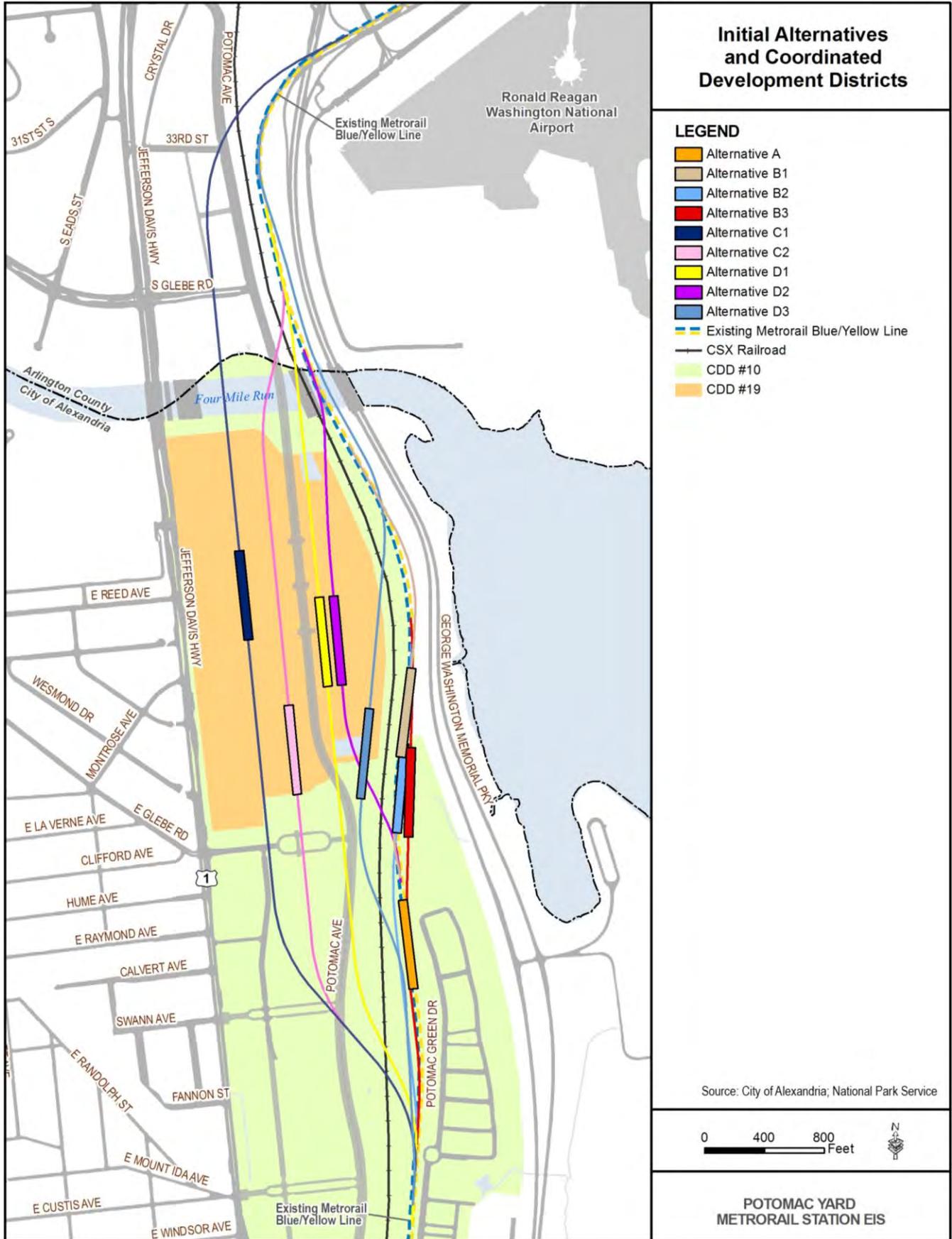
2.1.1 Alternatives A, B1, B2, and B3

Alternatives A, B1, B2, and B3, whether underground, at-grade, or aerial, would be consistent with the goals and objectives of the project purpose and need. Therefore, these alternatives pass the initial screening.

2.1.2 Alternatives C1 and C2

Alternatives C1 and C2 would be consistent with the goals and objectives of the project purpose and need, whether underground, at-grade, or aerial. Therefore, these alternatives pass the initial screening.

Figure 2-1: Potomac Yard Redevelopment Area



2.1.3 Alternatives D1, D2, and D3

Alternatives D1, D2, and D3 would be consistent with the goals and objectives of the project purpose and need, whether underground, at-grade, or aerial. Therefore, these alternatives pass the initial screening.

2.1.4 Alternatives E1 and E2

Alternative E1 would not be consistent with the goals and objectives of the project purpose and need, because of the distance from the proposed location in Old Town Alexandria to Potomac Yard. Likewise, Alternative E2 would not be consistent with the goals and objectives of the project purpose and need, because its proposed location is in the West End of Alexandria and far from Potomac Yard. Therefore, these alternatives would not provide direct transit service to Potomac Yard nor enhance Metrorail access or transit connectivity for Potomac Yard. Furthermore, Alternatives E1 and E2 would not accommodate travel demand or support safer travel modes in the Potomac Yard area. Therefore, these alternatives do not pass the initial screening.

2.1.5 VRE Station Alternative

The VRE Station Alternative would not be consistent with the goals and objectives of the project purpose and need, because it would not provide direct access to the Metrorail system and would only serve a small portion of existing and potential transit users. Specifically, the alternative would not provide direct access to the regional Metrorail system. Therefore, this alternative does not pass the initial screening.

2.1.6 Bus Alternative

The Bus Alternative would not be consistent with the project purpose and need, because it does not establish a new access point to the regional Metrorail system. Therefore, this alternative does not pass the initial screening.

2.1.7 Parking Garage Alternative

The Parking Garage Alternative would not be consistent with the goals and objectives of the project purpose and need, because it does not address the need to accommodate projected travel demand in the U.S. Route 1 corridor. Specifically, the alternative:

- Would not provide access to the regional Metrorail system;
- Would not improve transit access to Potomac Yard;
- Would help meet parking demand at the site but would not enhance mobility in the vicinity of Potomac Yard;
- Would not support travel modes that have the potential to improve regional air quality; and
- Would potentially increase auto traffic in the Potomac Yard development, which would create additional opportunities for conflicts with pedestrians and bicyclists.

Therefore, this alternative does not pass the initial screening.

Table 2-2: Consistency with the Project Goals and Objectives*

Alternative		Goal 1: Improve Potomac Yard Access to the Regional Metrorail System	Goal 2: Serve Population & Employment Growth in the Potomac Yard Area	Goal 3: Accommodate Travel Demand to and from the Potomac Yard Area & Improve Regional Air Quality	Goal 5: Enhance Transportation & Pedestrian Safety in the Potomac Yard Area
Metrorail Station Alternative A	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative B1	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative B2	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative B3	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative C1	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative C2	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative D1	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes

Alternative		Goal 1: Improve Potomac Yard Access to the Regional Metrorail System	Goal 2: Serve Population & Employment Growth in the Potomac Yard Area	Goal 3: Accommodate Travel Demand to and from the Potomac Yard Area & Improve Regional Air Quality	Goal 5: Enhance Transportation & Pedestrian Safety in the Potomac Yard Area
Metrorail Station Alternative D2	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative D3	underground	Yes	Yes	Yes	Yes
	at-grade	Yes	Yes	Yes	Yes
	aerial	Yes	Yes	Yes	Yes
Metrorail Station Alternative E1	underground	No	No	No	No
	at-grade	No	No	No	No
	aerial	No	No	No	No
Metrorail Station Alternative E2	underground	No	No	No	No
	at-grade	No	No	No	No
	aerial	No	No	No	No
VRE Station Alternative		Yes (limited) [†]	Yes	No	Yes
Bus Alternative		No	Yes	Yes	Yes
Parking Garage Alternative		No	Yes	No	No

**Note: Consistency with Goal 4 regarding cost-effectiveness and financial feasibility was not considered as part of this screening. The alternatives are not yet developed to a sufficient level of detail to assess their cost-effectiveness or financial feasibility.*

[†] A VRE station would not provide direct access to the regional Metrorail system, but would provide access via transfer at the King Street, Crystal City, L'Enfant Plaza, and Union Station Metrorail stations.

2.2 Consistency with Land Use and Development Plans

Following the screening based on responsiveness to the project purpose and need, the remaining build alternatives (underground, at-grade, and aerial station options for Alternatives A, B1, B2, B3, C1, C2, D1, D2, and D3) were evaluated based on consistency with the *North Potomac Yard Small Area Plan* (2010) and the *Potomac Yard Coordinated Development District (CDD #10) Concept Plan* (approved 1999, updated 2010). See **Figure 2-1** for CDD locations.

The plans identify where future development is intended or planned to occur in Potomac Yard. The evaluation of consistency with land use and development plans determined whether a build alternative or station option is consistent with or has potential to support the applicable land use and development plans. Alternatives which are consistent with these plans were considered consistent for screening purposes. Alternatives which are contrary to these land use and development plans were considered inconsistent and screened out for further analysis. The results of the initial screening of alternatives based on consistency with the land use and development plans are presented in **Table 2-3**.

Potomac Yard Coordinated Development District (CDD #10) Concept Plan

The *Potomac Yard Coordinated Development District (CDD #10) Concept Plan* proposes a development program to transform an underutilized tract into a high-density, mixed-use community. The plan proposes a street grid, network of open spaces, and a development program for approximately 166 acres of land. One of the main aspects of the proposed development program is a high-density, mixed-use “Town Center” surrounded by open spaces and medium-density residential communities. The center would be located immediately south of the existing Potomac Yard Retail Center. Although the concept plan does not propose or require a new Metrorail station at Potomac Yard, it assumes the use of the Metro Reservation site at Alternative A for a future Potomac Yard Metrorail Station. The concept plan locates the “Town Center” adjacent to Alternative A and the existing Potomac Yard Retail Center, with the intent that the “Town Center” would “draw upon the success” of the retail center’s activity.

North Potomac Yard Small Area Plan (2010)

The City of Alexandria’s *North Potomac Yard Small Area Plan* is intended to guide future growth and redevelopment in the area that currently includes the Potomac Yard Retail Center, which is just north of the “Town Center,” proposed in the *Potomac Yard CDD #10 Concept Plan*. Unlike the *Potomac Yard CDD #10 Concept Plan*, the *North Potomac Yard Small Area Plan*, does not assume the continued use of the Potomac Yard Retail Center. The plan recommends a rezoning of North Potomac Yard to be a new CDD (CDD #19), apart from CDD #10. The plan calls for high-density transit-oriented development, mostly office or mixed-use, connected by a multi-modal transportation network that is characterized by a “highly walkable urban environment, minimal automobile impact, and maximum use of existing and new Metro stations.”

2.2.1 Alternative A

Alternative A underground, at-grade, and aerial station options meet the criteria for consistency with land use and development plans. The *Potomac Yard CDD Concept Plan* assumes, but does not require, the use of the Metro Reservation site at this location for the Metrorail Station. Alternative A would serve the Potomac Yard area and would not conflict with land use and development plans. Therefore, Alternative A passes the initial screening. However, it should be noted that adoption of an alternative other than that included in the *North Potomac Yard Small Area Plan* would require a new local land use planning process to be undertaken by the City of Alexandria.

2.2.2 Alternatives B1, B2, and B3

Alternatives B1, B2, and B3 underground, at-grade, and aerial station options meet the criteria for consistency with land use and development plans. The *North Potomac Yard Small Area Plan* includes a Metrorail Station at roughly the location of Alternative B2 or B3. The B Alternatives would serve the Potomac Yard area and would not conflict with land use and development plans. Therefore, Alternatives B1, B2, and B3 pass the initial screening. It should be noted that although there is no current General Management Plan for the George Washington Memorial Parkway, potential impacts to planned land uses and viewsheds within the park will be evaluated in detail as part of the EIS.

Table 2-3: Consistency with Land Use and Development Plans

Alternative		Consistency with the <i>Potomac Yard CDD #10 Concept Plan</i> and <i>North Potomac Yard Small Area Plan</i>
Metrorail Station Alternative A	underground	Yes
	at-grade	Yes
	aerial	Yes
Metrorail Station Alternative B1	underground	Yes
	at-grade	Yes
	aerial	Yes
Metrorail Station Alternative B2	underground	Yes
	at-grade	Yes
	aerial	Yes
Metrorail Station Alternative B3	underground	Yes
	at-grade	Yes
	aerial	Yes
Metrorail Station Alternative C1	underground	Yes
	at-grade	No
	aerial	Yes
Metrorail Station Alternative C2	underground	Yes
	at-grade	No
	aerial	Yes
Metrorail Station Alternative D1	underground	Yes
	at-grade	No
	aerial	Yes
Metrorail Station Alternative D2	underground	Yes
	at-grade	No
	aerial	Yes
Metrorail Station Alternative D3	underground	Yes
	at-grade	No
	aerial	Yes

2.2.3 Alternatives C1 and C2

Alternatives C1 and C2 **underground** station options are consistent with land use and development plans. The options would not conflict with the new street grid, potential development, or open space proposed in the plans. Therefore, Alternatives C1 and C2 **underground** pass the initial screening. However, it should be noted that adoption of an alternative other than that included in the *North Potomac Yard Small Area Plan* would require a new local land use planning process to be undertaken by the City of Alexandria.

Alternatives C1 and C2 **at-grade** station options, which would require new track alignments through North Potomac Yard, are inconsistent with the plans. The at-grade station options would require grade separated crossings for auto, pedestrian, and bicycle traffic, which would force the street grid onto aerial structures over the WMATA right-of-way or into tunnels under the right-of-way. Grade separated crossings would conflict with the goal of creating a highly walkable urban environment. Therefore, Alternatives C1 and C2 **at-grade** do not pass the initial screening.

Alternatives C1 and C2 **aerial** station options, which would require establishing new track alignments through the planned development, as shown in the *North Potomac Yard Small Area Plan*, are consistent with the plans. The *Potomac Yard Metrorail Station Concept Development Study* (2010) identified a set of aerial options (Alternatives D1 and D2) which would require alterations to the planned street and block grid. Although this type of station option would require the use of parcels identified for high density for the right-of-way needs of the Metrorail station and elevated track, a restructuring of the grid to accommodate the C1 and C2 alignment locations could potentially be done in a way that upholds the integrity and purpose of the adopted plans. Therefore, Alternatives C1 and C2 **aerial** station options are consistent with development plans and pass the initial screening. However, it should be noted that adoption of an alternative other than that included in the *North Potomac Yard Small Area Plan* would require a new local land use planning process to be undertaken by the City of Alexandria.

2.2.4 Alternatives D1, D2, and D3

Alternatives D1, D2 and D3 **underground** station options are consistent with land use and development plans. The options would not conflict with the new street grid, potential development, or open space proposed in the plans. Therefore, Alternatives D1, D2, and D3 **underground** pass the initial screening. However, it should be noted that adoption of an alternative other than that included in the *North Potomac Yard Small Area Plan* would require new planning processes.

Alternatives D1 and D2 **at-grade** station options, which would require new track alignments through North Potomac Yard, are inconsistent with the plans. The at-grade station options would require grade separated crossings for auto, pedestrian, and bicycle traffic, which would force the street grid onto aerial structures over the WMATA right-of-way or into tunnels under the right-of-way. Grade separated crossings would conflict with the goal of creating a highly walkable urban environment. Therefore, Alternatives D1 and D2 **at-grade** do not pass the initial screening.

The Alternative D3 **at-grade** station option is inconsistent with land use and development plans, because it would result in the station and track alignment displacing or disrupting access to a planned park and recreational trail which is part of the *North Potomac Yard Small Area Plan*. The Alternative D3 at-grade option would potentially isolate the proposed parkland and trail between the realigned Metrorail line and the existing CSXT freight rail line. This planned park is intended to provide an accessible and continuous open space connection and off-street trail from Four Mile Run to Braddock Road. Therefore, Alternative D3 **at-grade** does not pass the initial screening.

As noted in the *Potomac Yard Metrorail Station Concept Development Study*, the **aerial** station options for Alternatives D1 and D2 would require alterations to the planned grid. The D1 aerial option would utilize an alleyway between new buildings for its alignment, and the D2 aerial option would require the realignment of Potomac Avenue for its alignment. The D1, D2 and D3 aerial station options would require the use of parcels identified for development or parks/open space for the right-of-way needs of the Metrorail station and elevated track. However, the modifications required for the Metrorail station could potentially be done in a way that upholds the integrity and purpose of the adopted plans. Therefore, Alternatives D1, D2, and D3 **aerial** station options pass the initial screening. However, it should be noted that adoption of an alternative other than that included in the *North Potomac Yard Small Area Plan* would require a new local land use planning process to be undertaken by the City of Alexandria.

2.3 Technical Feasibility

Following the screenings based on responsiveness to the Purpose and Need and Consistency with Land Use and Development Plans criteria, the remaining alternatives (Alternatives A, B1, B2, and B3 underground, at-grade, and aerial; and Alternatives C1, C2, D1, D2, and D3 underground and aerial) were analyzed for technical feasibility. Engineering design of each alternative was developed to the level necessary to assess technical feasibility, which is approximately five percent design. Rail engineers conducted a technical feasibility analysis which evaluated the alternatives for compliance with design criteria as they apply to maximum allowable track speed, horizontal and vertical alignment geometry, horizontal and vertical clearance requirements, and constructability/construction phasing requirements. This set of design criteria comprises the current adopted WMATA Manual of Design Criteria, Release 9 (2008) and relevant CSXT Criteria. Alternatives that do not meet the technical feasibility criteria were eliminated. A detailed listing of all criteria and sources is provided in **Appendix A**. See **Figure 2-2** (insets A through F) for an illustration of the technical feasibility criteria. The key criteria include:

- Constructability and Construction Phasing: WMATA policy requires that construction activities cannot interrupt existing Metrorail operations on the Blue and Yellow line for a period longer than a three-day holiday weekend (76 hours). In terms of this study, where proposed station locations require adjustments to mainline track alignments, tie-in to the existing mainline must be at-grade, and cannot occur along the aerial or tunnel track segments to the north and south of Potomac Yard;
- The maximum vertical grade for track is four percent (see **Inset A**);
- Vertical Clearance: 35 feet minimum is required over CSXT track, and 25 feet minimum is required under CSXT track (see **Inset B**);¹
- Horizontal geometry must allow for a minimum speed of 45 mph (radius=755 feet; see **Inset C**);
- Horizontal Clearance: 50 feet minimum is required from the centerline of Metrorail track to the centerline of CSXT track, and 40 feet minimum is required from the face of a Metrorail bridge, pier, or tunnel portal to the centerline of CSXT track (see **Inset D**); and
- Horizontal and vertical alignment at a station: a minimum 730 feet of tangent (straight track) is required; 600 feet along the platform, and 65 feet at either end of the platform before the beginning of a horizontal or vertical curve (see **Inset E**).

The following assumptions were made during the review process:

- For purposes of this study, CSXT top of rail elevations were considered to be similar to existing Blue and Yellow line top of rail elevations at the proposed crossing locations;
- Aerial Station: The top of rail is assumed to be 30 feet above surface;
- The top of rail is assumed to be 40 feet below surface under Four Mile Run. The existing ground profile shows a 20-foot depth to Four Mile Run. However, review of contour maps indicates this depth may be greater than 20 feet;
- To meet WMATA minimum mainline outage requirements, the existing aerial structure to the north and tunnel structure to the south will not be altered for purposes of accommodating the Potomac Yard Metrorail Station alignment;

¹ 35 feet of clearance over CSXT includes 23 feet clear from the top of CSXT rail to the bottom of the Metrorail structure, and 12 feet of structure depth from the bottom of Metrorail structure to the top of rail; 25 feet of clearance under CSXT or Four Mile Run includes 20 feet from the top of rail to top (or outside) of tunnel structure and 5 feet of additional clearance to top of CSXT rail.

- For constructability of above-grade or below-grade alignments, the new mainline vertical alignment will not begin rising or descending until the proposed alignment is 15 feet away horizontally from the existing mainline alignment (see **Inset F**); and
- Construction of temporary parallel mainline alignments is not considered feasible as a way of addressing constructability issues.

The screening results are described in the sections below and are summarized in **Table 2-4**. A more detailed description of the technical feasibility screening process is available in **Appendix A**.

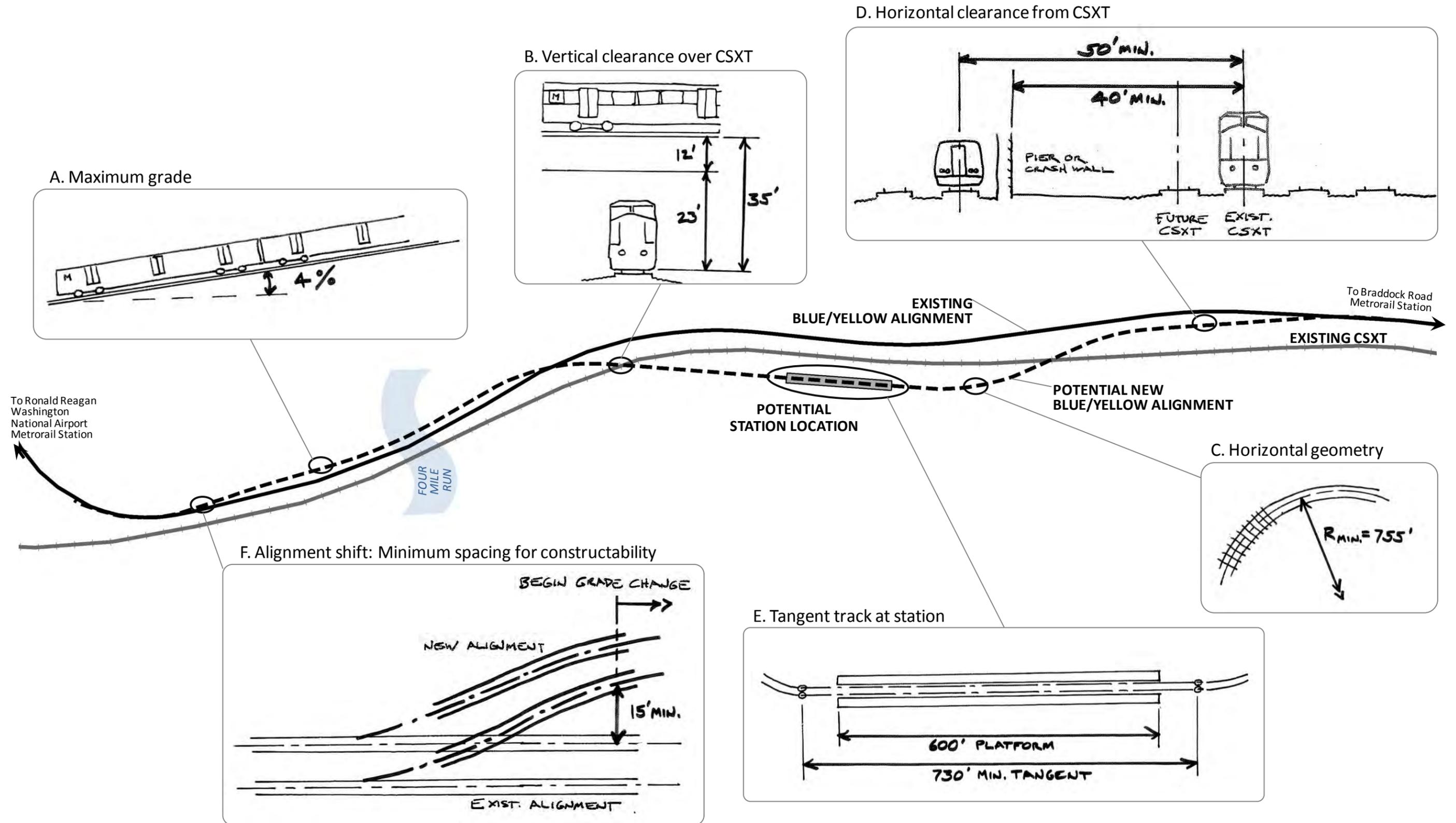
Table 2-4: Technical Feasibility

Alignment Option		Meets Constructability Requirements	Meets Vertical Clearance Requirements	Meets Horizontal Clearance Requirements
Metrorail Station Alternative A	underground	No	n/a	No
	at-grade	Yes	Yes	Yes
	aerial	No	n/a	No
Metrorail Station Alternative B1	underground	No	n/a	No
	at-grade	Yes	Yes	Yes
	aerial	No	n/a	No
Metrorail Station Alternative B2	underground	No	n/a	No
	at-grade	Yes	Yes	Yes
	aerial	No	n/a	No
Metrorail Station Alternative B3	underground	No	n/a	No
	at-grade	Yes	Yes	Yes
	aerial	No	n/a	No
Metrorail Station Alternative C1	underground	No	No	No
	aerial	No	No	No
Metrorail Station Alternative C2	underground	No	No	No
	aerial	No	No	No
Metrorail Station Alternative D1	underground	No	No	No
	aerial	No	No	No
Metrorail Station Alternative D2	underground	No	No	No
	aerial	No	No	No
Metrorail Station Alternative D3	underground	No	No	No
	aerial	Yes	Yes	Yes

2.3.1 Alternative A

Alternative A is located on the existing WMATA Blue and Yellow line horizontal alignment. The station would be placed within a segment of existing horizontal tangent which has sufficient length to accommodate a station. The Alternative A alignment and screening results are shown in **Figure 2-3**.

Figure 2-2: Technical Feasibility Criteria



Source: AECOM

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The Alternative A **at-grade** option meets the design criteria and is considered technically feasible. However, the existing vertical alignment in this section undulates, and would need to be flattened to create a continuous grade at the station. It appears feasible to modify the alignment to meet the design criteria. With respect to constructability and construction phasing, the work installing the station platforms would occur adjacent to live track, which would make staging of that work challenging. However, a Construction Phasing Plan could be developed for the alignments, which would phase the work in a method that would meet the maximum out of service requirements of 76 hours. Therefore, the Alternative A **at-grade** option passes the initial screening.

The Alternative A, **underground** and **aerial** options do not pass the initial screening due to constructability and construction phasing issues. The horizontal alignments for these options locate directly along the existing mainline alignment. Construction above or below the existing track would require the Blue and Yellow line to be out of service for the entire construction period, which could take 6 to 18 months of continuous work. This would be far beyond the 76-hour maximum closure period established by WMATA.

See **Appendix A** for more detailed analysis.

2.3.2 Alternatives B1, B2, and B3

Alternatives B1, B2, and B3 each require changes to the existing horizontal alignment in order to achieve the length of tangent track (straight track) required for a station. These alternatives generally stay in proximity to the existing mainline alignment, with the realigned track shifting approximately ten feet on average from the existing track, with a maximum shift of approximately 70 feet. All Alternative B options locate Metrorail within its existing corridor between the George Washington Memorial Parkway to the east and CSXT right-of-way to the west. The Alternative B1 alignment and screening results are shown in **Figure 2-4**, the Alternative B2 alignment and screening results are shown in **Figure 2-5**, and the Alternative B3 alignment and screening results are shown in **Figure 2-6**.

The Alternatives B1, B2, and B3 **at-grade** options meet the design criteria and are considered technically feasible. With respect to constructability and construction phasing, work for Alternatives B1 and B2 would occur adjacent to live track, which would make staging of that work challenging. Staging the construction of Alternative B3 would be less challenging, as the edge of the station platform would be located a minimum of 28 feet from the centerline of the existing track. A Construction Phasing Plan could be developed for the alignments, which would phase the work to meet the maximum out of service requirement of 76 hours.

The Alternatives B1, B2, and B3 **underground** and **aerial** options do not pass the initial screening due to issues associated with constructability and construction phasing. The horizontal alignments for these options locate in close proximity to the existing mainline alignment. Construction above or below the existing track would require the Blue and Yellow line to be taken out of service for most of the construction period, which could take 6 to 18 months. This would be far beyond the 76-hour maximum closure period established by WMATA.

See **Appendix A** for more detailed analysis.

2.3.3 Alternatives C1 and C2

Alternatives C1 and C2 diverge from the existing Blue and Yellow line alignment, cross the CSXT line and Four Mile Run, and locate in the corridor between CSXT and U.S. Route 1. At the northern end, Alternative C1 diverges from the existing alignment on the aerial structure, approximately at the point where the Blue and Yellow line cross over the George Washington Memorial Parkway. Alternative C2 diverges from the existing alignment at approximately the location of transition between the Ronald Reagan Washington National Airport aerial structure guideway and the at-grade guideway. At the southern end, both alignments rejoin the existing alignment approximately 400 feet north of the existing tunnel portal. The Alternative C1 alignment and screening results are shown in **Figure 2-7**, and the Alternative C2 alignment and screening results are shown in **Figure 2-8**.

Alternative C1 **underground** and **aerial** options do not pass the initial screening due to issues associated with vertical clearance, constructability, and construction phasing. Assuming a four percent grade, the

proposed horizontal alignment at the southern end does not provide sufficient distance to achieve the vertical separation required to meet the required clearance over and under the CSXT line (35 feet and 25 feet, respectively). At the northern end, tie-in to the aerial structure would require a continuous out of service period of at least three to six weeks. This out of service period would exceed the acceptable 76 hour maximum closure period. In addition, the northern end of the alignment would require displacement or major modification of newly constructed buildings in the Arlington portion of Potomac Yard.

Alternative C2 **underground** and **aerial** options do not pass the initial screening due to vertical clearance issues. Assuming a four percent grade, the proposed alignment does not provide sufficient distance to achieve the vertical separation required to meet the required clearance over and under the CSXT line and under Four Mile Run at the northern end, or under and over the CSXT line at the southern end.

See **Appendix A** for more detailed analysis.

2.3.4 Alternatives D1 and D2

Alternatives D1 and D2 diverge from the existing Blue and Yellow line alignment, cross the CSXT line and Four Mile Run, and locate in the corridor between CSXT and U.S. Route 1. At the northern end, the divergence from the existing alignment occurs at approximately the location of transition between the Ronald Reagan Washington National Airport aerial structure guideway and the at-grade guideway. At the southern end, Alternative D1 rejoins the existing alignment approximately 400 feet north of the existing tunnel portal, while Alternative D2 rejoins the existing alignment approximately 2,500 feet north of the existing tunnel portal. The Alternative D1 alignment and screening results are shown in **Figure 2-9**, and the Alternative D2 alignment and screening results are shown in **Figure 2-10**.

Alternatives D1 and D2 **underground** and **aerial** options do not pass the initial screening due to issues associated with vertical clearance. Assuming a four percent grade, the proposed alignment does not provide sufficient distance to achieve the vertical separation required to meet the design criteria clearance over and under the CSXT line (35 feet and 25 feet, respectively) and under Four Mile Run (40 feet) at the northern end, or under and over the CSXT line at the southern end.

See **Appendix A** for more detailed analysis.

2.3.5 Alternative D3

Alternative D3 was suggested during scoping and has been developed to the point that technical feasibility can be evaluated. This alternative would be similar to the C and D alignments, diverging from the existing Blue and Yellow line alignment to cross the CSXT line and Four Mile Run and locate within the corridor between the CSXT line and U.S. Route 1. Alternative D3 would diverge from the existing Blue and Yellow line around the transition between the Ronald Reagan Washington National Airport aerial structure guideway and the current at-grade guideway. At the northern end, the alignment would locate to the east of the existing mainline track, between the existing Metrorail alignment and the George Washington Memorial Parkway. The alignment would continue in this corridor until sufficient horizontal length was provided to achieve the required vertical clearance of 35 feet over the CSXT line. At that point, the alignment would cross the existing Metrorail alignment and CSXT line, and run along the eastern edge of Potomac Yard. At the southern end, the alignment would cross over the CSXT line and run in the corridor between the CSXT line and the existing Metrorail alignment. The proposed alignment would continue south until a sufficient amount of horizontal alignment was provided to allow the proposed vertical alignment to match the existing vertical alignment elevation and tie into the existing alignment. The Alternative D3 alignment and screening results are shown in **Figure 2-11**.

The Alternative D3 **aerial** option meets the design criteria and is considered technically feasible. The Alternative D3 **underground** option does not pass the initial screening due to issues associated with vertical clearance. Assuming a four percent grade, the proposed alignment does not provide sufficient distance to achieve the 40 feet of vertical separation required to meet the design criteria clearance under Four Mile Run at the northern end.

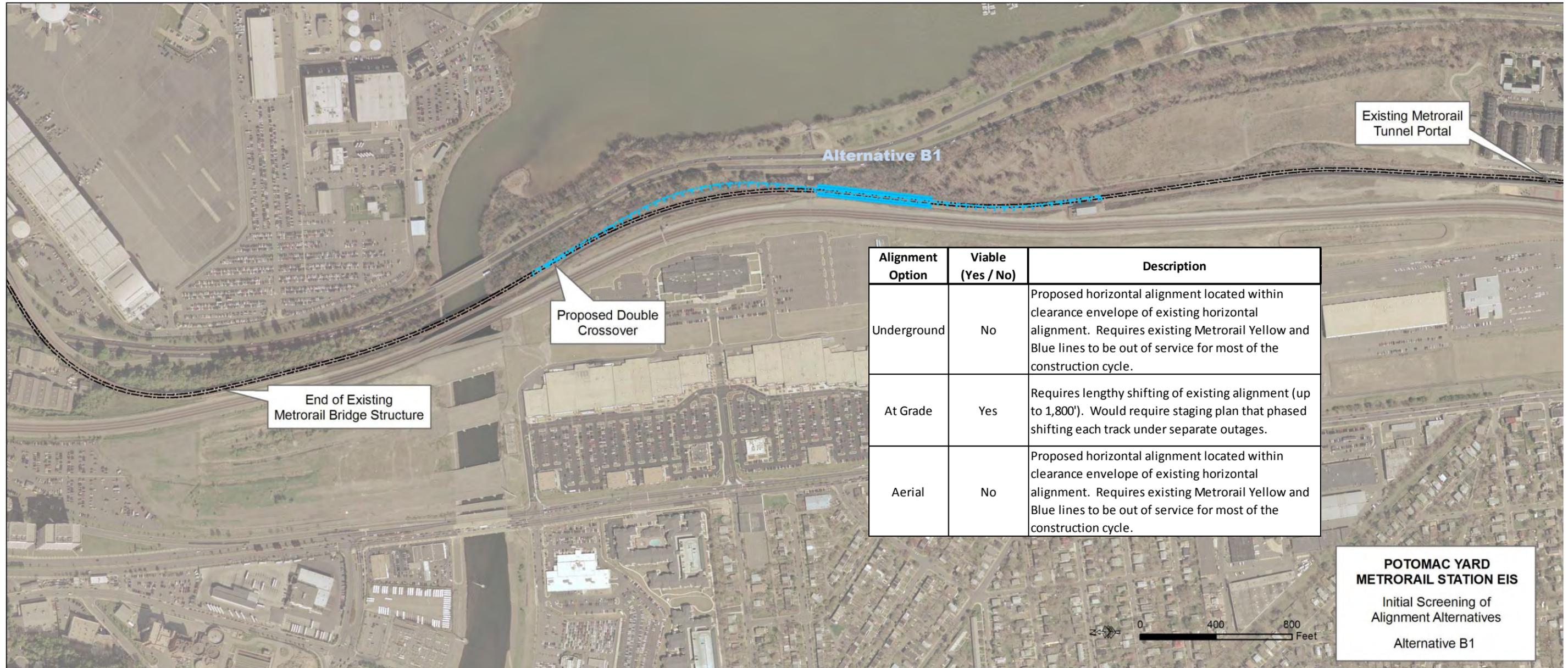
See **Appendix A** for more detailed analysis.

Figure 2-3: Alternative A Alignment and Initial Screening



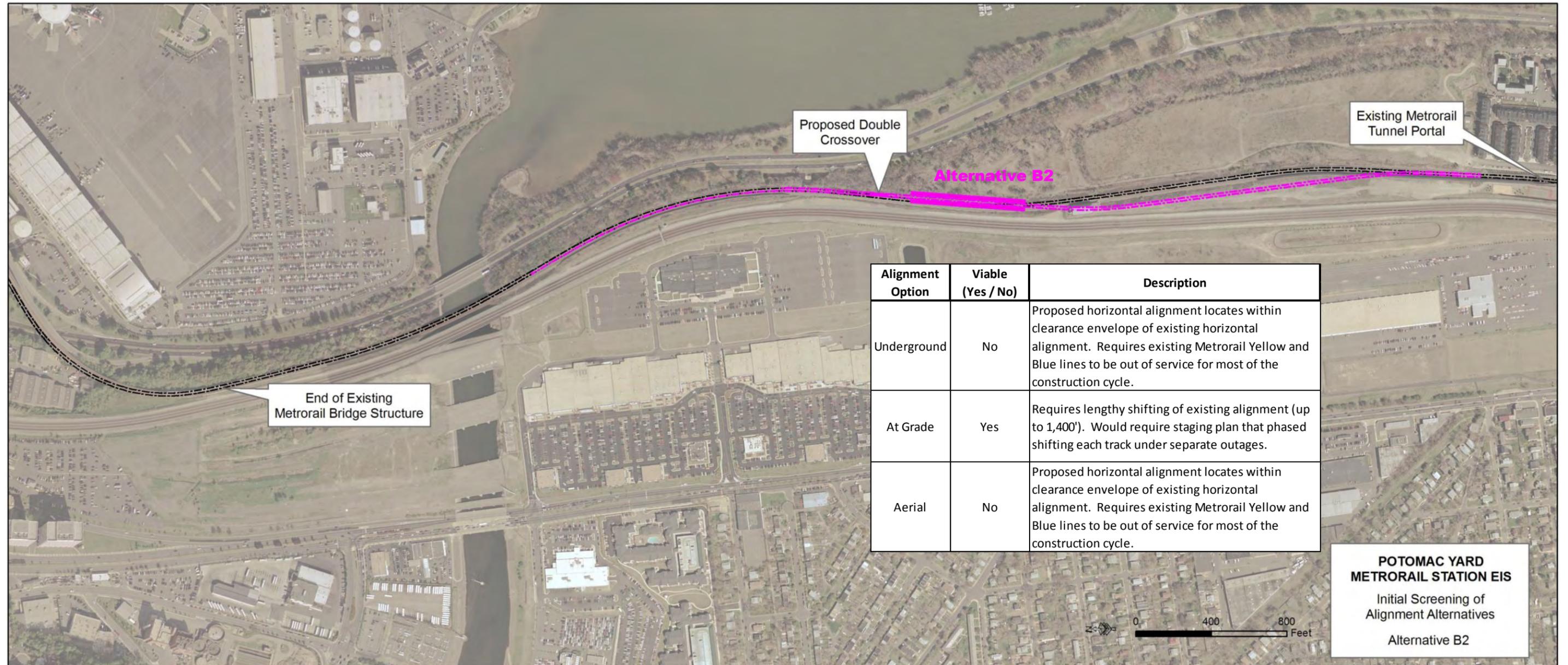
Source: AECOM

Figure 2-4: Alternative B1 Alignment and Initial Screening



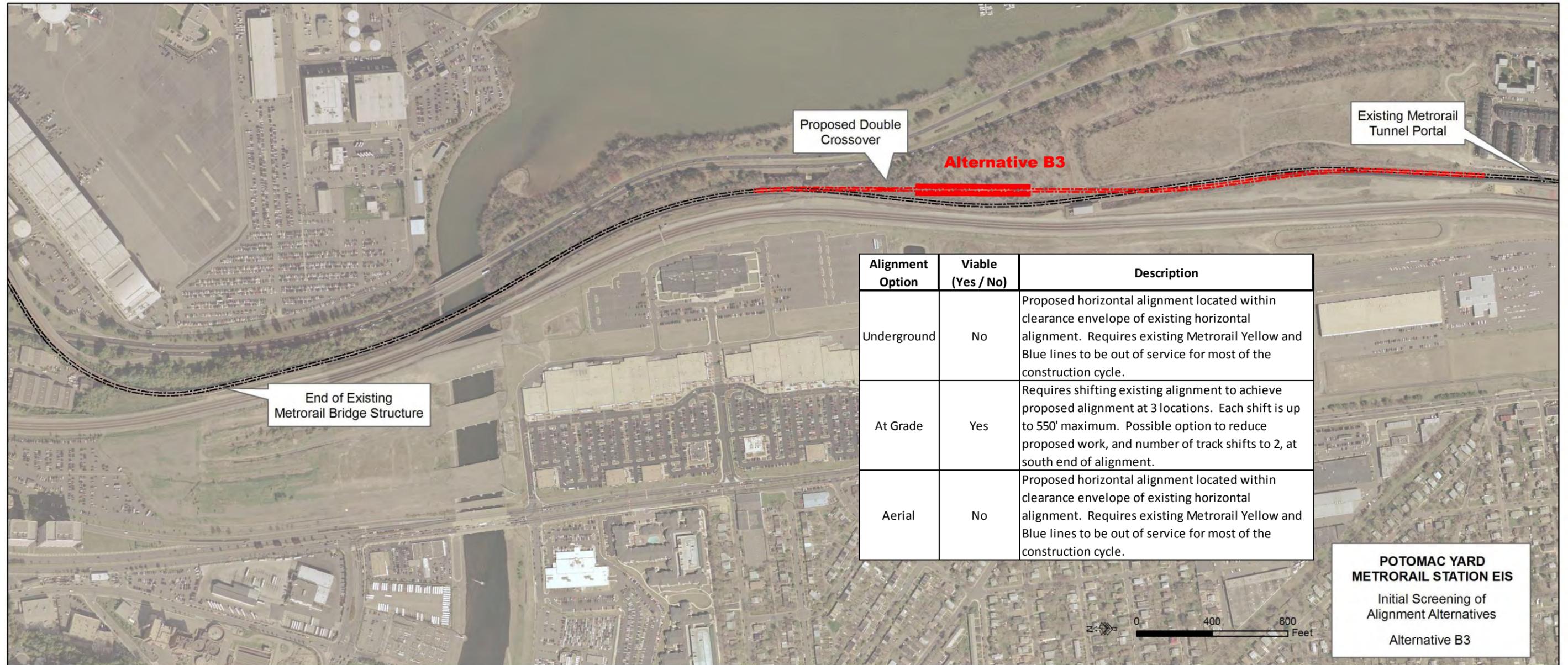
Source: AECOM

Figure 2-5: Alternative B2 Alignment and Initial Screening



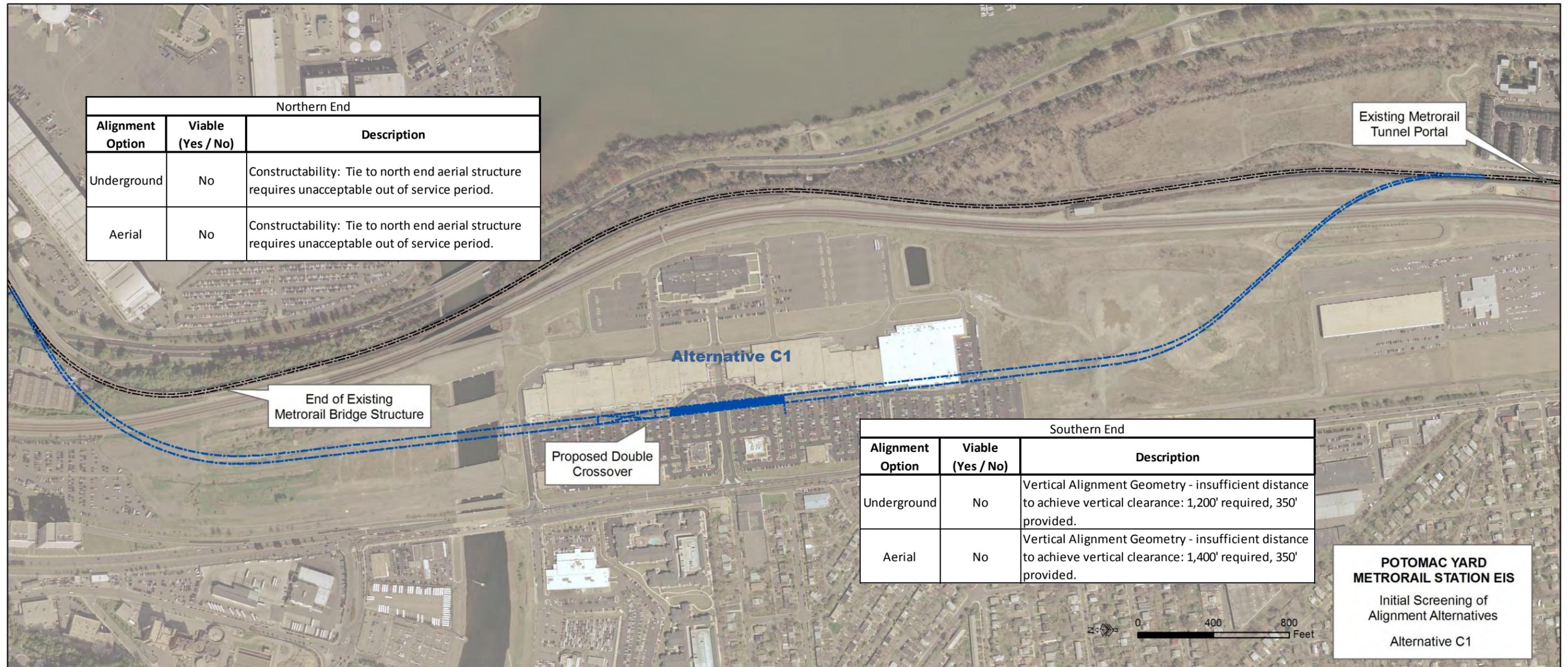
Source: AECOM

Figure 2-6: Alternative B3 Alignment and Initial Screening



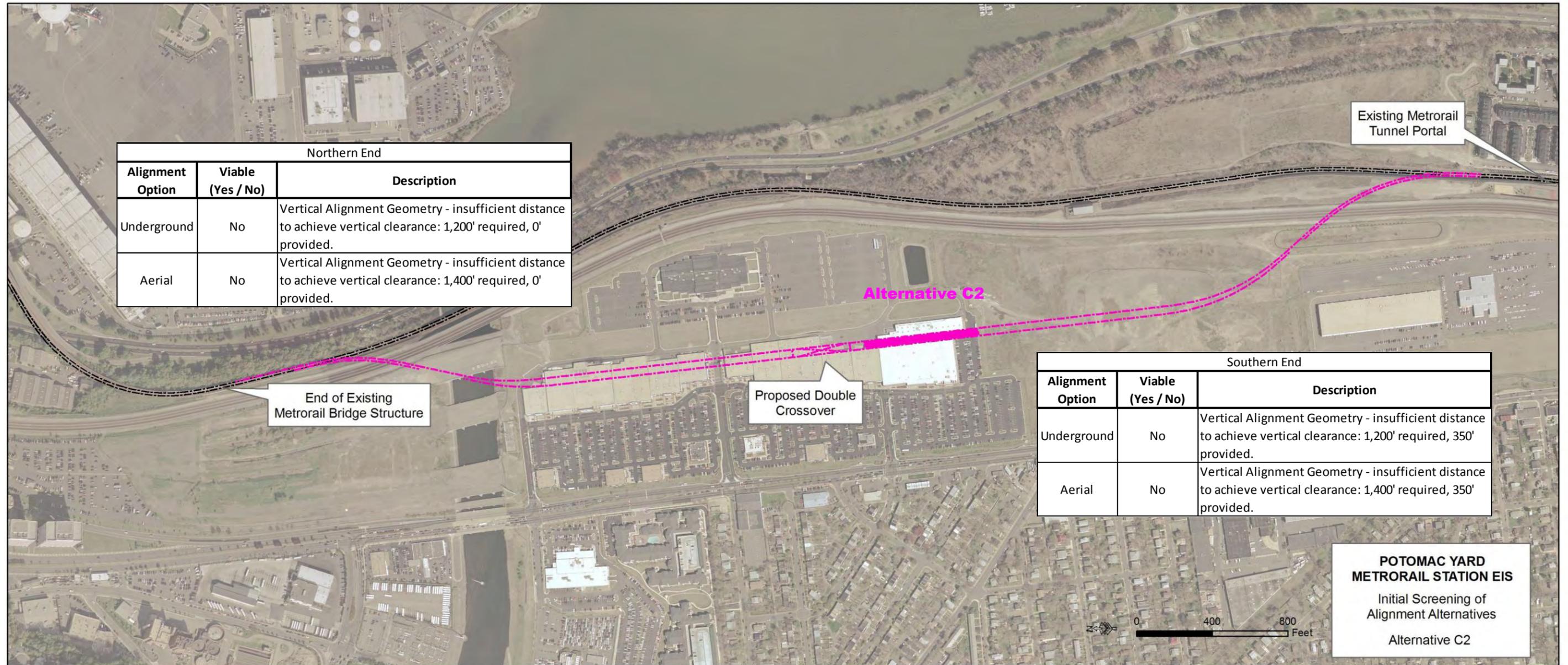
Source: AECOM

Figure 2-7: Alternative C1 Alignment and Initial Screening



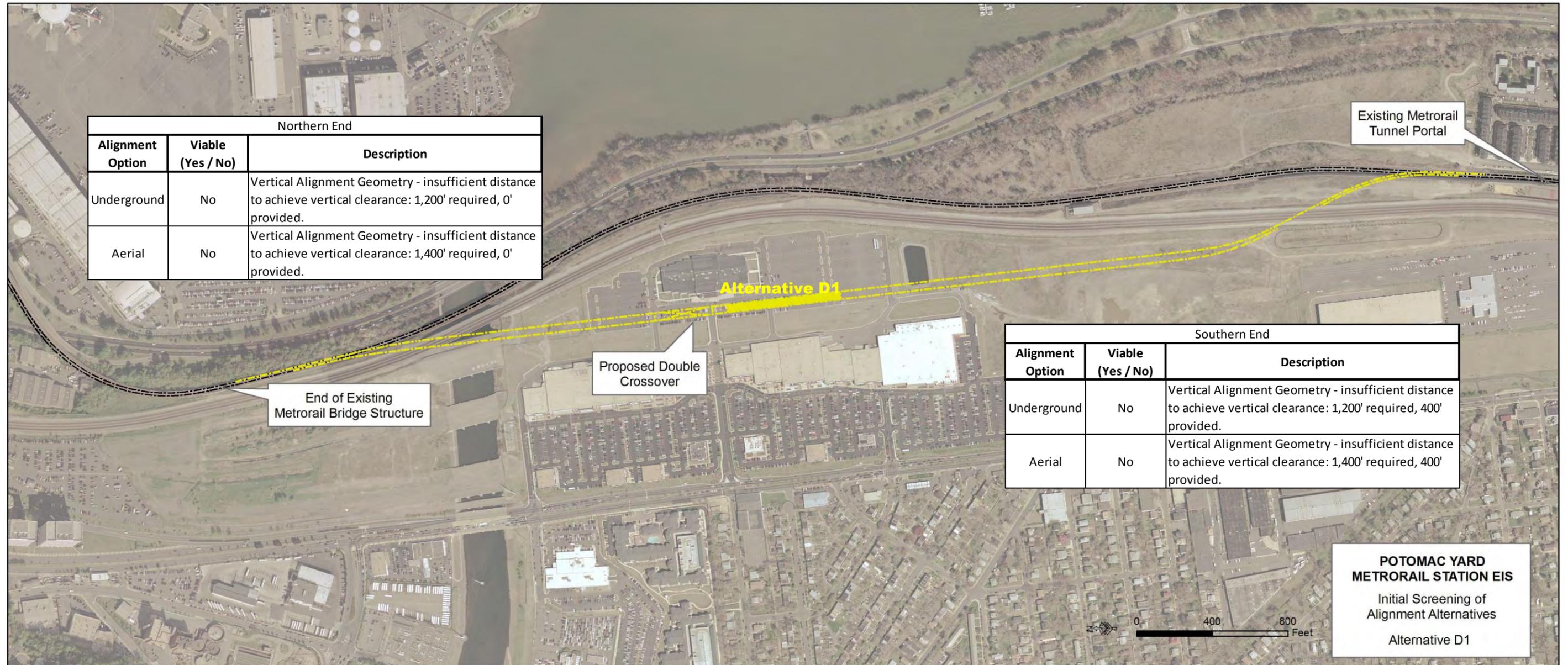
Source: AECOM

Figure 2-8: Alternative C2 Alignment and Initial Screening



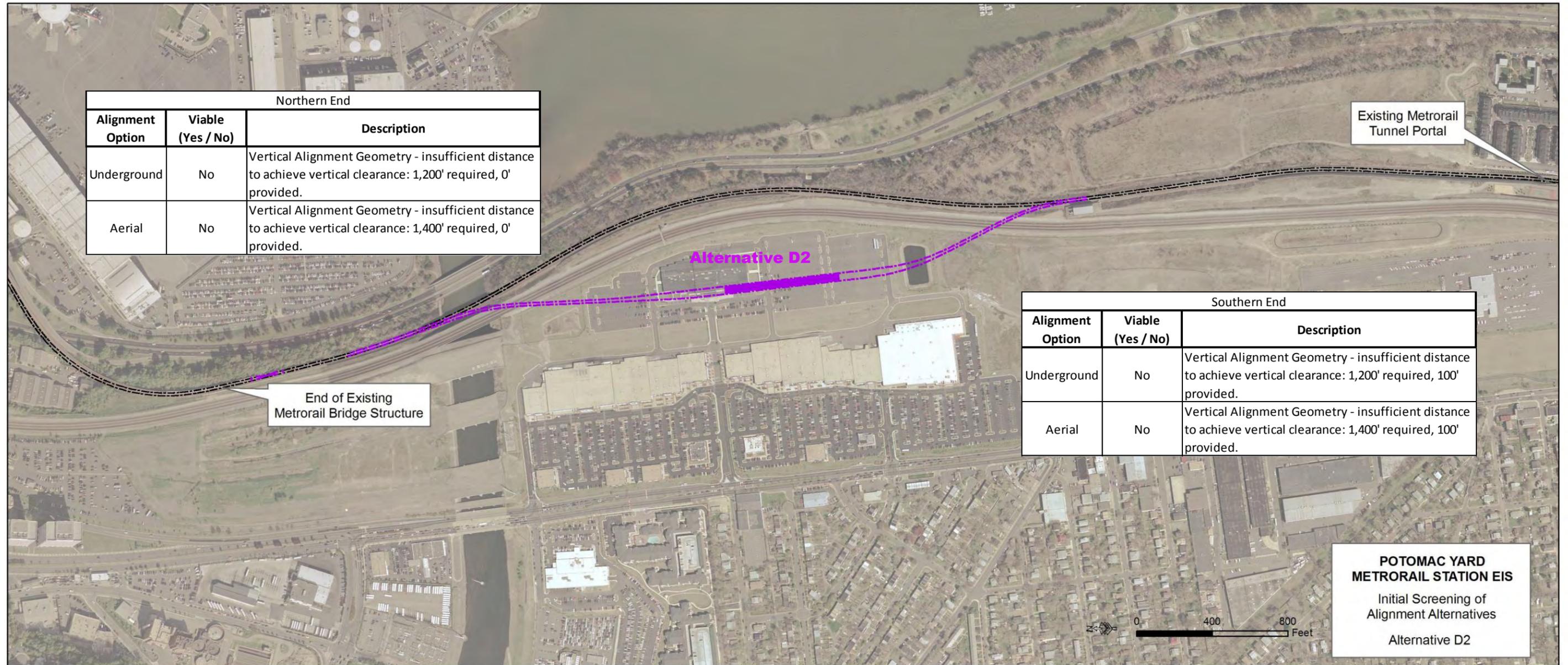
Source: AECOM

Figure 2-9: Alternative D1 Alignment and Initial Screening



Source: AECOM

Figure 2-10: Alternative D2 Alignment and Initial Screening



Source: AECOM

Figure 2-11: Alternative D3 Alignment and Initial Screening



Source: AECOM

2.3.6 Technically Feasible Zones

The technical screening demonstrates that, for the alternatives deemed feasible, there could be multiple minor refinements in terms of design and configuration. Thus the concept of a “technically feasible zone” was developed for each group of alternatives. This term describes a zone within which a station could feasibly be located, but does not include areas that may be needed for connecting track. The technically feasible zone for each group of alternatives is described below and depicted in **Figure 2-12**. These zones will be carried into the environmental and community impact screening.

Zone A

The technically feasible zone in the vicinity of Alternative A is constrained by the available tangent (length of straight track) for a station.

Zone B

The technically feasible zone in the vicinity of the B alternatives is constrained by the ability to construct new track so that there is sufficient tangent for a station, and tie the new track back into existing track without requiring the Blue and Yellow lines to be out of service for longer than 76 hours.

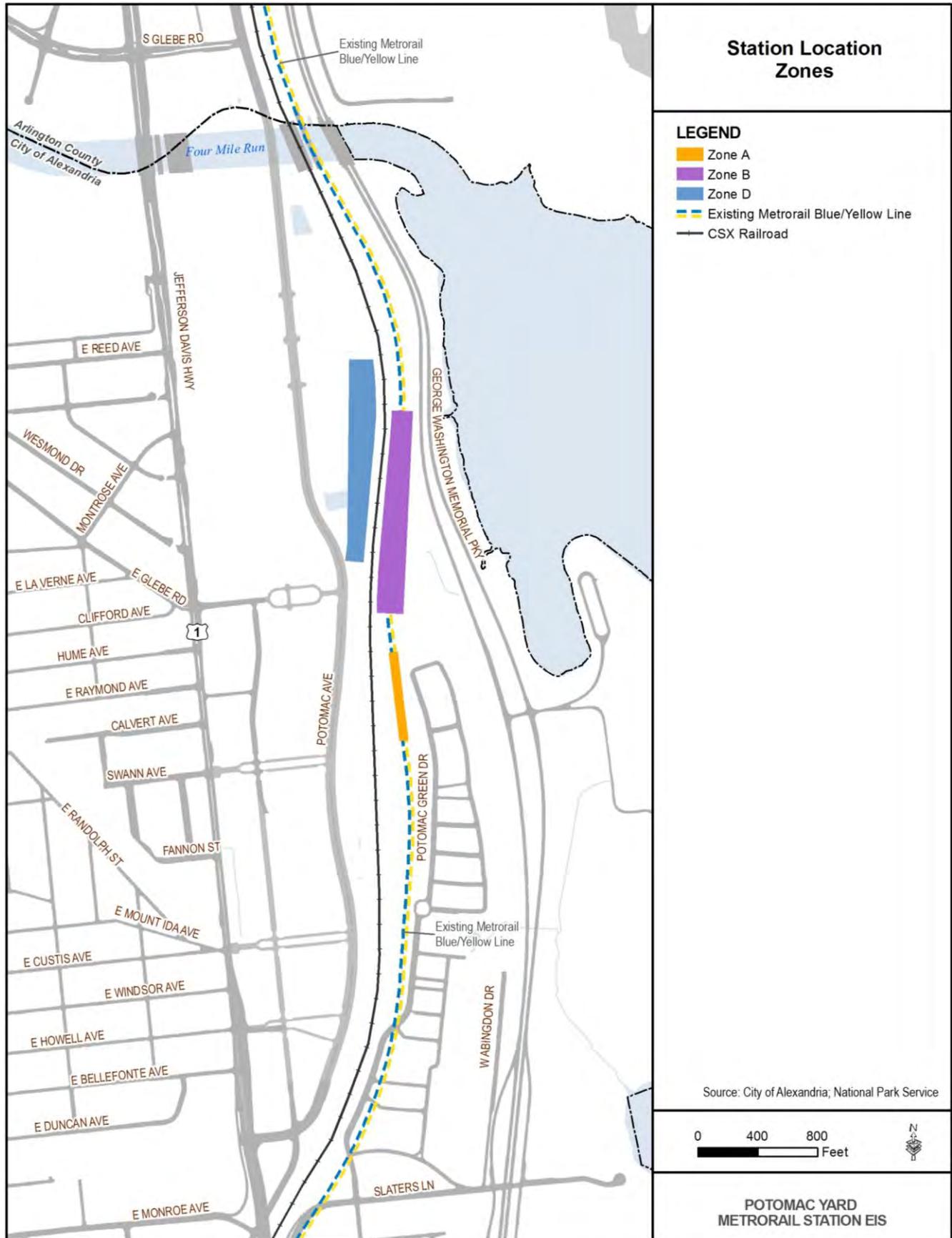
Zone C

Based on the technical criteria, the only technically feasible zone for a Metrorail station west of the CSXT tracks is Zone D, described below. It would not be possible to locate a station closer to U.S. Route 1: given the required vertical alignment and clearances, the curves required to reach the Alternative C locations from the existing Metrorail alignment would be too tight to allow for the 45 mph minimum speed. Therefore, there is no technically feasible zone for the C alternatives.

Zone D

The technical feasibility of alternatives west of the CSXT tracks is constrained by the ability to tie back into the existing Metrorail tracks, the minimum horizontal curve required to achieve a 45 mph speed, and the ability to achieve the vertical clearance needed to cross over the CSXT tracks. The tie-in must be at the end of the aerial structure that leads to the Ronald Reagan National Airport Station, because tying in on the aerial structure would require a service outage of approximately three to six weeks, beyond the acceptable 76-hour maximum closure period. In addition, approaching the tie-in to the existing Metrorail mainline from the west side of the existing tracks is not possible given the proximity of the existing CSXT tracks.

Figure 2-12: Technically Feasible Station Location Zones



3.0 INITIAL SCREENING RESULTS

3.1 Initial Screening Matrix

Table 3-1, below, shows the initial screening results for the alternatives included in the *Potomac Yard Metrorail Station Concept Development Study* and those suggested during the public scoping process.

Table 3-1: Summary of Results

Alternative		Responsiveness to Project Purpose and Need	Consistency with Land Use and Development Plans	Technical Feasibility
Metrorail Station Alternative A	underground	Yes	Yes	No
	at-grade	Yes	Yes	Yes
	aerial	Yes	Yes	No
Metrorail Station Alternative B1	underground	Yes	Yes	No
	at-grade	Yes	Yes	Yes
	aerial	Yes	Yes	No
Metrorail Station Alternative B2	underground	Yes	Yes	No
	at-grade	Yes	Yes	Yes
	aerial	Yes	Yes	No
Metrorail Station Alternative B3	underground	Yes	Yes	No
	at-grade	Yes	Yes	Yes
	aerial	Yes	Yes	No
Metrorail Station Alternative C1	underground	Yes	Yes	No
	at-grade	Yes	No	-
	aerial	Yes	Yes	No
Metrorail Station Alternative C2	underground	Yes	Yes	No
	at-grade	Yes	No	-
	aerial	Yes	Yes	No
Metrorail Station Alternative D1	underground	Yes	Yes	No
	at-grade	Yes	No	-
	aerial	Yes	Yes	No
Metrorail Station Alternative D2	underground	Yes	Yes	No
	at-grade	Yes	No	-
	aerial	Yes	Yes	No
Metrorail Station Alternative D3	underground	Yes	Yes	No
	at-grade	Yes	No	-
	aerial	Yes	Yes	Yes
Metrorail Station Alternative E1	underground	No	-	-
	at-grade	No	-	-
	aerial	No	-	-
Metrorail Station Alternative E2	underground	No	-	-
	at-grade	No	-	-
	aerial	No	-	-
VRE Station Alternative		No	-	-
Bus Alternative		No	-	-
Parking Garage Alternative		No	-	-

3.2 Alternatives Eliminated from Further Consideration

The following alternatives were eliminated from further consideration:

Bus Alternative, Metrorail Station Alternatives E1 and E2, VRE Station Alternative, and Parking Garage Alternative

The alternatives did not pass the initial screening. They did not respond to the project purpose and need.

The Bus Alternative would not establish a new access point to the regional Metrorail system and therefore would not enhance Metrorail access, serve population and employment growth, or accommodate travel demand to and from Potomac Yard.

Metrorail Station Alternative E1, located in Old Town Alexandria, and Metrorail Station Alternative E2, located in the West End of Alexandria, would not enhance Metrorail access, provide direct transit service, accommodate travel demand, or support safer travel modes in the Potomac Yard area. In addition, these alternatives would not support WMATA's system development plans or regional long-range transportation plans.

The VRE Station Alternative would not provide all-day or frequent access to the Metrorail system and would only serve a small portion of existing and potential transit users.

The Parking Garage Alternative would not address the need to accommodate travel demand in the U.S. Route 1 corridor or improve transit access to the Potomac Yard area.

Metrorail Station Alternatives C1, C2, D1, D2, and D3 (at-grade options)

The alternatives did not pass the initial screening. They were not consistent with land use and development plans. The at-grade alignments for Alternatives C1, C2, D1, and D2 through Potomac Yard would conflict with the goal of pursuing a comprehensive multi-modal approach to transportation, because they would require grade separated crossings and disrupt the planned street grid. The at-grade alignment for Alternative D3 would displace or disrupt access to a planned park and recreational trail and would potentially isolate the proposed parkland and trail between the realigned Metrorail line and the existing CSXT freight line.

Metrorail Station Alternatives A, B1, B2 and B3 (aerial and underground options); C1, C2, D1, and D2 (aerial and underground options); D3 (underground option)

The alternatives did not pass the initial screening. They were not technically feasible.

The horizontal alignments for the underground and aerial options for Alternatives A, B1, B2, and B3 locate on or in close proximity to the existing alignment. Construction above or below the existing track would require the Blue and Yellow line to be taken out of service for most of the construction period, which could take 6 to 18 months. This would be far beyond the 76-hour maximum closure period established by WMATA.

The proposed horizontal alignments for the aerial and underground options for Alternatives C1, C2, D1, and D2 do not provide sufficient distances to achieve the vertical separation required to meet the design criteria clearance over and under the CSXT line and under Four Mile Run at the northern end, or under and over the CSXT line at the southern end.

The proposed horizontal alignment for the underground option for Alternative D3 does not provide sufficient distance to achieve the vertical separation required to meet the design criteria clearance under Four Mile Run.

4.0 NEXT STEPS

As noted in Section 1.1, the refinement of the alternatives resulting from scoping will take place in two steps. The results of the screening assessed the feasibility of the alternatives and are documented in Sections 2.1 through 2.4.

The screening resulted in the determination that the at-grade options for Alternatives A, B1, B2, and B3 are feasible, and that the aerial option for Alternative D3 is feasible. Because each of these alternatives could include slight variations in location and still be feasible, a “technically feasible zone” was identified for each.

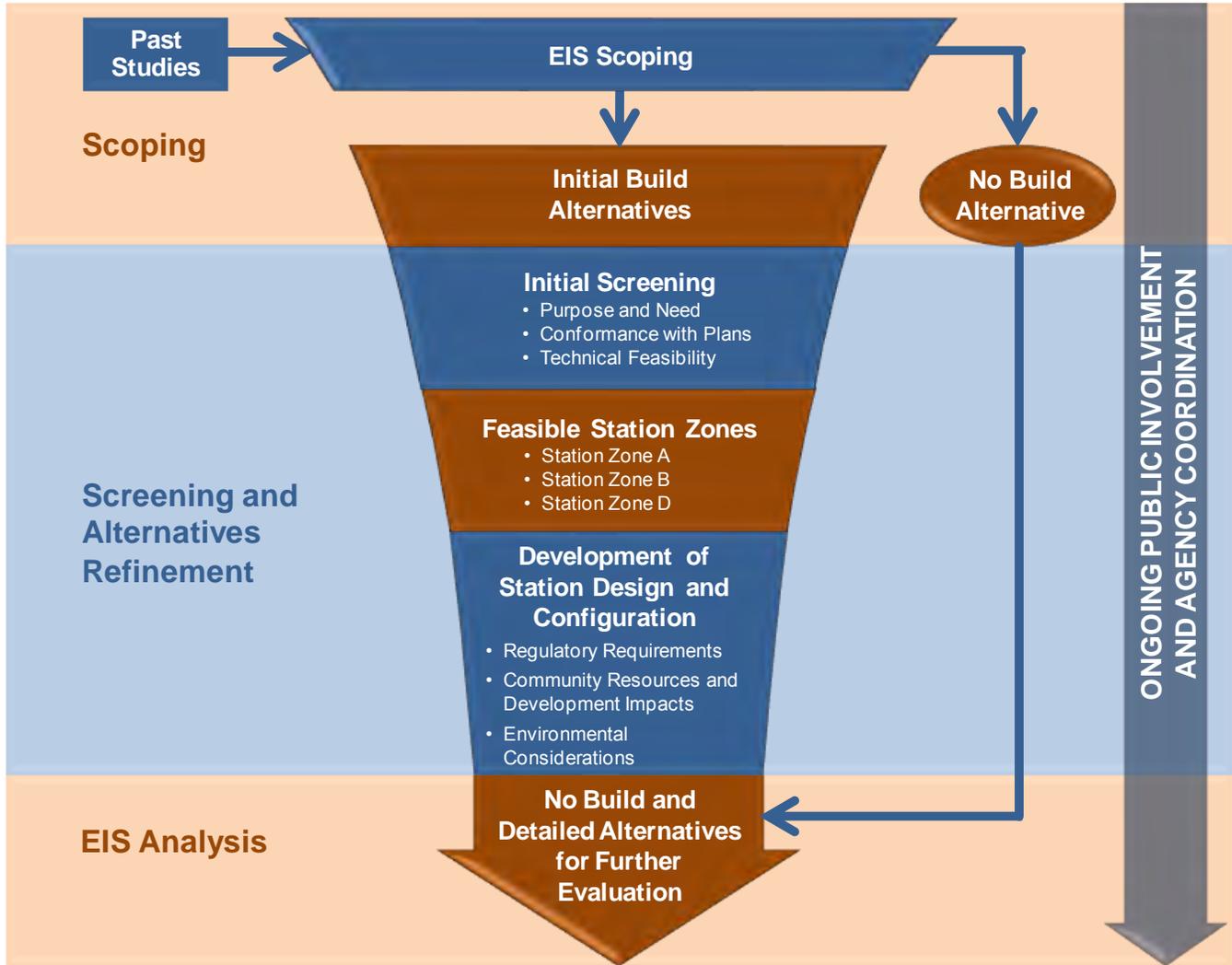
Next steps, as illustrated in **Figure 4-1**, include determining the station design and configurations within each technically feasible zone for a station. These station designs and configurations, including associated track, ancillary and auxiliary facilities, will be determined based on minimizing social, environmental, and economic impacts, while maximizing the potential benefits of a Metrorail station.

Specifically, the next step in the refinement of alternatives will identify station design and configurations based on the following considerations:

- *Regulatory Requirements*: How might various station locations affect resources that are regulated by local jurisdictions, the Commonwealth of Virginia, or the federal government? Based on initial analysis and concerns raised by the public and agencies during scoping, these resources are likely to include wetlands, floodplains, water quality, parkland, and cultural resources.
- *Impacts to Community Resources and Development*: How might potential station locations within each zone affect existing development, development plans, and community resources?
- *Environmental Considerations*: How might potential station locations affect other environmental impacts that were identified as key considerations during the project scoping process? This includes issues such as visual resources, acquisitions and displacements, noise and vibration, air quality, contaminated materials, transportation, and safety and security.

The result of this refinement of alternatives will be detailed station plans, inclusive of track alignments, that will be carried forward for evaluation in the Draft Environmental Impact Statement.

Figure 4-1: Refinement of Alternatives



Source: AECOM

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**APPENDIX A:
ANALYSIS OF TECHNICAL FEASIBILITY OF ALTERNATIVES**

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APPENDIX A: TECHNICAL FEASIBILITY

Memorandum

Date: **May 2, 2011**

By: Steve Kley, PE (AECOM)

To: Mark Niles, AICP (AECOM)

Subject: **Potomac Yard Metrorail Station EIS, Technical Review of Trackwork Alignment Alternatives.**

This document serves as a memorandum, describing the process followed in performing the technical feasibility analysis review of the Potomac Yard Metrorail Station Alignment Alternatives. The analysis was performed by myself and others under my supervision.

The objective was to evaluate for engineering feasibility, each track alignment alternative as provided in the document titled, "Technical Memorandum, Analysis of Station Location Alternatives", dated May 15, 2009, and an additional alternative added during a scoping meeting in February 2011. For purposes of this analysis, the track design was reviewed to determine compliance with design criteria, and constructability requirements.

Prior to beginning the analysis, relevant design criteria were compiled. As well, constructability requirements were defined, and AECOM met with WMATA personnel to discuss and verify these requirements. That criteria and assumptions are included in Section 1.0 of this Document.

Alignments A, B1, B2, B3, C1, C2, D1, D2, as provided in .dwg format, were evaluated for underground, at grade and aerial options. Alignment D3, was sketched based on meeting notes and was evaluated for underground at grade and aerial options. Existing WMATA Blue and Yellow alignment horizontal and vertical alignment were provided in .dwg format, and used to establish line and grade at tie in locations. Contour information was provided and used to develop existing ground elevations. CSXT top of rail elevations, and the depth elevation of Four Mile Run were not provided.

Based on the analysis, the following was determined:

1. Alignment options A, B1, B2, and B3, all at grade are feasible, noting that each option involves some level of construction phasing challenges.
2. Alignment options A, B1, B2, and B3, underground and aerial are not feasible due to constructability issues.
3. Alignment options C1, C2, D1, and D2 underground, aerial, and at grade are not feasible due to vertical clearance criteria, and constructability issues.
4. It appears that alignment option D3 can be developed to meet the technical criteria requirements.

Detailed findings of the analysis are provided in an Evaluation Table and supporting graphics which are included as Sections 2.0 and 3.0 of this memorandum.

1.0 DETAILED TECHNICAL CRITERIA

The technical feasibility evaluation measures focus on the WMATA design criteria document, WMATA Manual of Design Criteria (WMDC), and relevant CSXT Criteria as related to horizontal alignment, vertical alignment, clearance required, and construction phasing. Additional criteria are based on standards set as part of the 2010 *Potomac Yard Metrorail Station Concept Development* Study, experience from the Dulles Metrorail Extension project, and applicable Virginia standards for bridge clearance. Design criteria elements used to evaluate the alignments are defined and described as follows:

1.1 General Constraints

- A. The Consultant has identified the following existing elements which will be considered as physical constraints, and as such, are assumed not be modified in this study:
 - i. Maintain existing roadway lines and grades.
 - ii. Maintain existing CSXT track lines and grades.
 - iii. North tie-in: Maintain existing Metrorail Airport Station location, and meet alignment criteria adjacent to the station.
 - iv. South tie-in: Maintain existing portal configuration near Potomac Greens Drive and Fitzhugh Way.
- B. The Consultant has identified the following general assumptions/criteria for use in developing alignment alternatives:
 - i. Special Trackwork: Each Alternative shall consider installation of a double Number 8 cross-over on one end of the proposed station platform. If physical constraints preclude inclusion of the cross-over, the alignment shall not be considered flawed, however a notation shall be made for reduction in operational flexibility.
 - ii. Inclusion of a pocket track shall not be considered.
 - iii. Construction of temporary, parallel trackage necessary for construction phasing is to be minimized. Such alignments shall not encroach on CSXT right-of-way or on environmentally sensitive areas such as National Park Service land.
 - iv. For construction of new alignments, CSXT criteria may apply. For location of proposed Metrorail piers or abutments adjacent to CSXT tracks, the abutments / piers must locate parallel to the CSXT alignment. The abutments and piers shall be placed as follows: (Data from CSXT Criteria for Overhead Bridges)
 - 25 feet from nearest track on one side
 - 40 feet from nearest track on the opposite side (to accommodate an additional track)

1.2 Track Speed

- A. 75 mph desirable
- B. 30 mph absolute minimum
- C. Track speed will be set in 5 mph increments at this level of design.

1.3 Horizontal Alignment (Track Layout):

- A. Horizontal Tangent Between Curves: (WMDC 11.4.2)
- i. 200 feet desirable
 - ii. 75 feet absolute minimum
- B. Horizontal Tangent At Station Platforms:
- i. 730 feet total, comprised of:
 - 600 feet at the station platform (WMDC 11.4.2)
 - 65 feet either end of the station platform (WMDC 11.4.2)
 - ii. 80 feet minimum between end of station platform and point of switch, special trackwork (WMDC 11.8.4)
- C. Horizontal Tangent at Special Trackwork: (WMDC 11.8.4)
- i. 80 feet minimum between point of switch and end of station platform as indicated above.
 - ii. 40 feet minimum between point of switch and point of horizontal curve.
 - iii. Note that per WMDC 11.8.4, the absolute minimum tangent length of 10 on direct fixation track was not considered in this study due to the level of design of the study.
- D. Horizontal Curvature
- i. Horizontal curve radius, curve length, superelevation, underbalance, and spiral lengths shall be set to accommodate the minimum Track Speeds as indicated above.
 - ii. Horizontal curve radius: (WMDC 11.5.1)
 - Desired minimum radius: 1000 feet
 - Absolute minimum radius: 755 feet
 - Radius of adjacent tracks, in double track guideway shall not be concentric. It is desired that the curves maintain the same radius, however, if they must be different, the inside curve radius shall be set greater than the inside curve radius.
 - iii. Horizontal curve length: (WMDC 11.5.1)
 - Minimum curve length shall be the greater of the lengths listed below:
 - $L_c = 100$ feet.
 - L_c shall not be less than one half the sum of the connecting spiral lengths. (Not in criteria, but good engineering practice).
 - iv. Superelevation:
 - The relationship between Superelevation (E_a), Underbalance (E_u), Track Speed (V), and Curve Radius (R) is defined using the following equation:
 - $E_u = (4.011 * V^2/R) - E_a$ (WMDC 11.6.3)
 - Where E_u is in inches, V is in mph, R is in feet, E_a is in inches
 - Underbalance criteria is as follows : (WMDC 11.6.5)
 - E_u desirable: 0 inches
 - E_u maximum: 4 – 1/2 inches absolute maximum
 - E_u shall never be less than 0 inches.
 - Superelevation criteria is as follow: (WMDC 11.6.4)

- $E_a \text{ min} = \frac{1}{2}$ inch
 - $E_a \text{ max in tunnel} = 4$ inches
 - $E_a \text{ max at grade or on aerial structure} = 6$ inches.
 - When the above mentioned criteria for underbalance and superelevation can not be met, either the curve radius must be increased, or the track speed must be reduced.
- E. Spiral Transition Curves
- i. All horizontal circular curves shall contain spiral transition curves. Spiral transition curves shall be used to transition both superelevation and lateral acceleration,
 - ii. Minimum length of spiral curve shall be the greater of the lengths as determined by the formula listed as follows: (WMDC 11.5.2)
 - $L_s = 50 * E_a$
 - $L_s = 1.22 * E_u * V$
 - $L_s = 100$ feet
 - Where, E_a = superelevation (in), E_u = underbalance (in), V = track speed (mph).

1.4 Vertical Alignment (Track Profile):

- A. Vertical Tangent Between Vertical Curves: (WMDC 11.7.5)
- i. 100 feet absolute minimum
- B. Vertical Tangent At Station Platforms:
- i. 730 feet total, comprised of:
 - 600 feet at the station platform (WMDC 11.4.2)
 - 65 feet either end of the station platform (WMDC 11.4.2)
 - Note, WMDC 11.4.2 defines horizontal tangent length. WMDC does not specify vertical tangent lengths in station platforms. However, ADA requirements will require similar tangent lengths.
- C. Vertical Tangent at Special Trackwork:
- i. All special trackwork components shall locate in vertical tangent.
 - ii. 40 feet minimum between point of switch and point of vertical curve. (WMDC 11.8.4)
 - iii. Note that per WMDC 11.8.4, the absolute minimum tangent length of 10 on direct fixation track was not considered in this study due to the accuracy level of design for the study.
- D. Vertical Grades: (WMDC 11.7.1)
- i. 4.0% maximum except at station platform.
 - ii. 0.35% minimum at direct fixation and tunnel sections
 - iii. 0.00% minimum at-grade, ballasted sections
 - iv. At station platforms, 2.0% maximum, 0.35% minimum.

- E. Vertical Curves:
- i. Minimum length of vertical curve shall be the greater of the lengths as determined by the formula listed as follows: (WMDC 11.7.4)
 - ii. $L_{vc} = (G_2 - G_1) * 100$
 - Where L_{vc} = minimum vertical curve length
 - $G_2 - G_1$ = algebraic difference of grades in percent
 - iii. $L_{vc} = 200$ feet.
 - Note: for initial screening/evaluation of alignment and station options, assumed vertical curve begins at a point along the horizontal alignment that is separated by 15 feet from the existing track alignment.

1.5 Special Trackwork

- A. Special Trackwork Geometry shall be in accordance with a standard WMATA No. 8 turnout having the following characteristics:
- PS – PITO distance = 30.00 feet
 - Turnout angle = 7d9'10"

1.6 Clearances

This measure will consider whether each alternative would have sufficient horizontal clearance from fixed wayside objects or freight trains on adjacent tracks, and whether each alternative would have sufficient vertical clearance when passing over or under features such as the CSXT tracks and Four Mile Run. This measure also includes the depth of tunneling required to pass under Four Mile Run. The WMATA design criteria document, WMATA Manual of Design Criteria (WMDC), will be identified as referenced.

- A. Horizontal Clearances:
- i. Several WMDC contains various clearance scenarios. The below general criteria shall govern:
 - Open Sections, at grade – fenced alignment:
 - 10.5 feet, centerline of track to face of fence in horizontal tangent. (WMDC 11.12.4)
 - 12 feet centerline of track to face of fence in horizontal curve.
 - Tunnel and Elevated structures:
 - At this level of design, horizontal clearance at these type of alignment types shall not be considered. However, the overall guideway widths shall be assumed to extend 12 feet from centerline of outside tracks.
 - ii. Horizontal Clearance to existing roadways:
 - Open Sections, at grade – Same as open sections at grade – fenced alignment.
 - Open Sections, at grade – adjacent to CSXT trackage:
 - 50 feet centerline of Metrorail track to centerline of CSXT track. Assumes provision for future CSXT track at 15 feet offset to existing track, 25 feet clear from future CSXT track to 1.5 foot wide by 6 foot high crashwall and 8.5 feet clear from crashwall to Metrorail track. (While not written criteria, the Consultant has experienced this direction from CSXT on previous projects.

- B. Vertical Clearances – Metrorail over facility – STRUCTURAL DEPTH
 - i. For purposes of this study, the following assumptions will be made with respect to the relationship between top of rail, Metrorail, and bottom of Metrorail bridge structure:
 - ii. Span length up to 120 feet:
 - 10 feet (from Dulles Extension Project)
 - iii. Span length between 120 feet and 150 feet (WMATA maximum structure length):
 - 12 feet (from Dulles Extension Project)
- C. Vertical Clearances – Metrorail over facility – CLEARANCES
 - i. Minimum clear dimension to roadway in the state of Virginia:
 - 16.5 feet
 - ii. Minimum clear dimension to top of rail CSXT track:
 - 23 feet (Data from CSXT Criteria for Overhead Bridges)
- D. Vertical Clearances – Metrorail under roadway or railroad
 - i. 23 feet
- E. Vertical Clearances – Metrorail under FAA height restriction
 - i. Metrorail alignment including station elements shall not be placed greater than 80 feet above existing ground to meet the requirements of the FAA height restrictions associated with Ronald Reagan Washington National Airport
- F. Vertical Clearance – Metrorail in tunnel under CSXT
 - i. 25 feet, top of Metrorail to top of CSXT rail.
- G. Vertical Clearance – Metrorail in tunnel under Four Mile Run Waterway
 - i. 40 feet, from normal water surface elevation to top of rail

1.7 Track Centers:

- A. In double track, guideway, where no obstruction exists between tracks, the track centers shall be set at 14 feet apart. Adjustment for chording in horizontal curvature shall not be considered at this level of design, however, adjacent curves shall be set with equal radius (not concentric), so the widening of track centers due to this method of curve design should be sufficient.
- B. In single guideway, where physical barriers locate between tracks, the horizontal clearance criteria shall apply for clearance adjacent to track.
- C. In double track guideway in adjacent tunnel structures, the track / tunnel sections shall be set based on the existing soil structure, and tunnel width. Due to the limited knowledge of the existing soil conditions at this level of design, track centers in this type of guideway shall be set at 40 feet minimum.
- D. At center station platforms, track centers shall be set 40.454 feet apart.
- E. At side station platforms, track centers shall be as indicated in 1.7 A. above.

1.8 Constructability and Phasing:

This measure reviews whether construction of each alternative would result in service disruptions, to existing infrastructure, including:

- A. Blue and Yellow Line Metrorail service between the Ronald Reagan National Airport and Braddock Road Metrorail stations.
 - Note: A Metrorail service disruption is considered major if it exceeds 52 hours (a typical weekend track outage).
- B. Existing roadways
- C. Existing CSXT railroad
- D. Other Infrastructure Elements:
 - i. Utilities
 - ii. Businesses

This measure also considers whether there are any impediments to construction at a specific site, including the ability to bring materials or equipment to the site, and available space for construction staging.

2.0 DETAILED TABLE OF INITIAL TECHNICAL SCREENING

Table A-1: Technical Feasibility

Track Alignment and Clearance Technical Feasibility		Meets Technical Requirements	Complies with General Constraints	Complies with Track Speed Criteria	Complies with Horizontal Track Alignment Criteria	Complies with Vertical Track Alignment Criteria	Includes Special Trackwork	Complies with Horizontal Clearance Criteria	Complies with Vertical Clearance Criteria	Complies with Track Center Criteria	Constructability and Phasing Difficulty (Minor, Moderate, Major, and Fatal Flaw)
Metrorail Station Alternative A	underground	No - Constructability	-	-	-	No -Proposed horizontal alignment matches existing horizontal alignment. Requires closing existing Metrorail Yellow and Blue lines for entire construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
	at grade	Yes – Constructability limitations	Yes	Yes	Yes	Yes, However requires significant (about 3000') of re-profiling existing track to achieve proposed vertical alignment. Would require staging plan that phased the vertical re-profiling in multiple outages.	Yes	Yes	Yes	Yes	Major - 1. Station Construction Activities Adjacent to Live Metrorail and CSXT railroad 2. Re-Profiling 3000' (+) of Live Track To Achieve Vertical Criteria.
	aerial	No - Constructability	-	-	-	No - Proposed horizontal alignment matches existing horizontal alignment. Requires closing existing Metrorail Yellow and Blue lines for entire construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
Metrorail Station Alternative B1	underground	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
	at grade	Yes – Constructability limitations	Yes	Yes	Yes	Yes- Requires lengthy shifting of existing alignment (up to 1800'). Would require staging plan that phased shifting each track under separate outages.	Yes	Yes	Yes	Yes	Major - Requires Legthy (up to 1800+ feet) Alignment Shifts. These Alignment Shifts Will be Difficult to Achieve in the 52 Hour Outage / Window.
	aerial	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle

Track Alignment and Clearance Technical Feasibility		Meets Technical Requirements	Complies with General Constraints	Complies with Track Speed Criteria	Complies with Horizontal Track Alignment Criteria	Complies with Vertical Track Alignment Criteria	Includes Special Trackwork	Complies with Horizontal Clearance Criteria	Complies with Vertical Clearance Criteria	Complies with Track Center Criteria	Constructability and Phasing Difficulty (Minor, Moderate, Major, and Fatal Flaw)
Metrorail Station Alternative B2	underground	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
	at grade	Yes – Constructability limitations	Yes	Yes	Yes	Yes - Requires lengthy shifting of existing alignment (up to 1400'). Would require staging plan that phased shifting each track under separate outages.	Yes	yes - HOWEVER, station Ancillary Facilities Will Need to be Tight on West Side, Adjacent to CSXT. Clear Distance From CSXT to Back of Platform is About 63', Criteria Allows 50'.	Yes	Yes	Major - Requires Legthy (up to 1400+ feet) Alignment Shifts. These Alignment Shifts Will be Difficult to Achieve in the 52 Hour Outage / Window.
	aerial	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
Metrorail Station Alternative B3	underground	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle
	at grade	Yes	Yes	Yes	Yes	Yes - Requires shifting existing alignment to achieve proposed alignment at 3 locations. Each shift is up to 550' maximum. Possible option to reduce proposed work, and number of track shifts to 2, at south end of alignment.	Yes	Yes	Yes	Yes	Moderate - Requires Legthy (up to 600+ feet) Alignment Shifts. These Alignment Shifts Will be Challenging to Achieve in the 52 Hour Outage.
	aerial	No - Constructability	-	-	-	No - Proposed horizontal alignment locates within clearance envelope of existing horizontal alignment. Requires existing Metrorail Yellow and Blue lines to be out of service for most of the construction cycle.	-	-	-	-	Fatal Flaw - Require Closing Existing Metrorail Yellow and Blue Lines for Entire Construction Cycle

Track Alignment and Clearance Technical Feasibility		Meets Technical Requirements	Complies with General Constraints	Complies with Track Speed Criteria	Complies with Horizontal Track Alignment Criteria	Complies with Vertical Track Alignment Criteria	Includes Special Trackwork	Complies with Horizontal Clearance Criteria	Complies with Vertical Clearance Criteria	Complies with Track Center Criteria	Constructability and Phasing Difficulty (Minor, Moderate, Major, and Fatal Flaw)
Metrorail Station Alternative C1	underground	No– Vertical Clearance and Constructability	No	No	No	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1100' required, 350' provided. Constructability: Tie to north end aerial structure requires unacceptable out of service period.	-	-	No-does not provide sufficient distance to achieve clearance under CSXT at south end, 1100' required, 350' provided.	-	North End; Proposed Alignment Requires Reconstruction of Existing WMATA Curved Aerial Structure South of Reagan National Airport, Requiring Extensive Out of Service Period.
	at grade	No– Vertical Clearance and Constructability	-	-	-	No- Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: as indicated in Underground and Aerial options.	-	-	No- south end 1, similar issues to underground options.	-	-
	aerial	No – Vertical Clearance and Constructability	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1300' required, 350' provided. Constructability: Tie to north end aerial structure requires unacceptable out of service period.	-	-	No-does not provide sufficient distance to Achieve clearance over CSXT at south end, 1300' required, 350' Provided.	-	-
Metrorail Station Alternative C2	underground	No – Vertical Clearance	No	No	No	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1100' required, 350' provided; north end - 1100' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance under CSXT at south end, 1100' required, 350' required, and to achieve clearance under CSXT at the north end 1100' required, 50' provided.	-	-
	at grade	No – Vertical Clearance	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: as indicated in Underground and Aerial options.	-	-	No- south end and north end, similar issues to aerial and underground options.	-	-
	aerial	No – Vertical Clearance	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1300' required, 350' provided; north end - 1400' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance over CSXT at south end, 1300' required, 350' Provided.	-	-

Track Alignment and Clearance Technical Feasibility		Meets Technical Requirements	Complies with General Constraints	Complies with Track Speed Criteria	Complies with Horizontal Track Alignment Criteria	Complies with Vertical Track Alignment Criteria	Includes Special Trackwork	Complies with Horizontal Clearance Criteria	Complies with Vertical Clearance Criteria	Complies with Track Center Criteria	Constructability and Phasing Difficulty (Minor, Moderate, Major, and Fatal Flaw)
Metrorail Station Alternative D1	underground	No – Vertical Clearance	No	No	No	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1100' required, 350' provided; north end - 1100' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance under CSXT at south end, 1100' required, 350' provided, and to achieve clearance under CSXT at north end; 1100' Required, 0' Provided.	-	-
	at grade	No – Vertical Clearance	-	-	-	No -Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: as indicated in Underground and Aerial options.	-	-	No- south end and north end, similar issues to aerial and underground options.	-	-
	aerial	No – Fatal Flaw – Vertical Clearance	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1300' required, 400' provided; north end - 1300' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance over CSXT at south end, 1300' required, 400' provided, and to achieve clearance over CSXT at north end; 1300' Required, 0' provided.	-	-
Metrorail Station Alternative D2	underground	No – Vertical Clearance	No	No	No	No -Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1100' required, 100' provided; north end - 1400' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance under CSXT at south end, 1100' required, 100' provided, and to achieve clearance under Four Mile Run and CSXT; 1400' Required, 0' Provided.	Yes	-
	at grade	No – Vertical Clearance	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: as indicated in Underground and Aerial options.	-	-	No- south end and north end, similar issues to aerial and underground options.	-	-
	aerial	No – Vertical Clearance	-	-	-	No - Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: south end - 1300' required, 100' provided; north end - 1300' required, 0' provided.	-	-	No-does not provide sufficient distance to achieve clearance over CSXT at south end, 1300' required, 100' provided, and to achieve clearance over CSXT at north end; 1300' Required, 0' provided.	Yes	-

Track Alignment and Clearance Technical Feasibility		Meets Technical Requirements	Complies with General Constraints	Complies with Track Speed Criteria	Complies with Horizontal Track Alignment Criteria	Complies with Vertical Track Alignment Criteria	Includes Special Trackwork	Complies with Horizontal Clearance Criteria	Complies with Vertical Clearance Criteria	Complies with Track Center Criteria	Constructability and Phasing Difficulty (Minor, Moderate, Major, and Fatal Flaw)
Metrorail Station Alternative D3	underground	No	No	-	-	No- Vertical Alignment Geometry - insufficient distance to achieve vertical clearance: north end – 1400' required, 900' provided.	-	-	No-does not provide sufficient distance at north to achieve clearance under Four Mile Run; 1400' Required, 900'	-	-
	at grade	No	No	-	-	No – Vertical Alignment Geometry - insufficient distance to achieve vertical clearance on west side of CSXT: south end – 1300' required, 600' provided, north end – 1300' required, 250' provided,	-	-	No-does not provide sufficient distance to achieve clearance under CSXT at south end – 1300' required, 600' provided, at north end - 1300' Required, 250'.	-	-
	aerial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Moderate – construction of aerial structure over existing Metrorail and CSXT will present challenges

3.0 GRAPHICAL ANALYSIS OF ALTERNATIVES C AND D

Figure A-1: Alternative C1 Clearance Envelope Plan and Profile

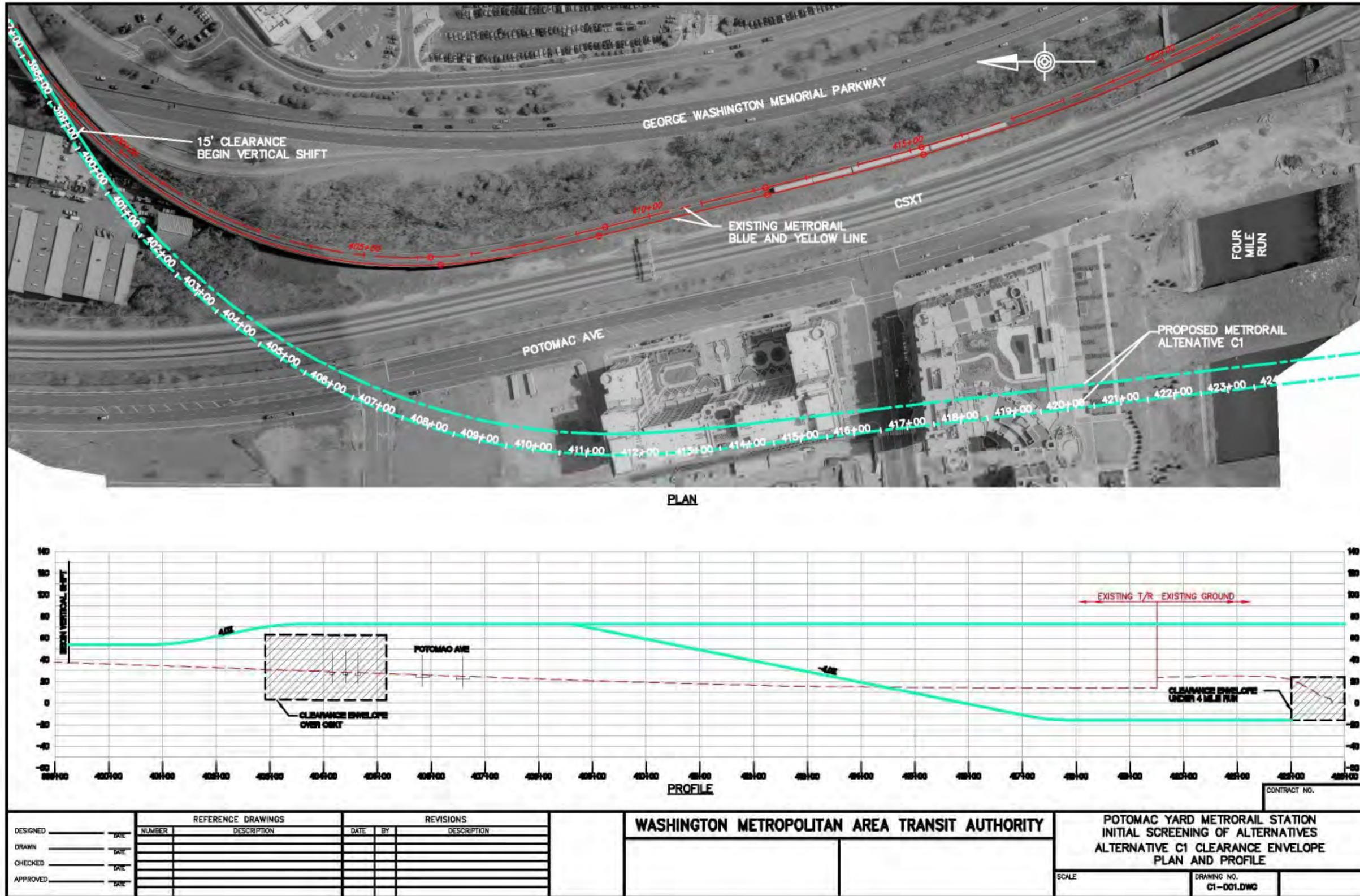
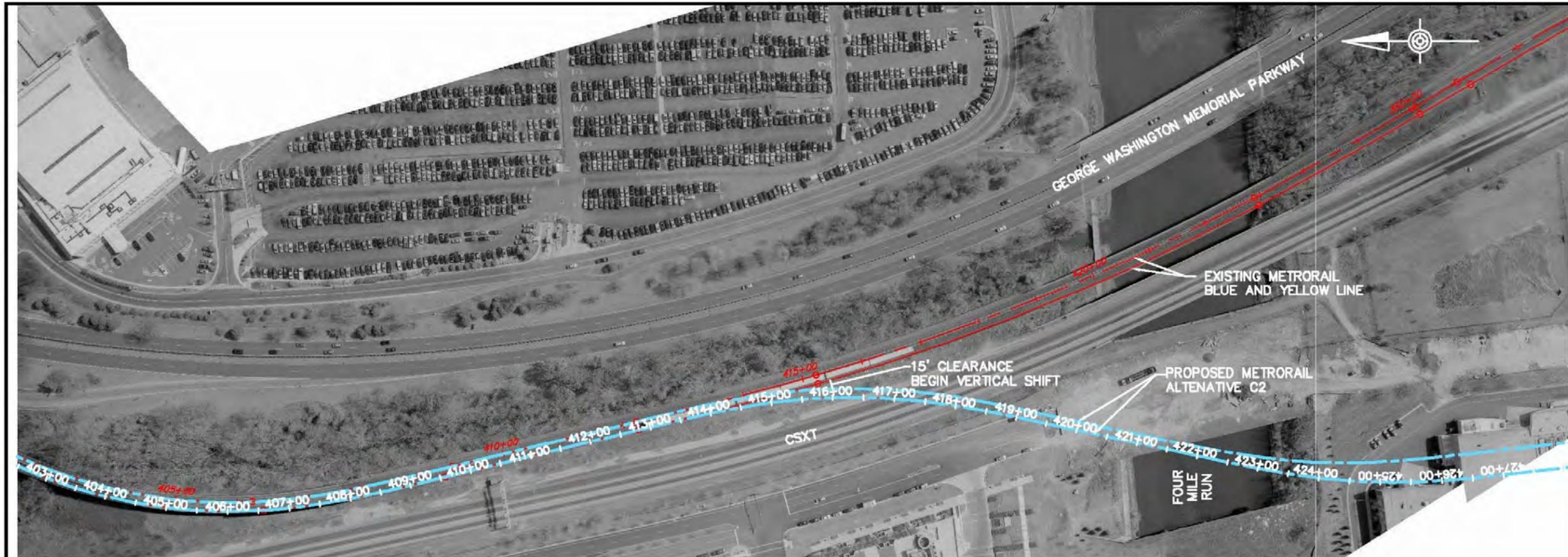
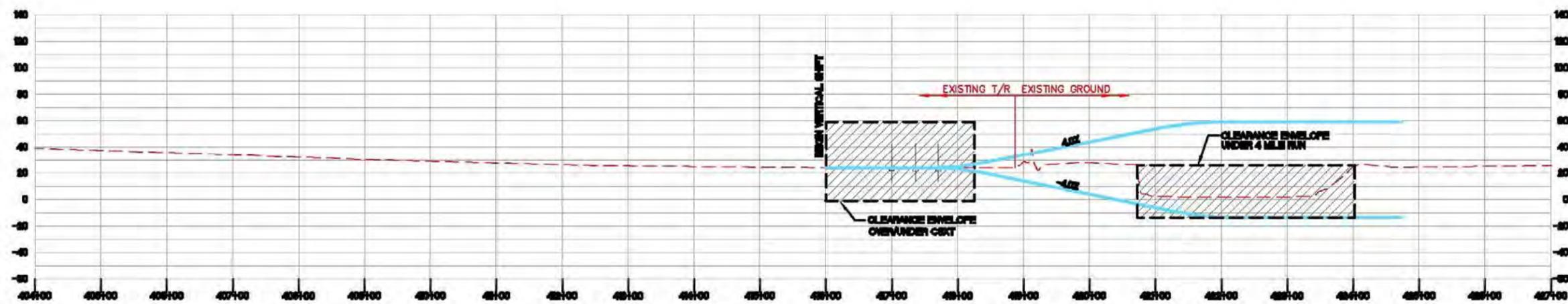


Figure A-2: Alternative C2 Clearance Envelope Plan and Profile



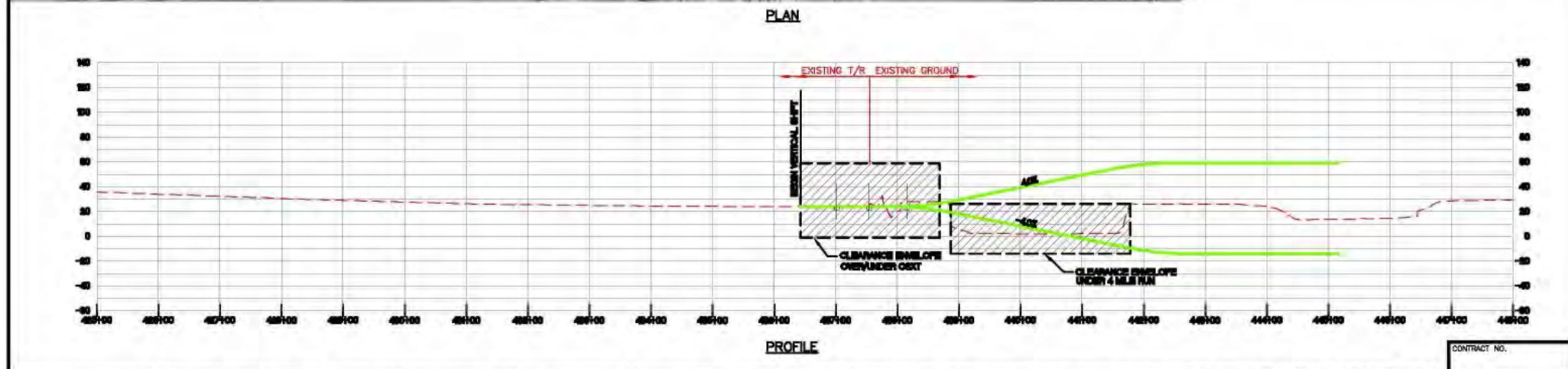
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PROFILE

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NUMBER	DESCRIPTION	DATE	BY	DESCRIPTION																																		
						SCALE _____		DRAWING NO. C2-001.DWG																														

Figure A-3: Alternative D1 Clearance Envelope Plan and Profile

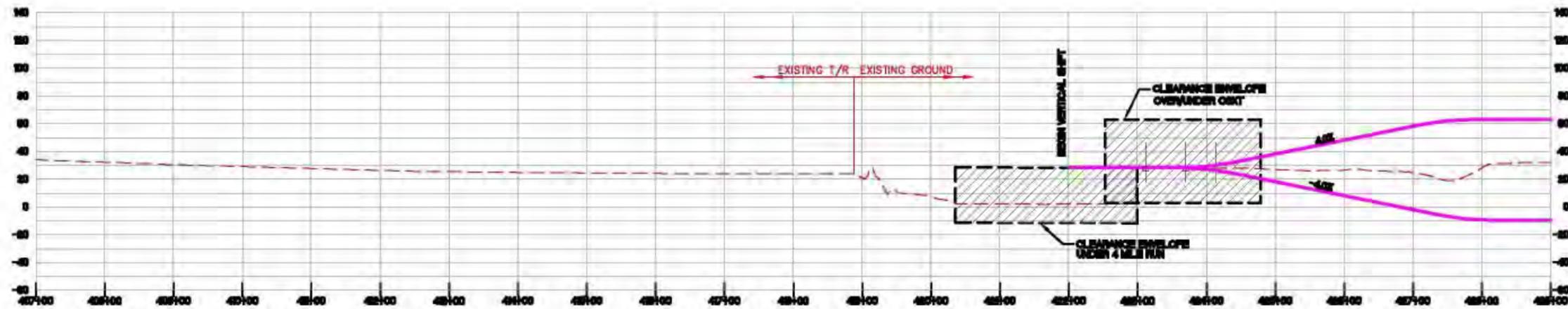


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DRAWN _____ DATE _____	NUMBER DESCRIPTION	DATE BY DESCRIPTION			
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APPROVED _____ DATE _____					
				SCALE	DRAWING NO. D1-001.DWG

Figure A-4: Alternative D2 Clearance Envelope Plan and Profile



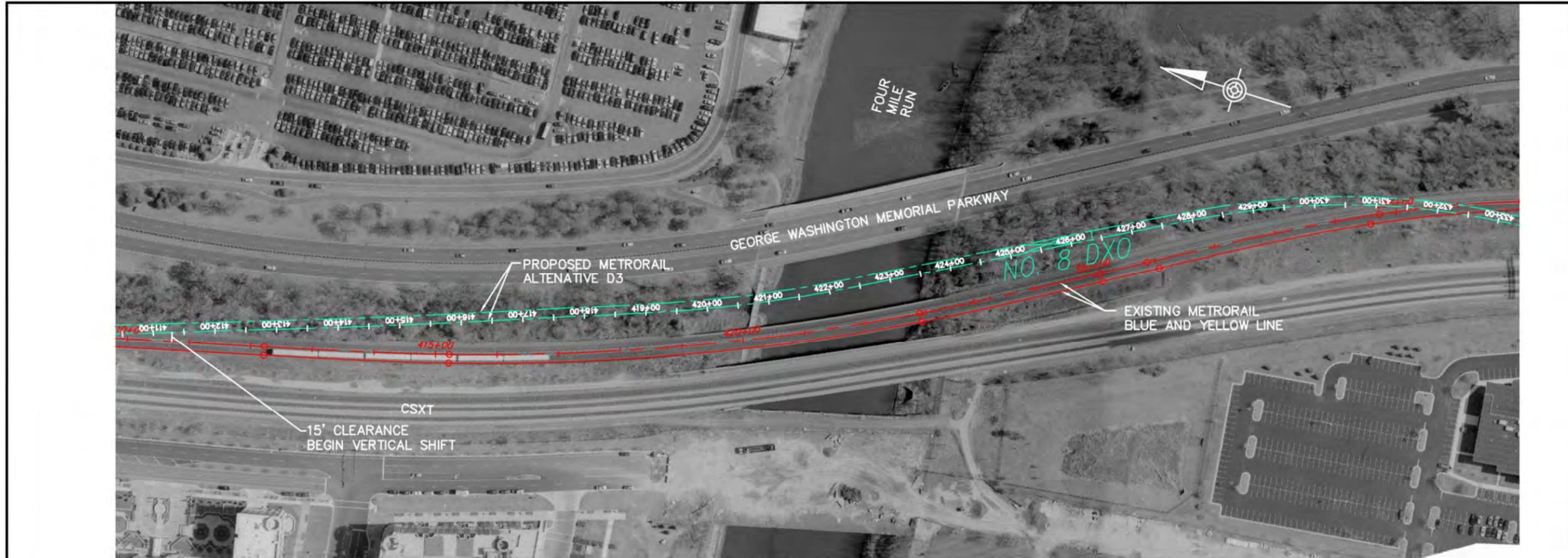
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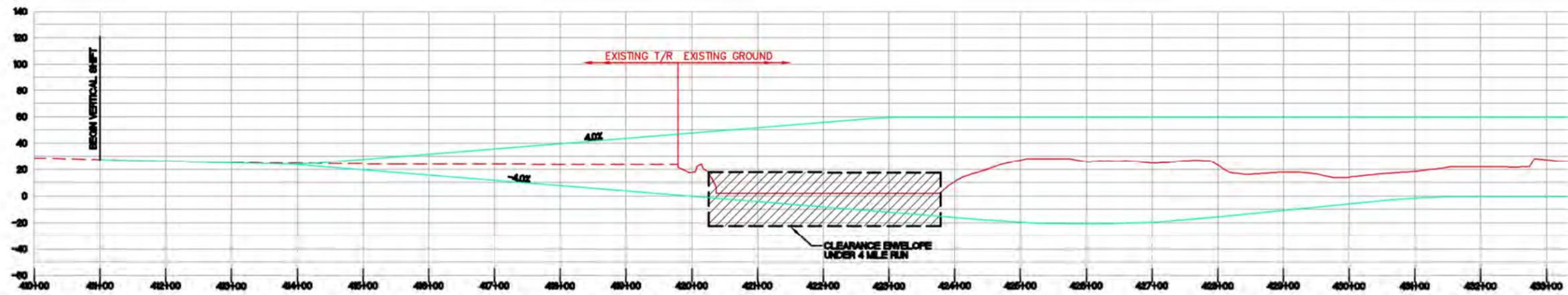
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Figure A-5: Alternative D3 Clearance Envelope Plan and Profile (1 of 3)



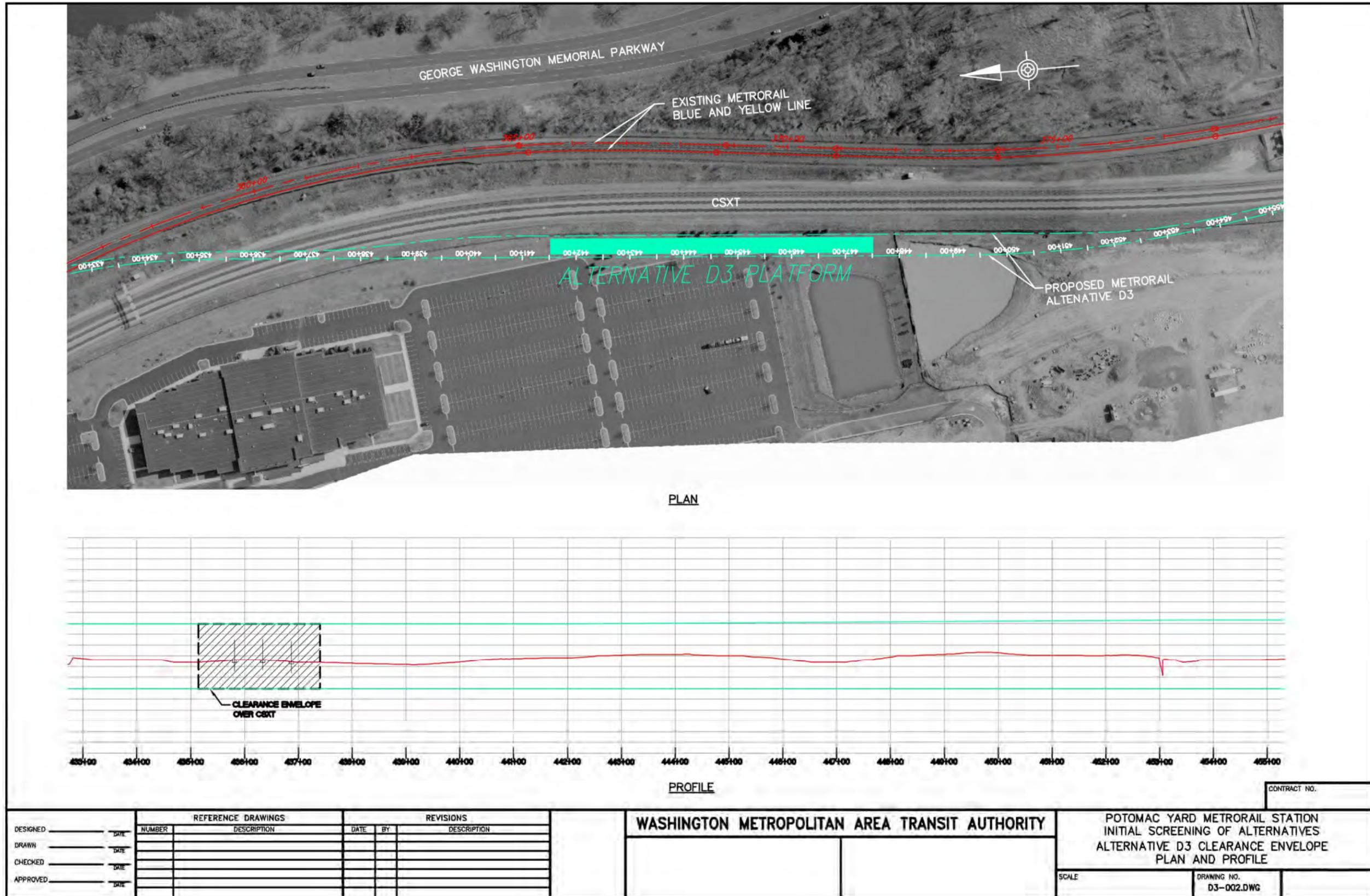
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Figure A-6: Alternative D3 Clearance Envelope Plan and Profile (2 of 3)

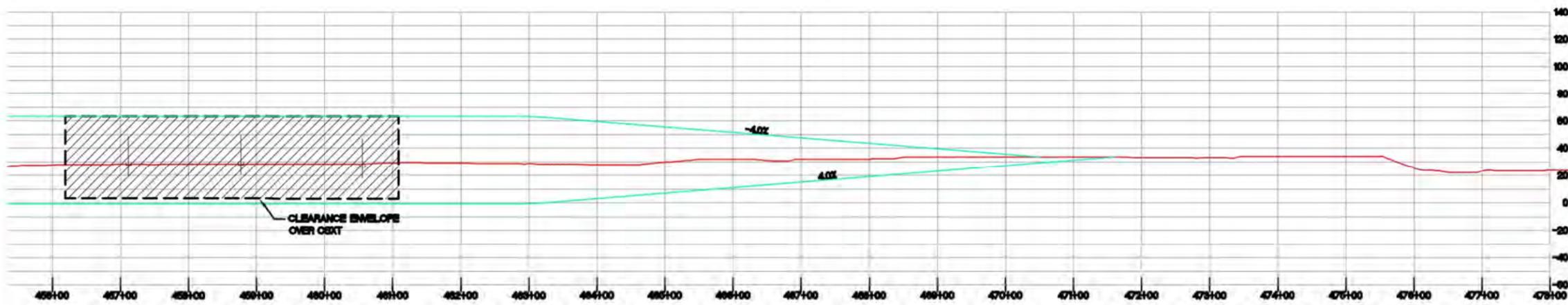


DESIGNED _____ DATE _____		DRAWN _____ DATE _____		CHECKED _____ DATE _____		APPROVED _____ DATE _____		REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY		POTOMAC YARD METRORAIL STATION INITIAL SCREENING OF ALTERNATIVES ALTERNATIVE D3 CLEARANCE ENVELOPE PLAN AND PROFILE		CONTRACT NO.	
NUMBER	DESCRIPTION	DATE	BY	DESCRIPTION	SCALE	DRAWING NO. D3-002.DWG											

Figure A-7: Alternative D3 Clearance Envelope Plan and Profile (3 of 3)



PLAN



PROFILE

DESIGNED _____ DATE _____	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY	POTOMAC YARD METRORAIL STATION INITIAL SCREENING OF ALTERNATIVES ALTERNATIVE D3 CLEARANCE ENVELOPE PLAN AND PROFILE	
DRAWN _____ DATE _____	NUMBER	DESCRIPTION	DATE	BY		DESCRIPTION	SCALE
CHECKED _____ DATE _____							
APPROVED _____ DATE _____							