TIER 1 & 2 SCREENING RESULTS

TECHNICAL MEMORANDUM

Prepared for:

Southeastern Pennsylvania Transportation Authority (SEPTA)

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1 INTRODUCTION

The Federal Transit Administration (FTA) in coordination with the Southeastern Pennsylvania Transportation Authority (SEPTA) initiated the preparation of a Draft Environmental Impact Statement (DEIS) to evaluate alternative transit alignments that will connect the Norristown High Speed Line (NHSL) and destinations in King of Prussia to improve transit connections to the King of Prussia/Valley Forge areas of Upper Merion Township, Pennsylvania. The King of Prussia Rail project, also known as the NHSL extension, is intended to provide faster, more reliable transit service, improve transit connections between major destinations in the area, better serve existing transit riders, and accommodate new transit patrons. FTA published a Notice of Intent (NOI) to prepare an environmental impact statement for the project in the Federal Register on June 27, 2013 (*Intent to Prepare an Environmental Impact Statement for Increased Transit Service to King of Prussia, PA*).

This *Tier 1 and 2 Screening Results Working Draft Technical Memorandum* describes the first and second of three levels of alternatives screening and evaluation undertaken by FTA and SEPTA in the National Environmental Policy Act (NEPA) process for the project. This memorandum includes a statement of the regulatory framework under which FTA and SEPTA performed the Tier 1 and Tier 2 screening, describes each alternative and the planning framework for the evaluation, summarizes the screening methodology, presents the results of the screening and evaluation, describes the input received upon sharing the results with the public and agencies, and makes recommendations for the alternatives to advance into the Tier 3 evaluation.

1.1 Overall Screening Approach

The alternatives development and evaluation process for the King of Prussia (KOP) Rail project consists of three distinct tiers of screening and evaluation. In each step, alternatives are examined and compared for their performance in terms of specific and progressively more detailed criteria. This process initially examines a large number of alternatives with the goal of reducing this "long list" of alternatives through screening and evaluation to only those that are reasonable (i.e., practical or feasible). In accordance with the Council on Environmental Quality's (CEQ) Regulations for Implementing NEPA, this process enables FTA and SEPTA to screen the full range of alternatives and arrive at a subset of reasonable alternatives to undergo detailed study in the DEIS.

Briefly, the three tiers of screening and evaluation process consist of:

- Tier 1: Preliminary Screening of the Long List of Alternatives ⟹ Preliminary Alternatives – *Tier 1 is completed and is documented in this technical memorandum.*
- Tier 2: Initial Screening of the Preliminary Alternatives ⟹ Retained Alternatives – *the Tier 2 results are documented in this technical memorandum.*

- Tier 3: Final Screening and Evaluation of the Retained Alternatives ⟹ Locally Preferred Alternative – *the Tier 3 analysis will be documented in the DEIS.*

SEPTA's 2013 *Screening Methodology Technical Memorandum* for the King of Prussia Rail project outlines the overall screening methodology for the project. A summary of the methodology for the Tier 1 screening is presented in Section 3 and the Tier 2 screening is presented in Section 5 of this *Tier 1 & 2 Screening Technical Memorandum*.

2 REGULATORY SETTING

The Tier 1 and 2 screenings are elements of the DEIS and were undertaken in accordance with the CEQ Regulations for Implementing NEPA (40 Code of Federal Regulations 1502.14), with federal requirements related to the environmental review (23 CFR Part 771 et seq.), and the requirements for project development and for New Starts funding (FTA New Starts program, 49 USC 5309). As applicable to the Tier 1 and 2 screenings, the following FTA rules and policy guidance were applied: Final Rules regarding the evaluating and rating major transit capital investments (January 9, 2013); *New and Small Starts Policy Guidance* (August, 2013); and Final Rules regarding environmental impact and related procedures (February 7, 2013).

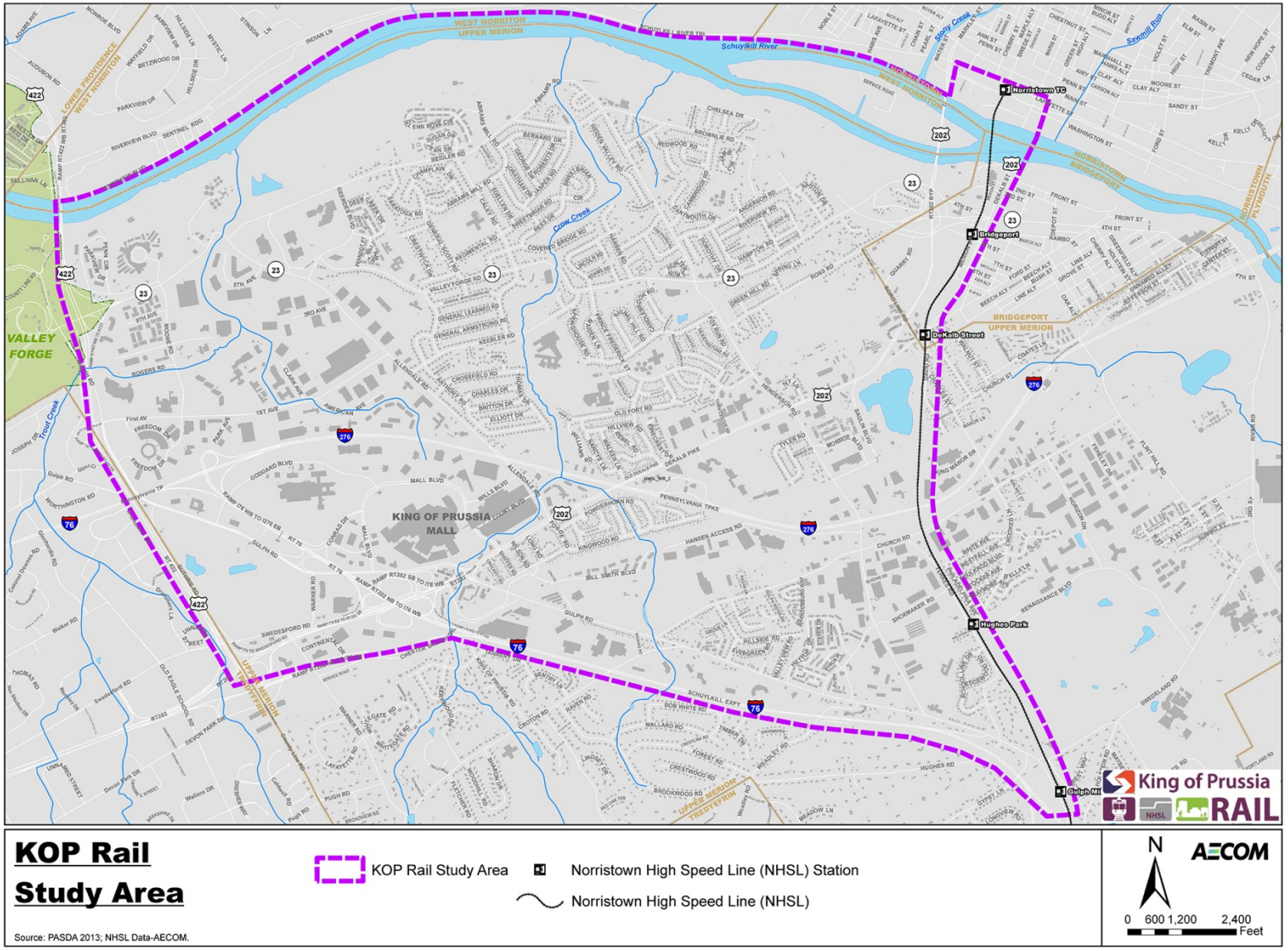
SEPTA is conducting the alternatives screening and the DEIS to evaluate alternatives in terms of their transportation and environmental benefits and effects, and to aid in its decision- making on the course of action to take. In these activities, SEPTA is complying with the Public Law 112-141 and its guidance for developing transportation projects using federal funds entitled, Moving Ahead for Progress in the 21st Century Act (MAP-21). In order to qualify for funding under the FTA New Starts program, 49 USC 5309 requires that projects be based upon the results of an environmental review.

In addition, as a transportation infrastructure project for which SEPTA may seek to use federal funds, the King of Prussia Rail Project is subject to other federal environmental review regulations during NEPA as defined by Section 4(f) and 6(f) of the Department of Transportation Act of 1966, Section 106 of the National Historic Preservation Act of 1966, the Clean Water Act and the Clean Air Act of 1970, along with other applicable federal, state and local regulations.

3 CONCEPTUAL ALTERNATIVES & PLANNING FRAMEWORK

SEPTA's alternatives development and evaluation process is grounded in the project purpose and need and its goals. The overall goal of the King of Prussia Rail project is to improve rail transit access to the King of Prussia and Valley Forge areas by extending the benefits of the existing NHSL beyond its current service area. The proposed extension of the NHSL would increase transportation system capacity in the King of Prussia and Valley Forge areas of Upper Merion Township. It represents a way to serve a growing transit market, provide direct rail transit service to this area, attract additional transit riders, provide a more efficient ride for existing transit riders to the area, help to reduce the rate of growth in traffic congestion, and link Philadelphia, Norristown, and Upper Darby and existing communities along the line to activity centers in King of Prussia and Valley Forge. The study area is depicted on the map in Figure 1.

Figure 1 Study Area



The alternatives under consideration within the DEIS will consist of the following.

No Build Alternative: Represents future conditions in the DEIS analysis year of 2040 without the proposed project. The No Build Alternative includes the existing transit and transportation system in the region plus all projects in the region's fiscally constrained long range transportation plan. The No Build Alternative will be included in the DEIS as a means of comparing and evaluating the impacts and benefits of the Build Alternatives.

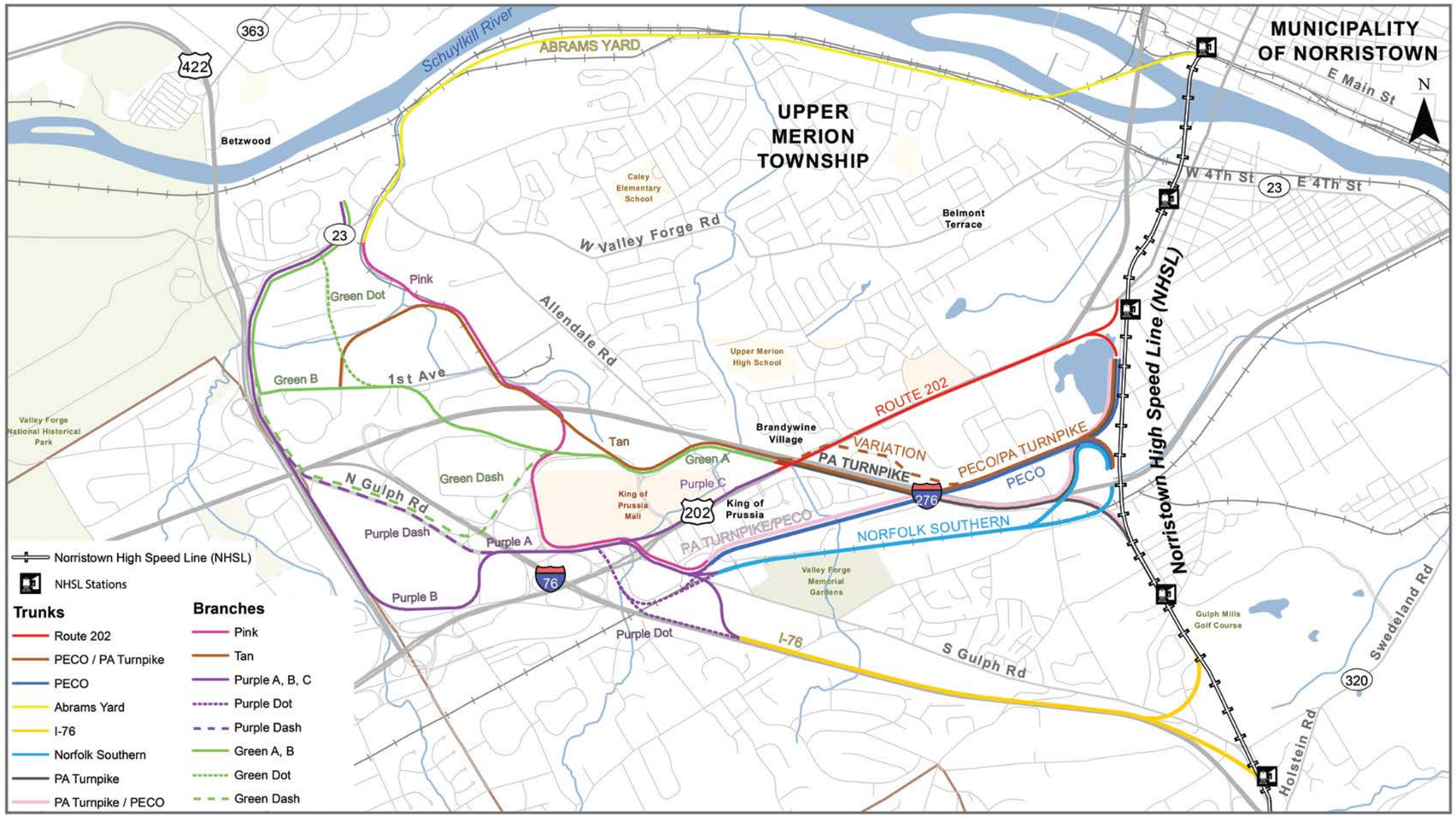
Build Alternatives: Build Alternatives are future conditions in the DEIS analysis year of 2040 with the proposed project. The Build Alternatives will be developed through a tiered screening and alternatives definition process. The process begins with a determination of a Long List of Alternatives.

SEPTA developed the Long List of Alternatives from previous studies, new concepts SEPTA and its engineering consultants developed, and ideas identified through agency, stakeholder and public outreach activities. Given the developed nature of the study area and an effort to avoid and minimize negative effects, the Long List of Alternatives that SEPTA identified primarily use existing transportation and utility rights of way. These rights of way include a PECO energy corridor, Route 202, Interstate 276, Interstate 76, Norfolk Southern's Morrisville Line and Abrams Yard Line as well inactive freight rail rights of way, and other public streets north and west of the King of Prussia Mall.

Figure 2 is a map of the Long List of Alternatives as displayed at the public and agency scoping meetings. At the time of the scoping meetings, the long list of alternatives consisted of primarily elevated rail alignments along existing transportation (freight rail or roadway) or utility rights of way. Elevated alignments minimize potential impacts in the built-up community of Upper Merion Township. Elevated railway also enables SEPTA to fully segregate the rail right of way from the outside environment, thereby protecting the energized, high voltage third rail traction power system used by NHSL vehicles.

At the time of the public and agency scoping meetings, the long list of alternatives consisted of thirty (30) alternatives. Each alternative consisted of two pieces: a trunk and a branch. The trunk is the portion of the alternative that connects the NHSL to key destinations in the KOP/Valley Forge Area, particularly the Mall. The branch is the portion of the alternative that extends beyond the Mall.

Figure 2 Long List of Alternatives



3.1 Findings of Tier 1 Screen

Tier 1 of the screening process examined the long list of alternatives. Using existing information, field reconnaissance, aerial photography, and SEPTA's standards and railway engineering judgment, the long list of alternatives was screened to identify the subset of reasonable alternatives (i.e., practical or feasible).

Tier 1 screening focused on eliminating alternatives that are not viable in terms of engineering and/or do not meet the purpose and need of the project. Also, by comparing the closely similar alternatives, Tier 1 screening enabled SEPTA to identify alternatives that eliminate or reduce concerns or clearly provide advantages, and in doing so, eliminating less well performing alternatives.

Tier 1 screening entailed first determining if the alternative would address purpose and need. If it did not, the alternative was eliminated from further consideration. If an alternative was deemed to meet purpose and need, it underwent two reasonableness tests as identified below. In the screening, the trunks and branches of the alternatives were examined separately.

Reasonableness Test 1:

- Is the alternative feasible and reasonable to build, operate and maintain relative to other alternatives under consideration?

Reasonableness Test 2:

- Can the ROW/land area accommodate the needed cross-section?

3.1.1 Findings on the Elevated Rail Alternatives

The results of the Tier 1 screening for the elevated rail alternatives are shown in Tables 1 and 2. Of the long list, the Tier 1 screening process resulted in twelve (12) elevated rail alternatives recommended to be carried forward for subsequent alternatives definition, and screening and evaluation in Tier 2. Based upon the information available for the screen and compared with the other alternatives, the 12 surviving elevated alternatives are the best performing alternatives. Each achieves the purpose and need; is feasible and reasonable to build, operate, and maintain; and sufficient right-of-way and land area is available for the railway cross-section. Figure 3 depicts the twelve (12) surviving elevated rail alternatives that were recommended for advancement into Tier 2: six (6) Route 202 Alternatives, three (3) PECO Alternatives, and three (3) PECO/PA Turnpike Alternatives.

The Tier 1 screening process resulted in the elimination of eighteen (18) elevated rail alternatives from further consideration. Based upon the information available for the screen and compared with the other alternatives, the 18 elevated alternatives are not reasonable for one or more of the following reasons: does not achieve the purpose and need; is not feasible; is not reasonable to build, operate, and maintain; or sufficient right-of-way and land area is not available for the railway cross-section. The 18 elevated rail alternatives that were eliminated as a result of Tier 1 screening are discussed below.

Table 1 Tier 1 Screening Results – Trunks (Elevated)

Trunks	Tier 1 Screening Results	Explanation
Abrams Yard	Eliminated	Does not meet Purpose and Need. Does not provide faster, more reliable service.
PECO	Passed	Met all criteria.
I-76	Eliminated	Complex construction and not reasonable to operate primarily as a result of excessive grade.
Route 202	Passed	Met all criteria.
Norfolk-Southern (Morrisville Line)	Eliminated	Not operationally feasible. Three rail services within same track segment. Very slow speeds exiting and entering trunk.
PA Turnpike	Eliminated	Not reasonable to build. Extraordinarily high and complex elevated structure needed. Requires moving NHSL Hughes Park Station further south.
PA Turnpike/PECO	Eliminated	Not reasonable to build. Extraordinarily high and complex elevated structure needed. Requires moving NHSL Hughes Park Station.
PECO/PA Turnpike	Passed	Met all criteria.

Table 2 Tier 1 Screening Results – Branches (Elevated)

Branches	Tier 1 Screening Results	Explanation
Pink (South Gulph Road to West Valley Road via Abrams Industrial Track)	Passed	Met all criteria.
Green A (Wills Road and Mall Boulevard)	Passed	Met all criteria.
Green B (Goddard Boulevard/1st Avenue)	Eliminated	Not reasonable to build. Extraordinarily high and complex structure needed.
Green Dot (Moore Avenue)	Eliminated	Not reasonable to build. Straddle bents over roadway.
Green Dash (North Gulph Road)	Passed	Met all criteria.
Purple A (South Gulph Road and North Gulph Road to Village at Valley Forge)	Passed	Met all criteria.
Purple B (From Village at Valley Forge to West Valley Road)	Eliminated	Cannot be accommodated in right of way. US Route 422 widening.
Purple C (Route 202 from PA Turnpike to North Gulph Road)	Passed	Met all criteria.
Purple Dot (Intersection of I-76 and Route 202)	Eliminated	Cannot be accommodated in right of way. In major interchange.
Purple Dash (North Gulph Road)	Passed	Met all criteria.
Tan (Wills Road to 1st Avenue via Abrams Industrial Track)	Passed	Met all criteria.

As noted in Tables 1 and 2, the Abrams Yard trunk alternative was eliminated in the Tier 1 screen as it did not meet the project's purpose and need. The Abrams Yard trunk alternative does not provide a direct connection to/from established communities along the existing NHSL to the KOP/Valley Forge area for three reasons. First, the location of Abrams Yard is north of key destinations intended to be served by the extension. Second, due to extreme differences in grade between the NHSL and Norfolk Southern's Abrams Yard tracks at the Norristown Transportation Center, passengers would have to transfer from one train to another. As a result, rail service to the KOP/Valley Forge area using the Abrams Yard trunk from Norristown would operate as a separate rail shuttle not a railway extension of existing rail service. Third, as a rail shuttle the Abrams Yard trunk alternative would not provide direct service to the 69th Street Transportation Center. These limiting factors are not present in the other alternatives; thus the

Abrams Yard trunk alternative does not meet the project's purpose and need and was eliminated from further consideration.

The I-76/Schuylkill Expressway trunk alternative was also eliminated in the Tier 1 screen. It would require long, extended steep grades that are not reasonable for the NHSL vehicles to operate on; other alternatives do not have that limiting factor present. Additionally, this alignment would require very highly complex construction that is not present in other alternatives.

Using the Norfolk Southern (Morrisville Line) trunk alternative is not operationally feasible as three different rail services (Norfolk Southern trains, NHSL extension trains to/from KOP to/from Norristown, and NHSL extension trains to/from KOP to/from 69th Street) cannot operate within the same segment of rail track. Additionally, the junction of the Norfolk Southern (Morrisville Line) trunk with the existing NHSL would require a very slow train operating speed due to a sharp track curve at the connection with the NHSL. A very slow train operating speed at this location is substantially less than that of the other alternatives, and would result in slower overall travel time for alternatives using this trunk. These limiting factors are not present in alternatives that use other trunk alignments. As a result, it is not prudent to carry the Norfolk Southern (Morrisville Line) trunk alternative forward; SEPTA eliminated it as a result of the Tier 1 screening process.

The Pennsylvania Turnpike trunk alternative was also eliminated in the Tier 1 screen. It is not reasonable to build as it would require extraordinarily long and highly complex elevated structures to provide vertical clearance over Norfolk Southern's Morrisville Line; other alternatives do not have this limiting factor. Additionally, the Pennsylvania Turnpike trunk alternative would require relocating the existing Hughes Park station to the south along the NHSL in order to provide sufficient space for the trunk junction.

The Pennsylvania Turnpike/PECO trunk alternative is not reasonable to build as it would require extraordinarily long and highly complex elevated structures to provide vertical clearance over Norfolk Southern's Morrisville Line; other alternatives do not have that limiting factor. Additionally, the Pennsylvania Turnpike/PECO trunk alternative would require relocating the existing Hughes Park station further south to the south along the NHSL in order to provide sufficient space for the trunk junction. For these reasons, it is not prudent to carry the Pennsylvania Turnpike/PECO trunk alternative forward; SEPTA eliminated it as a result of the Tier 1 screening process.

Four of the branch alternatives were also eliminated as a result of the Tier 1 screen: Green B, Green Dot, Purple B and Purple Dot. Green B branch alternative, which follows Goddard Boulevard/1st Avenue, was eliminated as it is not reasonable to build for two reasons. First, it would require extraordinarily long and highly complex elevated structures crossing the Pennsylvania Turnpike. Second, it would require steep railroad grades due to the differences in the elevations between the two sides of the Pennsylvania Turnpike. Other branch alternatives do not have these limiting factors.

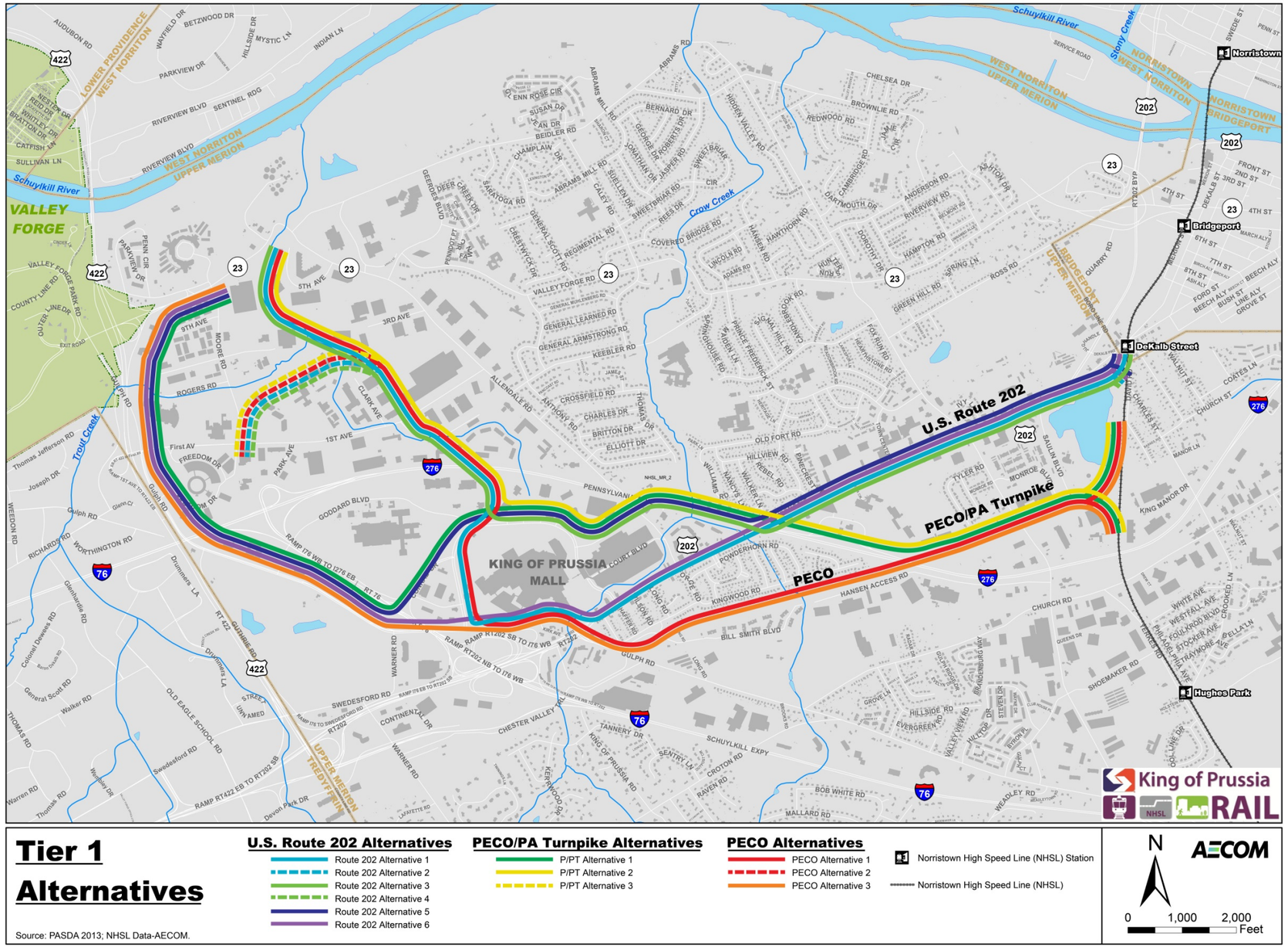
Green Dot branch alternative, which follows Moore Road, was eliminated as it is not reasonable to build for two reasons. First, it would require complex changes in grade to achieve level track at the terminal station. Second, the elevated rail bed would have to be supported by a complex structure, known as a straddle bent system, consisting of pairs of columns on both sides of a roadway topped by a network of overhead beams across the roadway. This complex structure would increase project costs and have a potentially high visual effect on the community as well

as drivers on the roadways below it compared with the single column structure envisioned for the project. Other branch alternatives do not have these limiting factors.

Purple B branch alternative, which is from the Village at Valley Forge to West Valley Road, was eliminated as it cannot be accommodated within the roadway right of way due to the planned widening of US Route 422. Purple Dot branch alternative, which begins at the intersection of I-76 and US Route 202, was eliminated as it cannot be accommodated within the roadway right of way within that major interchange.

The map shown on Figure 3 depicts the twelve (12) surviving elevated rail alternatives that were recommended for advancement into Tier 2.

Figure 3 Surviving Tier 1 Alternatives



3.1.2 Development of the At-Grade Rail Alternatives

Comments were made at the public scoping meeting concerning the potential effects of an aerial railway structure on the community. This input prompted SEPTA to broaden its alternatives identification process by considering the potential for ground level rail operations. Specifically, SEPTA evaluated the alternatives that had already been found in Tier 1 to achieve the project's purpose and need; were feasible and reasonable to build, operate, and maintain; and had sufficient right-of-way and land area available for the railway cross-section. Figure 3 shows these alternatives: six (6) Route 202 Alternatives, the three (3) PECO Alternatives, and the three (3) PECO/PA Turnpike Alternatives. The alternatives eliminated by the Tier 1 screening were not considered for potential at-grade operations; these alternatives would have been eliminated during Tier 1 screen regardless of whether they were elevated or at-grade.

At-grade alternative development required SEPTA to determine specific vehicle assumptions, at-grade operation requirements (for example, no mixed traffic operation, fully signalized railway crossings with gates, etc.), and other key system requirements. As part of this activity, SEPTA established guideway design criteria and overhead catenary power criteria. A change in power source from a third rail traction power system to an overhead powered rail traction system would be necessary to ensure safe at-grade operations. The rail rolling stock that SEPTA operates on the NHSL was designed with capabilities to operate with an overhead powered rail traction system as well as third rail electric traction power. Currently, the entire NHSL operates within a third rail electric traction power system, but the vehicles can be powered by using overhead catenary wire and rooftop pantographs by modifying the equipment.

Using the at-grade assumptions, design criteria and operating requirements described above, SEPTA developed concept plans for each alternative. In doing so, SEPTA identified areas not meeting minimum SEPTA design criteria, identified potential station areas and platform types, and identified the number of at-grade crossing locations that would be created by each alternative. As the conceptual engineering progressed, it was evident that due to the built-up nature of the study area, only segments, not the entire alignments, of the alternatives could reasonably be brought to grade.

SEPTA then performed a two-step assessment of the reasonableness to build, operate and maintain each at-grade alternative. Figure 4 depicts SEPTA's at-grade alternative assessment process. In the first step, SEPTA used the Tier 1 screening procedure to:

- Determine the extent of at-grade sections for each alternative and whether this at-grade extent presents an effective difference from the elevated rail alternative along that alignment;
- Determine the operating impact of at-grade transitions to elevated rail segments;
- Determine consistency with SEPTA operating practices;
- Assess reconstruction and related engineering issues; and,
- Determine the reasonableness of each at-grade alternative to build, operate and maintain.

The Tier 1 screening of the at-grade alternatives mirrored that of the elevated alternatives and focused on reasonableness with the two tests as listed below:

1. It is not reasonable to build, operate, or maintain:
    - Inability to meet SEPTA design criteria (grade, radii, stations, etc.)

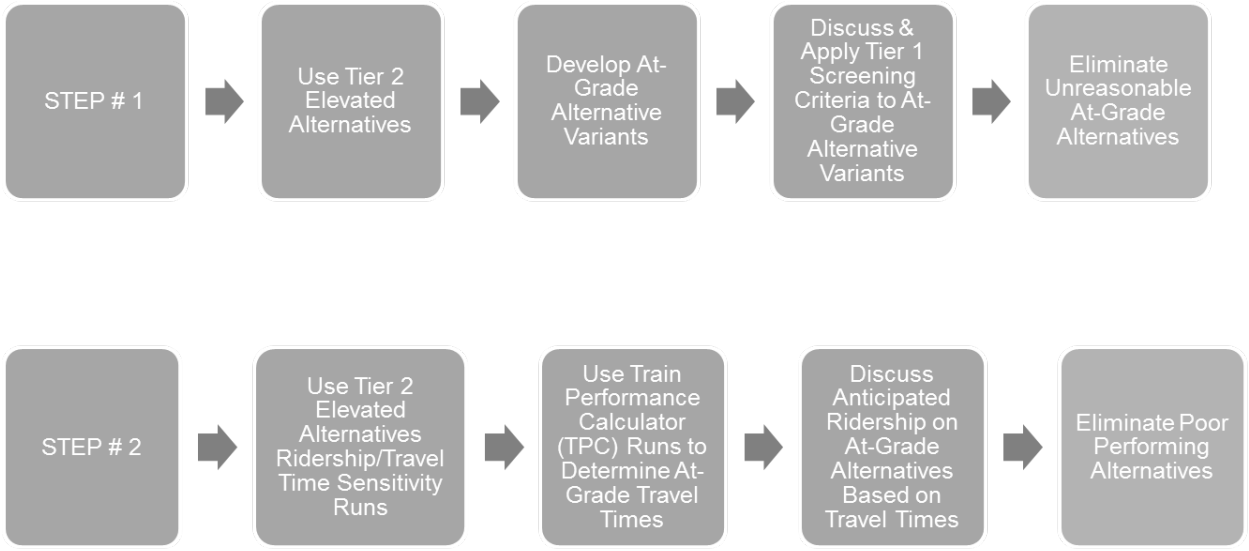
- Vehicle coordination issues (high number of grade crossings relative to other at-grade alternatives)
- Complex reconstruction issues

2. The cross-section cannot be accommodated predominantly in the public right-of-way. Based on the Tier 1 screening, an at-grade alternative may not be reasonable to build, operate, and maintain for one or more of the following reasons:
   - Low percentage of the alignment is actually at-grade (consider only as modification to elevated alternative)
   - High number of side platform stations
   - High number of curves with radius below SEPTA design criteria
   - High number of at-grade crossings (street/driveway crossings)
   - Many major reconstruction issues

Based on the Tier 1 assessment, segments of many at-grade alternatives were eliminated from further consideration.

In the second step, train performance calculator model runs were developed and used to determine travel times for the at-grade alternatives. SEPTA then compared the resulting travel times to the ridership model's travel time sensitivity runs; this comparison enabled SEPTA to identify reasonable at-grade alternatives and eliminate poorly performing alternatives.

Figure 4 At-Grade Assessment Approach



3.1.3 Findings on the At-Grade Rail Alternatives

As described above, SEPTA developed the elevated rail alternatives to include segments at-grade for the PECO Alternatives, the PECO/PA Turnpike Alternatives and the Route 202 Alternatives. Fourteen (14) at-grade rail alternatives were identified. Of this long list of at-grade alternatives, the Tier 1 screening process resulted in four (4) at-grade rail alternatives being carried forward for subsequent alternatives definition, and screening and evaluation in Tier 2, and elimination of ten (10) at-grade rail alternatives from further consideration. Based upon the information available for the Tier 1 screen, the 4 surviving at-grade alternatives are the best performing at-grade alternatives compared to the other at-grade alternatives. Thus, PECO 3, PECO/TP 1, US 202 7 and US 202 8 were retained by SEPTA to move forward into Tier 2 screening. Table 3 presents the results of the Tier 1 screening for the at-grade alternatives.

Table 3 Tier 1 Screening Results for Alternatives with At-Grade Segments

Alternative (At-Grade)	% At-Grade	# of Elevated Stations*	# and Type of At-Grade Stations*			# of Curves Below 450' Radius	# of At-Grade Crossings	Major Reconstruction Issues
			Center	Side	Total			
PECO 1	24%	3	0	1	1	3	8	
PECO 2	24%	3	0	1	1	3	8	
PECO 3	47%	1	3	0	3	0	11	I-276 abutments
PECO/TP 1	41%	3	3	0	3	0	11	I-276 abutments
PECO/TP 2	14%	3	1	0	1	0	2	
PECO/TP 3	14%	3	1	0	1	0	2	
US 202 1	68%	2	4	1	5	3	43	DeKalb station relocation; likely need to replace 2 travel lanes
US 202 2	68%	2	4	1	5	3	43	DeKalb station relocation; likely need to replace 2 travel lanes

Alternative (At-Grade)	% At-Grade	# of Elevated Stations*	# and Type of At-Grade Stations*			# of Curves Below 450' Radius	# of At-Grade Crossings	Major Reconstruction Issues
			Center	Side	Total			
US 202 3	38%	3	3	0	3	0	22	DeKalb station relocation; likely need to replace 2 travel lanes
US 202 4	38%	3	3	0	3	0	22	DeKalb station relocation; likely need to replace 2 travel lanes
US 202 5	60%	3	5	0	5	0	31	DeKalb station relocation; likely need to replace 2 travel lanes; I-276 abutments
US 202 6	84%	0	7	0	7	0	41	DeKalb station relocation; likely need to replace 2 travel lanes I-276 abutments
US 202 7	31%	5	3	0	3	0	11	DeKalb station relocation; I-276 abutments
US 202 8	34%	4	3	0	3	0	11	DeKalb station relocation; I-276 abutments

Eliminated from further consideration based upon application of highlighted criteria.
Retained for Tier 2 screening.
* Note: At-grade alternatives had stations identified in their Tier 1 process because they were developed from the elevated rail alternatives that had survived into Tier 2 (elevated rail alternatives had stations identified in Tier 2).

3.2 Preliminary Alternatives for Tier 2 Screen

In preparation for Tier 2 screening, SEPTA developed the 16 survivors (12 elevated rail alternatives and 4 rail alternatives with at-grade segments) into Preliminary Alternatives by applying conceptual level engineering. By further defining the Preliminary Alternatives, SEPTA could subject them to a more rigorous and quantitative analysis in the Tier 2 screen. For example, conceptual level engineering enabled SEPTA to determine order of magnitude, estimated capital cost, define an initial service strategy, and with that service strategy apply a validated travel demand model for ridership estimates.

The 16 Preliminary Alternatives retained for the Tier 2 screen are depicted on Figures 5, 6 and 7. The alternatives are aligned along three corridors: the PECO corridor, a combination of the PECO and PA Turnpike corridors, and US Route 202. Using these similarities, SEPTA grouped the Preliminary Alternatives by their common corridors. The Preliminary Alternatives are:

PECO Alternatives (PECO 1 to PECO 4): the trunk of each alternative would be aligned along the PECO corridor from the existing NHSL corridor to South Gulph Road. West of South Gulph Road, the branches are aligned along North Gulph Road or the former industrial track. Of those following the North Abrams Industrial Track, one alternative (PECO 2) turns short and heads west to follow an alignment going south along Moore Road. Three elevated alternatives (PECO 1, 2, and 3) and one at-grade alternative (PECO 4, which is at grade in the portion of its alignment that is along North Gulph Road with another short at-grade segment near Hansen Access Road and Bill Smith Boulevard) are represented in this group each with four stations.

Table 4 Number of Stations on the PECO Alternatives for the Tier 2 Screen

PECO Alternative	Number of Stations*
PECO 1	4
PECO 2	4
PECO 3	4
PECO 4	4

* Note: The count of the number of stations as identified for Tier 2 ridership forecasting work.

PECO/PA Turnpike Alternatives (PECO/TP 1 to PECO/TP 4): the trunk of each alternative would be aligned along the PECO utility corridor from the existing NHSL corridor to I-276 (PA Turnpike), and then along I-276 to Allendale Road and behind the mall. West of Allendale Road, the branches are aligned along North Gulph Road or the former industrial track. Of those following the North Abrams Industrial Track, one alternative (PECO/TP 3) turns short and heads west to follow an alignment going south along Moore Road. Three elevated alternatives (PECO/TP 1, 2, and 3) and one at-grade alternative (PECO/TP 4 which is at-grade in the portion of its alignment that is along North Gulph Road along with a short segment at-grade in the area north of the PA Turnpike and west of Henderson Road) are represented in this group; four to five stations are contemplated in each alternative.

Table 5 Number of Stations on the PECO/PA TP Alternatives for the Tier 2 Screen

PECO/TP Alternative	Number of Stations*
PECO/TP 1	5
PECO/TP 2	4
PECO/TP 3	4
PECO/TP 4	5

* Note: The count of the number of stations as identified for Tier 2 ridership forecasting work.

US Route 202 Alternatives (202 1 to 202 8): the trunk of each alternative would be aligned along US Route 202 from the existing NHSL corridor to I-276. Some alternatives (202 3, 4, 5, and 7) would then run along I-276 to Allendale Road and behind the King of Prussia Mall. From there, the alternatives would follow an alignment along North Gulph Road or the former North Abrams Industrial Track rail line. Of those following the North Abrams Industrial Track, one alternative (Alternative 202 4) turns short and heads west to follow an alignment going south along Moore Road. The other alternatives (202 1, 2, 6, and 8) would continue along US 202 in front of the mall and then follow an alignment along North Gulph Road or the former industrial track but with one alternative (Alternative 202 2) turning short on the former industrial track and following an alignment along Moore Road. Six elevated alternatives (202 1, 2, 3, 4, 5 and 6) and two at-grade alternatives (202 7 and 8 which are at-grade in the portion of their alignments that are along North Gulph Road) are represented in this group; five to six stations are contemplated in each alternative.

Table 6 Number of Stations on the US Route 202 Alternatives for the Tier 2 Screen

US Route 202 Alternative	Number of Stations*
US 202 1	6
US 202 2	6
US 202 3	5
US 202 4	5
US 202 5	6
US 202 6	6
US 202 7	6
US 202 8	6

* Note: The count of the number of stations as identified for Tier 2 ridership forecasting work.

Figure 5 Preliminary Alternatives - PECO Alternatives

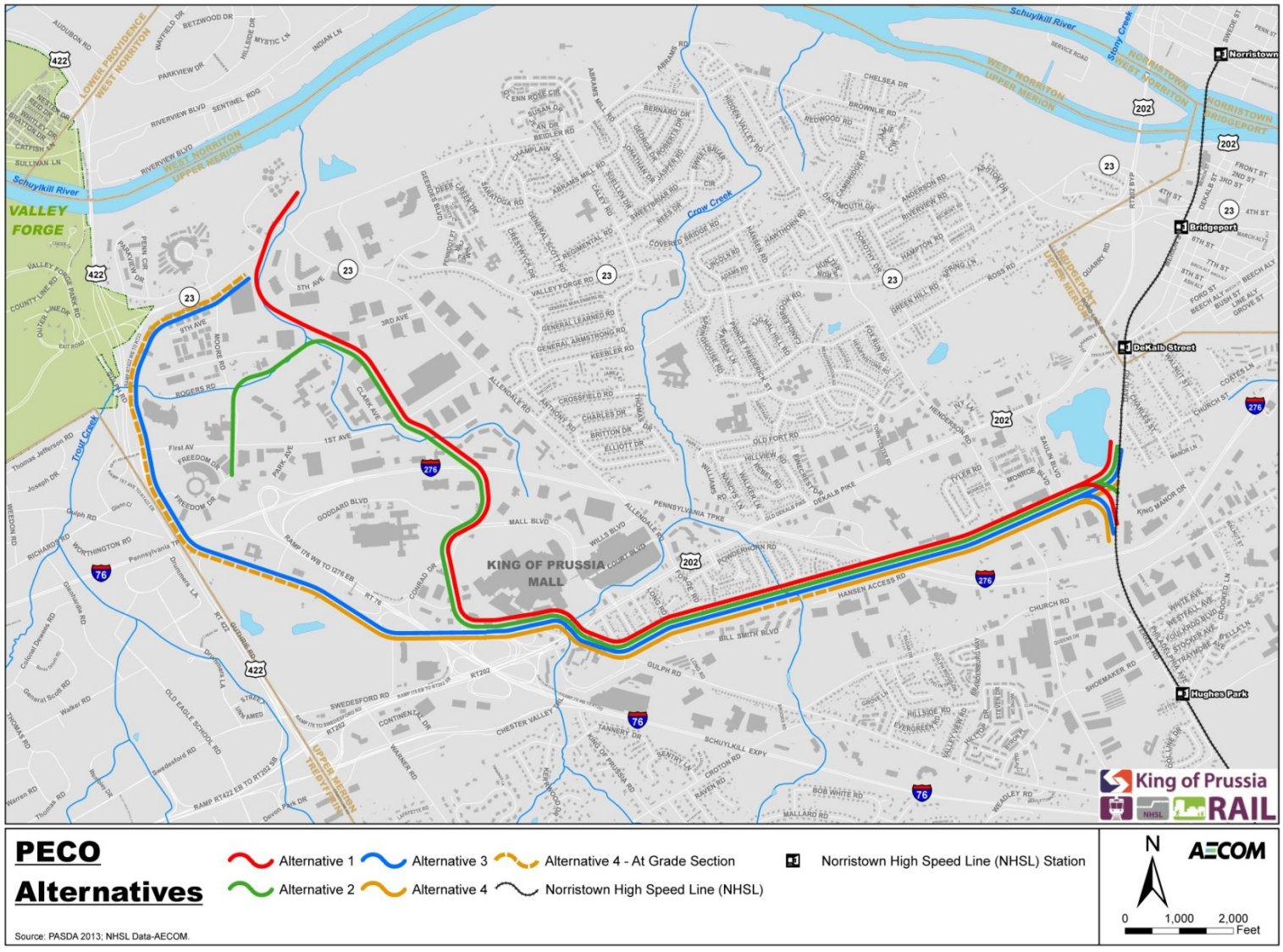


Figure 6 Preliminary Alternatives - PECO/Turnpike Alternatives

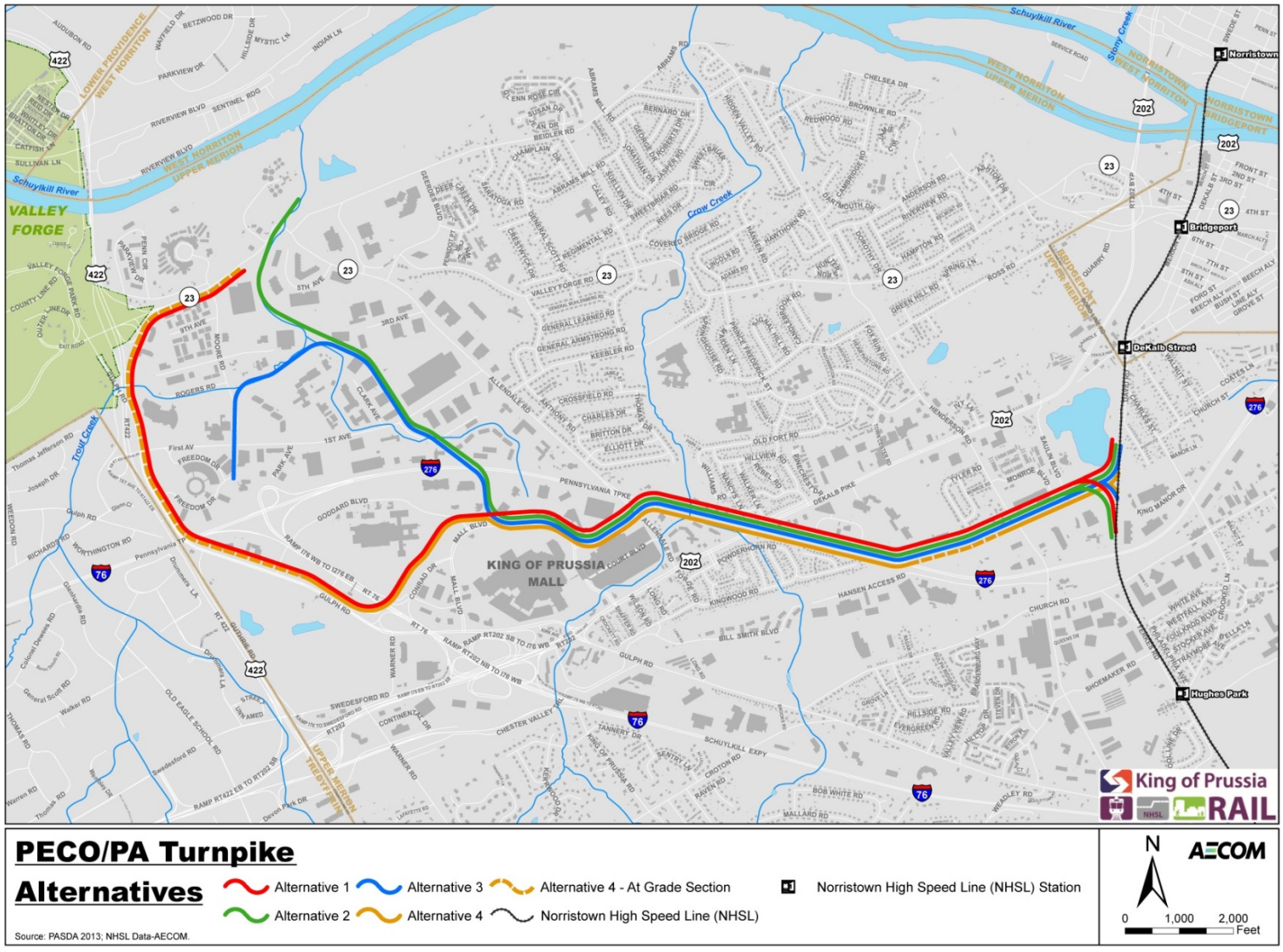
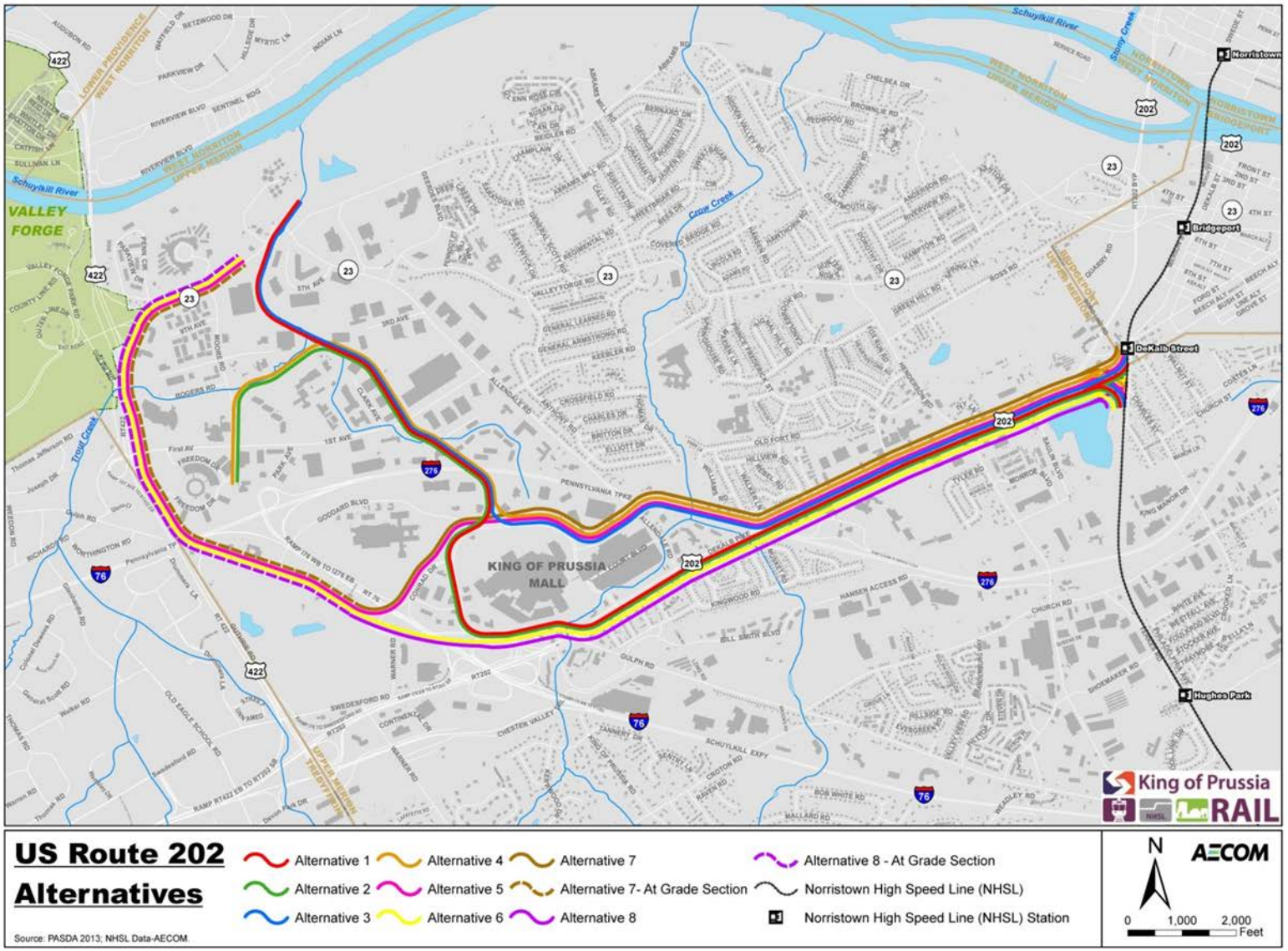


Figure 7 Preliminary Alternatives - US Route 202 Alternatives



3.3 Planning Framework

SEPTA's Tier 2 screening criteria reflect FTA's framework for evaluating and rating major transit capital investments in FTA's New Starts program. New Starts projects are evaluated and rated according to criteria set forth in FTA's 2013 Final Rules and *New and Small Starts Policy Guidance*. The statutory project justification criteria and their associated measures include:

- Mobility improvements – total number of linked trips using the project with extra weight given to trips made by transit dependent persons (estimated annual trips);
- Environmental benefits – dollar value of anticipated direct and indirect benefits to human health, safety, energy, and the air quality environment scaled by the cost of the project and computed based on the change in vehicle miles traveled (VMT) resulting from the implementation of the proposed project (as calculated from estimates of change in automobile and transit vehicle miles traveled);
- Congestion relief – no measure has been defined yet by FTA; all projects receive a medium rating;
- Economic development effects – the extent to which a proposed project is likely to enhance additional, transit supportive development in the future is based on a qualitative examination of local plans and policies to support economic development proximate to the project;
- Land use – an examination of existing corridor and station area development; development character; existing station area pedestrian facilities; existing corridor and station area parking supply; and affordable housing in the corridor and station areas; and
- Cost-effectiveness – annual capital and operating cost per trip on the project.

The statute also requires FTA to examine the following when evaluating and rating a local financial commitment:

- Availability of reasonable contingency amounts;
- Availability of stable and dependable capital and operating funding sources; and
- Availability of local resources to recapitalize, maintain, and operate the overall existing and proposed public transportation system without requiring a reduction in existing services.

The statute requires FTA to give "comparable, but not necessarily equal" weight to their evaluation criteria. In the Guidance, FTA will give each of the project justification criteria equal weight. Because of changes made by MAP-21, the FTA's Final Rules do not address how FTA will develop overall New Starts project ratings. Instead, FTA has indicated that this will be the subject of future, subsequent rulemaking. As an interim approach until that rulemaking process is complete, FTA has proposed to give 50 percent weight to the summary project justification rating and 50 percent to the summary local financial commitment rating to arrive at an overall

rating. FTA also has proposed to continue requiring at least a medium rating on both project justification and local financial commitment to obtain a medium or better rating overall.

In the Tier 2 screen, SEPTA developed criteria to measure the effectiveness of the Preliminary Alternatives at achieving the project purpose, need and goals. In doing so, SEPTA considered several factors. First SEPTA's Tier 2 screening criteria reflect FTA's statutory project justification criteria for which sufficient engineering and environmental detail has been developed to yield meaningful results. Second, some criteria were shaped by the planning, community involvement and stakeholder collaboration activities undertaken to date. For example, the project's Technical Advisory Committee asked that specific criteria be included to consider proximity to residential areas and access to parks. Third, SEPTA's criteria include other engineering and environmental factors that could be determined by the conceptual engineering undertaken to date.

By applying these several factors, SEPTA examined the following five criteria categories in Tier 2: engineering/right-of-way needs; system connectivity; support for transit-oriented development; ridership/market served; and community and environmental impact assessment. Table 7 lists the criteria for each category, and provides a description of the screening methodology for each criterion. Shaded criteria are reflective of FTA's statutory project justification criteria.

Table 7 Tier 2 Screening Criteria (shaded text relates to FTA News Starts measures)

Category	Criteria	Unit(s) of Measure(s)	Description of Methodology	Range
Engineering / Right of Way Needs	Estimated right-of-way needs	Private area affected by guideway (acres)	Calculated from GIS analysis of the location of the proposed guideway for each alternative relative to the location of individual parcels and the ownership of these parcels. Area includes properties other than those owned by PennDOT, PA Turnpike, PECO, or Norfolk Southern.	12-19
	Need for structures	Other affected structures	Identified affected structures not directly part of the guideway. Total of four: Dekalb Station reconstruction/US 202 overpass, PECO towers (8) between the NHSL and the Turnpike, PECO towers (12) between the NHSL and South Gulph Road, and the underpass of North Gulph Road/US 422 under the PA Turnpike.	1-2
	Capital cost	Preliminary capital cost estimates	Based upon unit costs and estimated costs organized by FTA standard cost categories. SEPTA reviewed and approved the unit cost and contingency factors. The values for each alternative reflect steel and concrete construction for the 2014 base year and year of expenditure.	High, Medium, Low
	Acquisition of ROW or easements	Number of institutions involved	Calculated number of institutions involved, including PennDOT, PECO, PA Turnpike, and NS.	2-4
	Ability to mitigate impacts of vehicular traffic intersection congestion	Number of intersections affected	Based on screening level traffic impact of the at-grade alternatives.	11
Ridership / Market Served	Ridership	Number of forecasted 2040 daily project trips	From Delaware Valley Regional Planning Commission (DVRPC) ridership forecasts.	4,800 – 8,700
	Size of centers served	Existing non-residential area served (in millions of square feet) Existing office area served (in millions of square feet)	Use property tax records to identify amount of square footage, use GIS to delineate ½ -mile station areas and determine how much square footage is within station area, and add station area totals for each alternative, adjusting for any duplicate businesses (total for all non-residential and total for office).	12.8-15.3 3.8-4.5
	Proximity to residential areas	Existing number of residential units served	Identify residential areas, use GIS to delineate ½-mile station areas and count number of units by station area, and add station area totals for each alternative, adjusting for any duplicate residences.	1,529-4,951
System Connectivity	Interface with other transit services	Number of potential bus route connections	Prepare map of alternatives and SEPTA bus routes (total of 5), determine how many connections can be potentially achieved.	7-31
	Access to parks, trails, and recreational resources	Number of existing parks, trails and recreational areas potentially served	Prepare map of alternatives and resources (total of 7), determine how many resources lie within each ½-mile station area, and add station area totals for each alternative.	3-6
Support for Transit-Oriented Development (TOD)	Area of King of Prussia Business Improvement District (KOP-BID) served	Station areas in KOP-BID district	Quantify the land area in acres within ½-mile station areas that are within the KOP-BID and add the station area quantities to determine the total KOP-BID area for each alternative	1,112 – 1,514
	Existence of transit supportive land use adjacencies at station areas	Number of station areas with transit supportive zoning	Identify zoning classifications and identify high-density zones, use GIS to delineate ½-mile station areas, calculate the area of high-density zoning in each area, determine the high-density percentage of each station area, rate each area H-M-L, and count number of H-M areas.	4-7
Environmental and Community Impacts	Water resource impacts	Area of floodplains affected (in acres)	Calculated by GIS analysis of the location of the proposed guideway relative to the location of floodplains, wetlands (including hydric soils), and streams.	0.8-3.9
		Area of wetlands affected (in acres)		0.5-4.6
		Impacts to streams (in linear feet)		104-2,131
	Park impacts	Impacts to parks, recreation, and open space (in acres)	Calculated by GIS analysis of the location of the proposed guideway relative to the location of parks, recreation, and open space resources.	0-4.4
	Potential visual change	Existing residential and non-residential land uses that could be affected by visual changes resulting from each alternative.	Using GIS, calculated by measuring the linear footage of commercial/retail/office land uses and residential land uses adjacent to the guideway.	19,003-37,220 (non-res) 1,661-4,787 (res)
	Potential temporary access change	Existing residential and non-residential land uses that could be affected in terms of access during temporary construction activity of each alternative.	Using a GIS-based overlay of the existing land use mapping and each alternative alignment, identified the commercial/retail/office land uses and residential land uses adjacent to the guideway with access driveways fronting on the alternative corridors, and identified the number of driveways serving those land uses.	16-91 (non-res) 0-1 (res)
	Property impacts	Number of properties affected	Calculated from GIS analysis of the location of the proposed guideway for each alternative relative to the location of individual parcels.	32-44

Note: Gray shading indicates reflection of FTA New Starts justification criteria.

4 DETAILED TIER 2 RATING & CRITERIA METHODOLOGY

This section summarizes the Tier 2 rating and criteria methodology, focusing on the criteria SEPTA applied to measure the effectiveness of each Preliminary Alternative in achieving the project purpose, needs and goals and which served as one step in the decision-making process to determine which alternatives should advance into Tier 3. The criteria are organized by category as shown in Table 7; each criterion is described and the resulting data is presented.

4.1 Engineering/Right of Way Needs

4.1.1 Criteria: Estimated Right-of-way Needs

Measure: Private area affected by guideway

The measure, private area affected by right-of-way needs, quantifies the approximate area in acres of privately-owned property the guideway would directly impact. The analysis assumed a consistently, conservatively realistic guideway width of 40 feet, including sufficient space for the track as well as adjacent land area for maintenance access and a safety buffer. Private properties include those owned by entities other than PennDOT, Pennsylvania Turnpike Commission (PTC), PECO, and Norfolk Southern (NS). SEPTA's consultant team calculated these values using GIS analysis of the location of the proposed guideway of each alternative relative to the location of privately owned land parcels. Table 8 reports the approximate acreage of private land area required for each alternative.

Table 8 Private Land Area Affected by Guideway

Alternative	Private Land Area Affected (Acres)
PECO 1	19
PECO 2	18
PECO 3	17
PECO 4	17
PECO/TP 1	16
PECO/TP 2	16
PECO/TP 3	15
PECO/TP 4	17
202 1	15
202 2	14
202 3	15
202 4	14
202 5	15
202 6	12
202 7	16
202 8	12

4.1.2 Criteria: Need for structures

Measure: Other affected structures

The measure, other affected structures, quantifies the number of major structures that are not elements of the alternatives, but would be affected by project implementation. SEPTA's consultant team identified four groups of major structures in this category, and Table 9 shows the structures affected by each alternative. The structures are:

- Dekalb Station / US 202 overpass of the existing Norristown High Speed Line (NHSL) - The 202 alternatives would require shifting the existing station platform and reconstructing the overpass to accommodate this shift.
- PECO transmission towers (8) between the existing NHSL and the Pennsylvania Turnpike - The PECO/TP alternatives would require relocating eight existing towers.
- PECO transmission towers (12) between the existing NHSL and South Gulph Road - The PECO alternatives would require relocating 12 existing towers.
- Underpass of North Gulph Road and US 422 under the Pennsylvania Turnpike - The at-grade alternatives along North Gulph Road would require reconstructing the underpass to accommodate the track alignment.

Table 9 Other Affected Structures

Alternative	DeKalb Station/ US 202	8 PECO Towers	12 PECO Towers	North Gulph Road/PA Turnpike underpass	Total Number of Other Structures
PECO 1			x		1
PECO 2			x		1
PECO 3			x		1
PECO 4			x	x	2
PECO/TP 1		x			1
PECO/TP 2		x			1
PECO/TP 3		x			1
PECO/TP 4		x		x	2
202 1	x				1
202 2	x				1
202 3	x				1
202 4	x				1
202 5	x				1
202 6	x				1
202 7	x			x	2
202 8	x			x	2

4.1.3 Criteria: Capital Cost

Measure: Preliminary capital cost estimates

The measure, preliminary capital cost estimates, quantifies the estimated cost of constructing each alternative based on the conceptual level of engineering performed to date. SEPTA's consultant team prepared preliminary estimates for each alternative, by applying unit pricing based on FTA's standard cost categories. The methodology involved preparing unit costs and contingency factors that SEPTA reviewed and approved and then applying these unit costs and factors to each alternative. Table 10 presents a rating of high, medium or low in terms of preliminary capital cost estimates.

Table 10 Preliminary Capital Cost Estimate (High, Medium and Low)

Alternative	Capital Cost
PECO 1	High
PECO 2	High
PECO 3	Medium
PECO 4	High
PECO/TP 1	Low
PECO/TP 2	High
PECO/TP 3	High
PECO/TP 4	Medium
202 1	Medium
202 2	Medium
202 3	High
202 4	High
202 5	Low
202 6	Low
202 7	Low
202 8	Medium

4.1.4 Criteria: Acquisition of Right-of-way or Easements

Measure: Number of institutions involved

The measure, number of institutions involved, quantifies the number of owners and operators of transportation and utility corridors with whom SEPTA would have to coordinate to implement each alternative. SEPTA's consultant team identified four institutions for this measure:

- PennDOT — The 202 alternatives would run in the median of US 202, which is under PennDOT jurisdiction. All other alternatives would encroach upon PennDOT right-of-way at some point, either by running along PennDOT roads or crossing over them.

- Pennsylvania Turnpike Commission — All alternatives would involve at least one crossing of the Turnpike. In addition, the PECO/TP alternatives and some 202 alternatives would run along the Turnpike median, while all of the at-grade alternatives pass under the Turnpike along North Gulph Road.

- PECO — The PECO and PECO/TP alternatives would use a portion of the PECO right-of-way that currently has several large transmission towers.

- Norfolk Southern — Several alternatives would run along a portion of the former North Abrams Industrial Track right-of-way, which Norfolk Southern currently owns.

Table 11 identifies and sums the institutions that would be involved in each alternative based upon overlaying each alternative right-of-way on available GIS-based municipal parcel mapping.

Table 11 Number of Institutions Involved

Alternative	PennDOT	Turnpike Commission	PECO	Norfolk Southern	Total Number of Institutions Involved
PECO 1	x	x	x	x	4
PECO 2	x	x	x	x	4
PECO 3	x	x	x		**3**
PECO 4	x	x	x		**3**
PECO/TP 1	x	x	x		**3**
PECO/TP 2	x	x	x	x	4
PECO/TP 3	x	x	x	x	4
PECO/TP 4	x	x	x		**3**
202 1	x	x		x	3
202 2	x	x		x	3
202 3	x	x		x	3
202 4	x	x		x	3
202 5	x	x			2
202 6	x	x			2
202 7	x	x			2
202 8	x	x			2

4.1.5 Criteria: Ability to Mitigate Impacts of Vehicular Traffic Intersection Congestion

Measure: Number of intersections affected

The measure, number of intersections affected, quantifies the overall number of roadway intersections and driveways each alternative would cross, and the number of roadway intersections each alternative would impact. Where an alternative crosses an intersection at-grade, an impact on intersection operations would occur, such as increased delay and/or turn prohibitions, and other effects on traffic movements. SEPTA's consultant team determined the number of affected intersections by examining existing intersection configurations and operations during peak traffic periods, and applying professional judgment as to the additive effects of rail transit operations, traffic growth by the project design year 2040, and the ability of SEPTA to mitigate the impacts of the project on each affected intersection. Table 12 lists the number of intersections and driveways crossed by each alternative and the estimated number of those intersections that would be affected by the project.

Table 12 Number of Affected Intersections

	Number of Intersections	
Alternative	**Affected**	**Overall Crossed**
PECO 1	0	19
PECO 2	0	19
PECO 3	0	21
PECO 4	11	21
PECO/TP 1	0	30
PECO/TP 2	0	12
PECO/TP 3	0	12
PECO/TP 4	11	30
202 1	0	82
202 2	0	82
202 3	0	51
202 4	0	51
202 5	0	69
202 6	0	84
202 7	11	69
202 8	11	84

4.2 Ridership/Markets Served

4.2.1 Criteria: Ridership

Measure: Number of Forecasted 2040 daily project trips

The measure, number of 2040 daily trips, quantifies the forecasted ridership for each alternative in design year 2040. The Delaware Valley Regional Planning Commission (DVRPC) derived daily ridership forecasts using their transit ridership forecasting model. Table 13 presents the daily project trips in 2040 for each alternative, as calculated by DVRPC and submitted to SEPTA on October 30, 2014.

Table 13 Number of Forecasted 2040 Daily Project Trips

Alternative	Number of Forecasted 2040 Daily Project Trips (Range)
PECO 1	5100-7700
PECO 2	5100-7600
PECO 3	5800-8700
PECO 4	5800-8600
PECO/TP 1	5800-8700
PECO/TP 2	4900-7400
PECO/TP 3	4800-7300
PECO/TP 4	5000-7500
202 1	5000-7500
202 2	5000-7500
202 3	4800-7200
202 4	4800-7200
202 5	5800-8700
202 6	5700-8600
202 7	5900-8800
202 8	6000-9000

4.2.2 Criteria: Size of Centers Served

Measures: Existing non-residential and office areas potentially served

The measure, existing non-residential and office areas potentially served, quantifies the square footage of non-residential and office floor space, in millions of square feet, located within ½-mile of proposed station areas along each alternative alignment. SEPTA's consultant team calculated the values for this measure using county property tax records to identify the amount of square footage for non-residential uses near the alignments. The process involved using GIS mapping to delineate a ½-mile radius around station areas and determine the amount of square footage within that radius at each station area. For each alternative, the station area sub-totals were added together, adjusting for overlapping businesses, to obtain the total existing commercial/office/retail/industrial area (total non-residential) and total office area potentially served by each alternative (see Table 14). Office area is counted in both totals.

Table 14 Existing Non-Residential and Office Areas Served

Alternative	Existing Non-Residential and Office Areas Served (millions of square feet)	
	Non-Residential Area (Including Office)	Office Area
PECO 1	13.5	4.3
PECO 2	15.3	4.4
PECO 3	13.6	4.4
PECO 4	13.6	4.4
PECO/TP 1	14.9	4.5
PECO/TP 2	13.5	3.9
PECO/TP 3	14.5	4.0
PECO/TP 4	14.9	4.5
202 1	14.1	4.2
202 2	16.8	4.3
202 3	12.8	3.8
202 4	13.7	4.0
202 5	13.2	4.3
202 6	13.6	4.4
202 7	13.2	4.3
202 8	13.6	4.4

Note: Office area is included in non-residential area totals.

4.2.3 Criteria: Proximity to Residential Areas

Measure: Number of existing residential units potentially served

Similar to the calculations for non-residential area, the measure, number of existing residential units potentially served, quantifies the number of existing residential units located within ½ mile of station areas. SEPTA's consultant team used county property tax records to identify residential areas and used GIS to delineate a ½-mile radius around station areas (see Figure 8). Within that radius, the number of housing units was counted. For each alternative, the station area sub-totals were added together, adjusting for overlapping units, to obtain the total number of existing residential units potentially served by each alternative (see Table 15). Subsequent to the ridership forecasting work and other technical work completed for Tier 2, a station at Henderson Road was identified by a Technical Advisory Committee member. This newly proposed station was included in all measures that were calculated using the ½-mile radius for station areas.

Figure 8 Station Areas

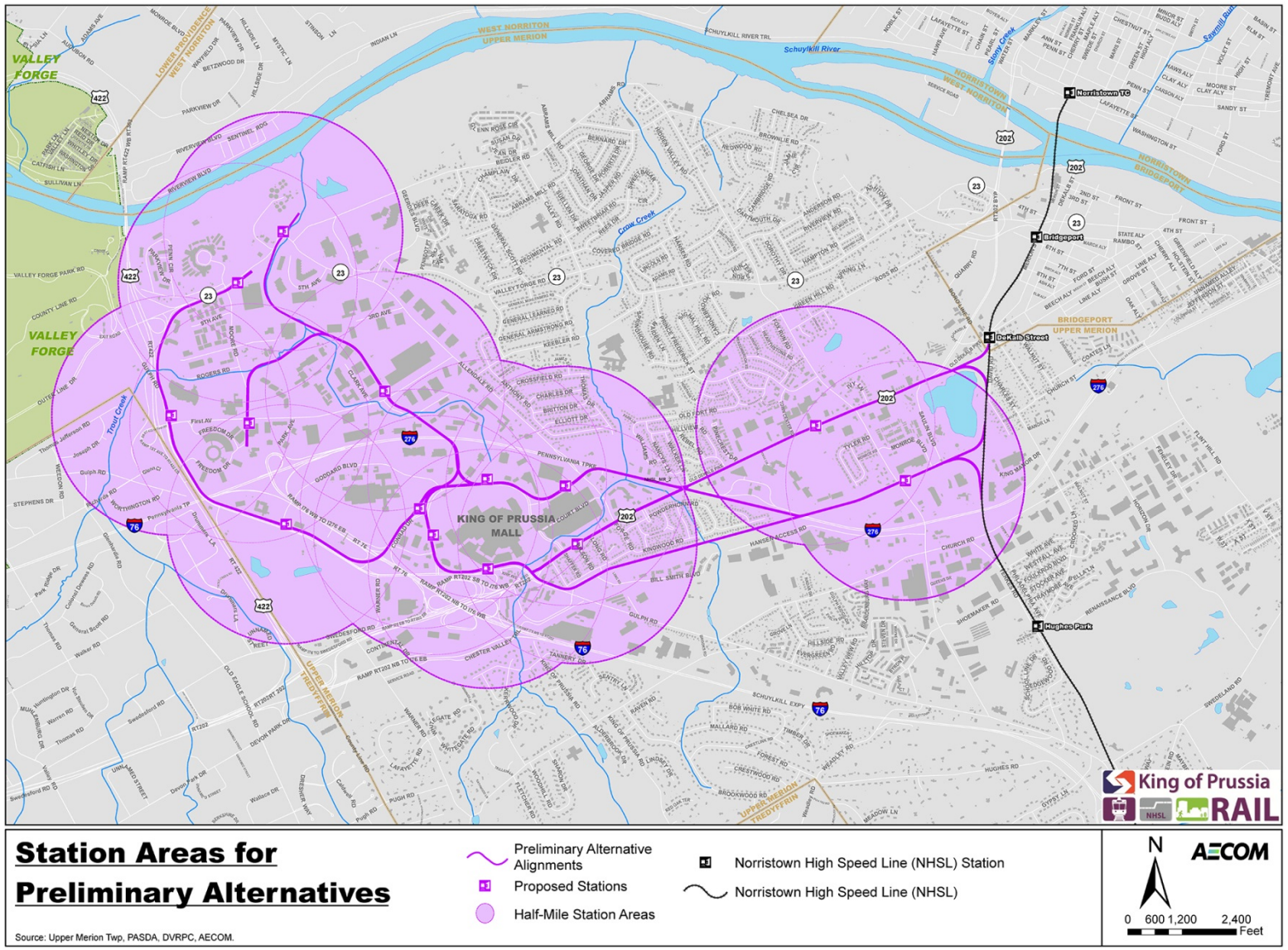


Table 15 Number of Existing Residential Units Potentially Served

Alternative	Number of Existing Residential Units Potentially Served
PECO 1	2,440
PECO 2	1,529
PECO 3	3,845
PECO 4	3,845
PECO/TP 1	4,484
PECO/TP 2	3,077
PECO/TP 3	2,166
PECO/TP 4	4,484
202 1	3,340
202 2	2,429
202 3	3,544
202 4	2,633
202 5	4,951
202 6	4,745
202 7	4,951
202 8	4,745

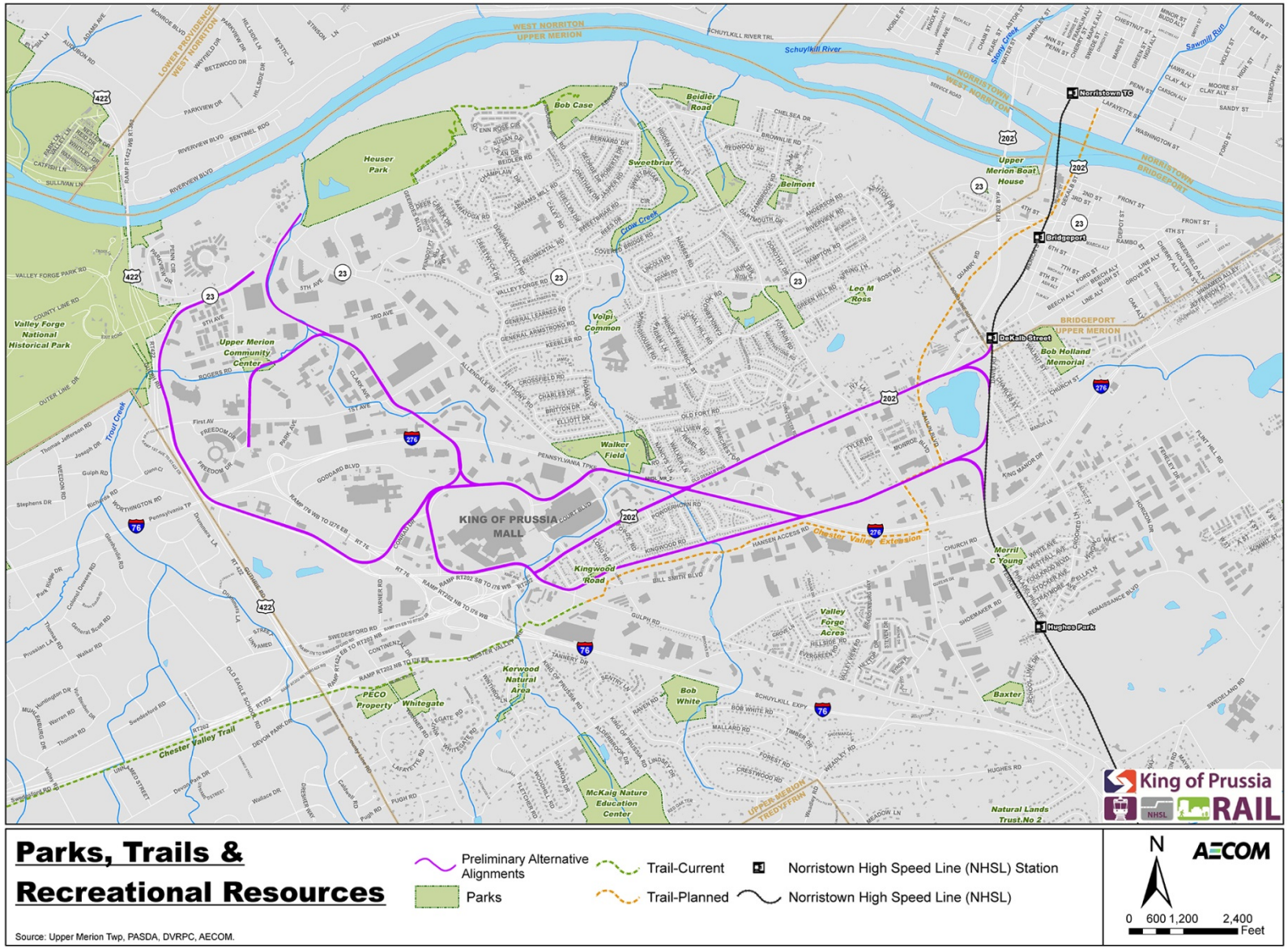
4.3 System Connectivity

4.3.1 Criteria: Access to Parks, Trails and Recreational Resources

Measure: Number of existing parks, trails, and recreational areas potentially served
The measure, number of existing parks, trails, and recreational areas potentially served, quantifies the number of these resources within ½ mile of a proposed station area. The total number of these resources is seven (7), including township parks and other resources that SEPTA identified based upon mapping provided by Upper Merion Township and available information on existing and planned trails (see Figure 9). These resources include the following:

- Heuser Park
- Heuser Park – Bob Case Park Trail
- Valley Forge National Historical Park
- Upper Merion Community Center (former)
- Walker Field
- Kingwood Road Park
- Chester Valley Trail

Figure 9 Parks, Trails, and Recreational Resources



SEPTA's consultant team calculated the values for this measure by delineating the ½-mile radius around proposed station areas, tabulating the number of existing resources within each station area radius, and adding the station area sub-totals to calculate the total for each alternative (see Table 16). This measure included access to resources at more than one station area along the same alternative.

Table 16 Number of Existing Parks, Trails, and Recreational Resources Served

Alternative	Heuser Park – Bob Case Park Trail	Heuser Park	Valley Forge National Historical Park	Community Center	Walker Field	Kingwood Road Park	Chester Valley Trail	Total Resources Served
PECO 1	x	x					2	4
PECO 2				x			2	3
PECO 3			x				2	3
PECO 4			x				2	3
PECO/TP 1			x		x		1	3
PECO/TP 2	x	x			x		1	4
PECO/TP 3				x	x		1	3
PECO/TP 4			x		x		1	3
202 1	x	x				x	3	6
202 2				x		x	3	5
202 3	x	x			x		1	4
202 4				x	x		1	3
202 5			x		x		1	3
202 6			x			x	3	5
202 7			x		x		1	3
202 8			x			x	3	5

4.3.2 Criteria: Interface with Other Transit Services

Measure: Number of bus connections

This measure quantifies the number of intersecting bus services at the proposed station areas along each alternative. SEPTA's consultant team understands that when the project is operational, modifications to existing bus routes will be made to reduce redundancy, particularly where routes parallel the selected alternative alignment. The current number of SEPTA bus routes in the study area is six (92, 99, 123, 124, 125, and 139 – see Figure 10). For the purposes of the analysis, it was assumed that five routes would still be operating, which is consistent with the service level DVRPC used in its ridership forecasting. SEPTA's consultant team used GIS mapping, from files provided by SEPTA in 2013, showing the alignment of each alternative relative to the location of the bus routes, counted the number of routes that intersect each alternative at each station area, and totaled the station area numbers (see Table 17).

Figure 10 Current SEPTA Bus Routes

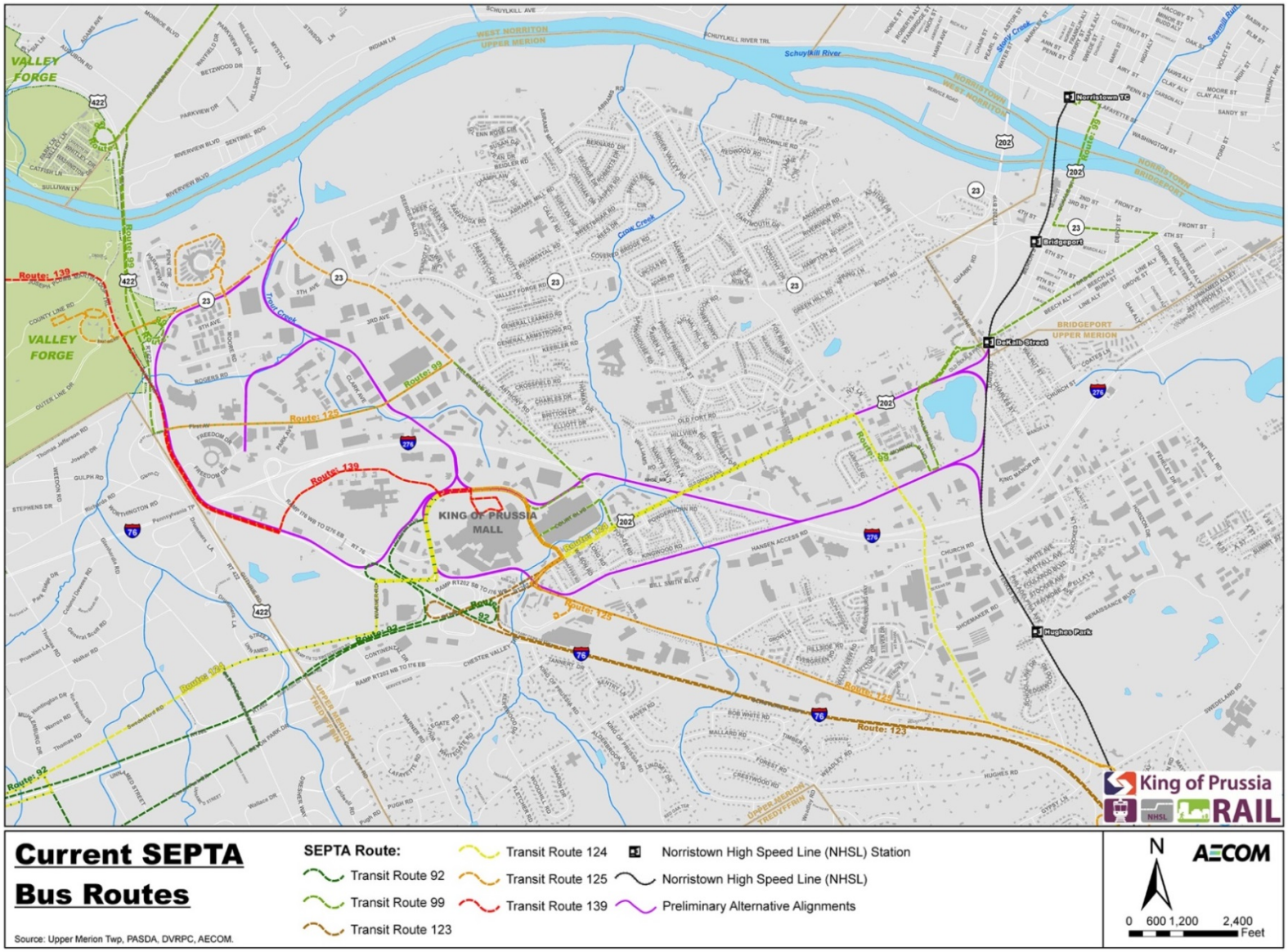


Table 17 Number of Bus Connections

Alternative	Number of Bus Connections
PECO 1	7
PECO 2	9
PECO 3	12
PECO 4	12
PECO/TP 1	23
PECO/TP 2	15
PECO/TP 3	17
PECO/TP 4	23
202 1	18
202 2	20
202 3	23
202 4	25
202 5	31
202 6	23
202 7	31
202 8	23

4.4 Support for Transit-Oriented Development (TOD)

4.4.1 Criteria: Area of KOP-BID served

Measure: King of Prussia Business Improvement District area within ½ mile of stations

The measure, King of Prussia Business Improvement District (KOP BID) area within ½ mile of stations, quantifies the land area in acres that is within the District within ½ mile of proposed station areas. This measure relates to transit-oriented development, which is a mixed-use area designed to maximize access to public transit. The KOP BID has been working with the Township to promote mixed-use development in the District, which would support and be supported by enhanced public transit service. Development within the District is supported by the District's economic development program; property owners are assessed for this support. SEPTA's consultant team used a GIS overlay of the proposed station areas with a delineated ½-mile radius area on the current KOP BID area map. The team added the station area quantities to determine the total BID area for each alternative. Table 18 presents the resulting acreages for each alternative.

Table 18 KOP-BID Area within ½ Mile of Stations

Alternative	BID Area Within ½ Mile of Stations (acres)
PECO 1	1226
PECO 2	1334
PECO 3	1249
PECO 4	1249
PECO/TP 1	1494
PECO/TP 2	1112
PECO/TP 3	1221
PECO/TP 4	1494
202 1	1275
202 2	1384
202 3	1132
202 4	1241
202 5	1514
202 6	1298
202 7	1514
202 8	1298

4.4.2 Criteria: Existence of Transit Supportive Land Use Adjacencies to Station Areas

Measure: Number of station areas with transit-supportive zoning

The measure, number of station areas with transit-supportive zoning, quantifies the number of station areas that occur within areas currently zoned to support transit service. SEPTA's consultant team assessed the Upper Merion Township zoning ordinance for transit-supportive provisions, including allowable density, provisions for pedestrians, and parking policies; these provisions reflect FTA's evaluation process in their "New Starts" guidelines related to transit-oriented development. The team determined that several zoning classifications allow development density/intensity that is considerably higher than other zones, namely:

- A-R, A-R1
- SC
- SM, SM1
- LI
- HR

In addition, the team's review of the zoning ordinance determined that provisions for pedestrians and general parking policies do not vary by zoning classification. For this reason, the analysis focused on the zoning classifications in each ½-mile station area. Using GIS analysis, the amount of each station area within the ½-mile radius having high-density zoning was identified and converted to a percentage of the total station area. On the basis of this percentage of high-

density zoning, each station area was rated high (over 60%), medium (30-60%), or low (below 30%). Table 19 reports the number of station areas with high, medium or low ratings.

Table 19 Number of Station Areas with Transit Supportive Zoning

Alternative	Number of Station Areas By Rating		
	High	Medium	Low
PECO 1	3	2	0
PECO 2	3	2	0
PECO 3	2	3	0
PECO 4	2	3	0
PECO/TP 1	4	3	0
PECO/TP 2	3	2	0
PECO/TP 3	3	2	0
PECO/TP 4	4	3	0
202 1	3	2	1
202 2	3	2	1
202 3	3	1	1
202 4	3	1	1
202 5	4	2	1
202 6	2	3	1
202 7	4	2	1
202 8	2	3	1

4.5 Community and Environmental Impact Assessment

4.5.1 Criteria: Impacts to Water Resources

Measure: Areas of floodplains and wetlands affected; impacts to streams

The measure, areas of floodplains and wetlands affected and impacts to streams, quantifies the amounts of floodplains, wetlands and streams that would potentially be directly impacted by each alternative. SEPTA's consultant team calculated the values of these measures using GIS analysis of the location of each alternative cross-section relative to the location of floodplains, wetlands, and streams. Table 20 presents the impacts to water resources. The sources of water resource data were the Pennsylvania Department of Environmental Protection (streams and watersheds), the National Wetlands Inventory (wetlands), and the Federal Emergency Management Agency (floodplains). The areas of floodplains and wetlands are the acres of each resource within the footprint of an alternative using a guideway width of 40 feet, including sufficient space for the track as well as adjacent land area for maintenance access and a safety buffer. The linear feet of streams, or longitudinal impact, were measured by the parallel overlapping distances of an alternative's alignment and a stream's alignment.

Table 20 Impacts to Water Resources

Alternative	Water Resources Impacts		
	Floodplains (acres)	Wetlands (acres)	Streams (linear feet)
PECO 1	3.9	4.6	2,131
PECO 2	2.0	2.0	1,006
PECO 3	1.2	0.8	181
PECO 4	1.8	1.1	181
PECO/TP 1	1.1	0.5	104
PECO/TP 2	3.6	4.4	2,054
PECO/TP 3	1.8	1.9	930
PECO/TP 4	1.6	0.9	104
202 1	3.5	4.6	2,107
202 2	1.6	1.9	982
202 3	3.5	4.4	2,054
202 4	1.7	1.9	930
202 5	0.9	0.5	104
202 6	0.8	0.7	157
202 7	1.5	0.9	104
202 8	1.4	1.0	157

4.5.2 Criteria: Impacts to Parks

Measure: Impacts to parks, recreation areas and open space

The measure, impacts to parks, recreation areas, and open space, quantifies the amounts of these resources, in acres, that would be potentially directly impacted by each alternative. SEPTA's consultant team calculated the values of these measures using GIS analysis, based on the location of the resources as identified by mapping provided by Upper Merion Township. The areas of parks, recreational land and open space are the acres of each resource within the footprint of an alternative. This measure also included an estimate of the impact of the PECO alternatives upon the area of the Upper Merion Township easement in the PECO right-of-way. Table 21 presents the impacts to parks, recreation areas, and open space.

Table 21 Impacts to Parks, Recreation Areas and Open Space

Alternative	Impacts to Parks, Recreation Areas and Open Space (acres)
PECO 1	4.4
PECO 2	3.0
PECO 3	3.0
PECO 4	3.0
PECO/TP 1	0.0
PECO/TP 2	1.3
PECO/TP 3	0.0
PECO/TP 4	0.0
202 1	1.4
202 2	0.0
202 3	1.3
202 4	0.0
202 5	0.0
202 6	0.0
202 7	0.0
202 8	0.0

4.5.3 Criteria: Property Impacts

Measure: Number of properties affected

The measure, number of properties affected, quantifies the number of properties potentially directly impacted by each alternative. SEPTA's consultant team calculated this number in GIS by overlaying each alternative on parcel maps and calculating the number of individual parcels within the footprint of each alternative. Table 22 presents the number of properties affected.

Table 22 Number of Properties Affected

Alternative	Number of Properties Affected
PECO 1	88
PECO 2	89
PECO 3	83
PECO 4	83
PECO/TP 1	35
PECO/TP 2	40
PECO/TP 3	41
PECO/TP 4	35
202 1	42
202 2	43
202 3	42
202 4	43
202 5	37
202 6	37
202 7	43
202 8	43

4.5.4 Criteria: Property Impacts

Measure: Potential visual change

This measure, potential visual change, quantifies the existing residential and non-residential land uses that could be affected by visual changes resulting from each alternative. Each alternative would introduce new transit elements that have the potential to change the visual environment.

In areas of commercial/retail/office land uses, a key factor in visual effect is the change in the visibility of businesses to customers. Businesses are sensitive to the visibility of their operations since their economic well-being is often dependent on customers being able to see them from existing travel corridors. In considering this factor, SEPTA's consultant team recognizes that beneficial as well as negative effects can occur when new transit service is introduced. On the beneficial side, new transit can provide business visibility to customers riding transit, particularly where a transit guideway is elevated. In some instances, visual obstructions such as trees and ground level infrastructure such as roadway barriers are removed to make way for a transit guideway, thereby removing existing visual obstructions and increasing business visibility. On the negative side, new transit infrastructure can partially obstruct business visibility from vantage points on the far side of a transit alignment.

In residential areas, new transit can have positive and negative effects on the visual character or quality of a neighborhood. In some cases, new transit can have a beneficial effect when derelict or undesirable materials (old buildings, debris, overgrown or invasive vegetation, for example) are removed from the guideway corridor. More often, however, residents are concerned that the visual change will have negative visual effects by introducing new visual elements and/or removing vegetation that they consider to be a visual buffer.

The team also recognizes that visual impact is an inherently subjective parameter that is always dealt with during the EIS using the federal (qualitative) methodology when the design is more developed than it is now and more interaction with concerned entities occurs. This is a context sensitive design activity during which SEPTA and the team will work through specific visual issues with affected parties.

In Tier 2, the conceptual design is insufficient to determine what the visual impacts would specifically be in each land use area: who would be affected; what an elevated structure would look like in detail; where exactly structural piers, stations and other infrastructure would be located and what it would look like; where are business signs are or would be positioned in relation to the project; and so on.

Instead, this quantified criterion provides a broad picture of the existing residential and non-residential land uses that could be affected visually by each alternative. Using a GIS-based overlay of the existing land use mapping and each alternative alignment, the team measured the linear footage of commercial/retail/office land uses and residential land uses that are directly adjacent to the guideway. Table 23 shows the potential for visual change on land uses.

Table 23 Potential Visual Change

Alternative	Visual Change - Existing Land Uses (linear feet adjacent to alignment)	
	Non-Residential	Residential
PECO 1	25,494	4,787
PECO 2	30,167	4,787
PECO 3	19,003	4,787
PECO 4	19,003	4,787
PECO/TP 1	25,185	2,810
PECO/TP 2	23,523	3,196
PECO/TP 3	28,196	3,196
PECO/TP 4	25,185	2,810
202 1	32,547	2,825
202 2	37,220	2,825
202 3	26,700	1,661
202 4	31,373	1,661
202 5	27,231	1,275
202 6	26,056	2,825
202 7	27,231	1,275
202 8	26,056	2,825

Measure: Potential temporary access change

This criterion measures the existing residential and non-residential land uses that could be affected in terms of access during temporary construction activity of each alternative. Access is the ability to travel to and from a land use. Customer and service (delivery) access to commercial/retail/office land uses are critical to the economic well-being of businesses. Likewise, residents' access to their homes during construction is a critical factor. For this criterion, SEPTA's consultant team defined a change in access as the condition in which access is maintained during construction although it may not be the same as the existing condition.

Importantly, loss of access, a situation in which access cannot not reasonably be maintained during construction, would be determined as design advances and prior to construction in consultation with the affected business or property owner; loss of access is not considered in this temporary effect criterion. The team anticipates loss of access to be an exceptional case and that, in most cases, a temporary access solution can be identified.

In Tier 2, the conceptual design is insufficient to determine what the temporary effects on access would specifically be to each land use: who would be affected; what the temporary access provision would be; and so on. Instead, this quantified criterion provides a broad picture of the existing residential and non-residential land uses where access could be temporarily affected by each alternative. Using a GIS-based overlay of the existing land use mapping and each alternative alignment, the team identified the commercial/retail/office land uses and residential land uses adjacent to the guideway with access driveways fronting on the alternative corridors, and identified the number of driveways serving those uses. Table 24 shows the potential for temporary change in access to existing land uses.

Table 24 Potential Temporary Access Change

Alternative	Access Change - Existing Land Uses (number of driveways)	
	Non-Residential	Residential
PECO 1	18	0
PECO 2	22	0
PECO 3	23	0
PECO 4	23	0
PECO/TP 1	25	0
PECO/TP 2	16	0
PECO/TP 3	20	0
PECO/TP 4	25	0
202 1	86	1
202 2	90	1
202 3	53	1
202 4	57	1
202 5	59	1
202 6	91	1
202 7	59	1
202 8	91	1

5 TIER 2 SCREENING RESULTS & DECISION METHODOLOGY

The results of the Tier 2 screening are described in this section, beginning with a presentation of the analysis findings, followed by a reporting of input received from the project committees, stakeholders, and the public on the alternatives. This section then details the decision methodology employed to identify the subset of alternatives to retain for detailed evaluation in Tier 3 and to be documented in the DEIS and concludes with the recommendation of the alternatives to advance to Tier 3.

5.1 Tier 2 Screening Results

The quantified data for each criteria measure and each alternative are presented in the tables in Section 4 of this technical memorandum. This data and the Tier 2 screening process are based on the current understanding by SEPTA's consultant team of the transportation needs within the study area, the data that was available at the time of the screening including the level of engineering undertaken, and relies on guidance provided by the FTA regarding the analysis of alternatives, the NEPA environmental review, and the FTA New Starts program evaluation and rating processes. The results are described below by criterion.

5.1.1 Criteria: Engineering/Right-of-way Needs

The measures for the engineering/right-of-way needs criteria yielded the following results:

Private area affected by guideway – Using a guideway cross-section of 40 feet in width, the range in the amount of private area that would be affected is 12 to 19 acres. While the 58 percent difference between the low and high ends of this range has some statistical significance, the difference is relatively small for 5 miles of transitway. Among the alternatives, the four PECO alternatives and PECO/TP 4 would affect the highest area of private property, from 17 to 19 acres. The alternatives affected the lowest area of private property are 202 2, 202 4, 202 6, and 202 8 with 12 to 14 acres.

Other structures affected – Each alternative would affect at least one of the four other structures, but several alternatives would affect more than one other structure. Specifically, PECO 4 and PECO/TP 4 would affect the PECO towers, 12 and 8 respectively, as well as the Turnpike underpass. 202 7 and 202 8 would affect the DeKalb Station/202 overpass and the Turnpike underpass.

Capital cost – The range of estimated capital costs for constructing the alternatives ranges from high to medium to low and these estimates represent order of magnitude estimates only at this time as limited conceptual engineering has been done (less than 5% engineering design). Higher costs generally relate to the length of the alignment and the extent of aerial structure.

Number of institutions involved – Each alternative would require SEPTA to coordinate with at least two institutions where alternatives would be within their rights-of-way: PennDOT and the Pennsylvania Turnpike Commission. Some alternatives would require coordination with PECO and/or Norfolk Southern, and four alternatives (PECO 1, PECO 2, PECO/TP 2, and PECO/TP 3) would require SEPTA to coordinate with all four institutions.

Number of intersections affected – Elevated alternatives would have no direct effect on roadway intersection operations. However, the four at-grade alternatives, PECO 4, PECO/TP 4, 202 7, and 202 8, would affect 11 intersections potentially causing significant, problematic impacts in terms of delay and congestion. The traffic assessment indicates that these impacts cannot be reasonably mitigated.

5.1.2 Criteria: Ridership/Market

The measures for ridership/market provided a variety of results:

Number of 2040 daily project trips –The DVRPC's ridership forecasting results show a comparatively similar range of projected 2040 daily trips. Looking at the results, eight alternatives (PECO 3, PECO 4, PECO/TP 1, PECO/TP 4, 202 5, 202 6, 202 7 and 202 8) demonstrate the highest results while the remaining eight alternatives demonstrate slightly lower ridership projections but the differences are not significant.

Existing non-residential area served – This measure quantified land use within a ½ mile radius from stations. Land use patterns in proposed station areas vary among the alternatives, with a range of 12.8 to 15.3 million square feet. The relatively high performers among the alternatives are aligned along 202 and the business park: PECO/TP 3, 202 2, 202 4, 2025, and 202 7, serving 7.9 to 9.0 million square feet. Low performers have relatively less non-residential land uses within station areas: PECO 1, PECO 3, PECO 4, and PECO/TP 2, serving 4.8 to 6.0 million square feet.

Existing office area served – Similar to the above measure, this measure quantified land use within a ½ mile radius from stations. The range of office area served varies from 3.8 to 4.5million square feet. Similar to the results for the non-residential area served measure, the relatively high performing alternatives are aligned along 202 and those with branches entering the business park.

Number of existing residential units served – Also similar to the above two measures, this measure also quantified land use within a ½ mile radius from stations. As with non-residential areas served, land use patterns within station areas vary among the alternatives. The range of existing residential units served varies from 1,529 to 4,951 units, with a substantial low-to-high difference of 223 percent. The alternatives with the highest number of existing residential units in station areas are: PECO/TP 1, PECO/TP 4, and 202 5 through 202 8 with 4,484 or more units. Other alternatives would serve 3,845 units or less. The lowest performing alternatives would serve 1,529 to 2,440 units: PECO 1, PECO 2, PECO/TP 3, and 202 2.

5.1.3 Criteria: System Connectivity

The measures for the system connectivity criteria yielded the following results:

Number of existing bus service connections – This measures the number of connections between NHSLX stations and bus stops at stations. The number of bus service connections varies among the alternatives from a low of 7 to a high of 31 depending on the alignment. While this measure yielded a statistically significant low-to-high difference in connections of 343 percent, this variation is tempered by the understanding that if the project were to become

operational, SEPTA would modify its bus services in the study area to eliminate redundancy with KOP Rail service and optimize its routes to best serve transit riders in light of the new transit service. As a consequence, the number of future bus connections could increase, decrease or remain the same. The highest performing alternatives have 23 to 31 connections: PECO/TP 1, PECO/TP 4, and 202 3 through 202 8. The lowest performing alternatives are the four PECO alternatives, with 7 to 12 existing bus service connections.

Number of existing parks, trails and recreational areas served – This measure quantified the number of existing parks, trails and recreational areas within a ½ mile radius of stations. The range of results for this measure is 3 to 6 areas served, with a low-to-high statistical difference of 100 percent. The high performing alternatives would serve 5 to 6 parks, trails and recreational areas: 202 1, 202 2, 202 6 and 202 8. The lowest performing alternatives would serve 3 areas: PECO 2 through PECO 4, PECO/TP 3, PECO/TP 4, 202 4, 202 5, and 202 7.

5.1.4 Criteria: Support for TOD

The measures for the support TOD criteria yielded the following results:

KOP-BID area served – This measure quantifies the land area in acres within ½ mile of proposed station locations that is within the District. The KOP-BID area served ranges from 1, 112 acres served to 1,514 acres served with high performing alternatives being PECO/TP 1, PECO/TP 4, 202 5 and 202 7.

Number of station areas with transit supportive zoning – This measure examined existing zoning in place on land within a ½ mile radius of stations. This measure yielded a range of 4 to 7 station areas with an overall high/moderate rating for transit supportive zoning. This low-to-high range has a 75 percent variation. The highest performing alternatives have a range of 6 to 7 high/moderate ratings: PECO/TP 1, PECO/TP 4, 202 5 and 202 7. The lowest performing alternatives have a 4 high/moderate rating: 202 3 and 202 4.

5.1.5 Criteria: Environmental/Community Impacts

The measures for the environmental/community impacts criteria yielded the following results:

Impacts to water resources – The range of impacts on floodplains, wetlands and streams among the alternatives is 0.8 to 3.9 acres of floodplains impacted (388 percent variation), 0.5 to 4.6 acres of wetlands impacted (820 percent variation), and 104 to 2,131 feet of streams impacted (1,949 percent variation). The amounts of impact at the high side of the range reflect impacts on waterbodies that run along portions of some alignments. In these areas, the longer the distance of parallel overlap, the higher the overall impact quantity. The high performing alternatives have the lowest quantities of water resources impacts: PECO 3, PECO/TP 1, PECO/TP 4 for streams, 202 5, 202 6, and 202 7 for streams. These high performers have 0.8 to 1.2 acres of floodplain impacts, 0.5 to 0.8 acres of wetland impacts and 104 feet of stream impacts each. The lowest performing alternatives have the highest quantities of water resources impacts: PECO 1, PECO 2 for streams, PECO/TP 2, 202 1 and 202 3. These low performers have 3.5 to 3.6 acres of floodplain impacts, 4.4 to 4.6 acres of wetlands impacts, and 1,006 to 2,131 feet of streams impacts.

Impacts to parks, trails, and recreation/open space areas – This measure yielded a range of 0 to 4.4 acres of impacts on parks, trails and recreation/open space areas. The amounts of impact on the high side of the range reflect impacts on the Upper Merion Township park use easement on the PECO right-of-way. The high performing alternatives are those with no impacts on park resources: PECO/TP 1, PECO/TP 3, PECO/TP 4, 202 2 and 202 4 through 202 8. The low performers are those with the highest impacts on park resources: PECO 1 through 4.

Number of properties affected – The range of numbers of property affected among alternatives is 35 to 89 (154 percent variation). The PECO alternatives have the most number of properties affected, while in comparison PECO/TP and US 202 alternatives have much fewer impacted properties.

Potential visual change - This measure, potential visual change, quantifies the existing residential and non-residential land uses that could be affected by visual changes resulting from each alternative. For non-residential land uses, the range is from 19,003 to 37,220 linear feet while for residential land uses, the range is 1,661 to 4,787 linear feet, in terms of the linear feet of that land use type adjacent to alignments. Those alternatives that score well for non-residential land use include PECO 3, PECO 4, and PECO/TP 2. For residential land use, those that score well include US 202 3, US 202 4, US 202 5 and US 202 7.

Potential temporary access change - This criterion measures the existing residential and non-residential land that could be affected in terms of access during temporary construction activity of each alternative. Access is the ability to travel to and from a land use. It is measured in the number of driveways by each land use type that could possibly be affected. The range of results for non-residential land use types is from 16 driveways to 91 driveways and for residential land uses from zero to one driveway.

5.2 Input from Committees, Stakeholders and the Public

5.2.1 Committees

As part of SEPTA's public involvement and agency coordination program for the DEIS, four (4) project committees work with SEPTA to offer input to the development of the DEIS: a Steering Committee, a Technical Advisory Committee, a Stakeholder Advisory Committee and an Agency Coordination Committee.

The project's Steering Committee (SC) offers guidance and direction regarding overall project activities, including the direction of the public involvement program. The SC is comprised of representatives from the FTA, SEPTA, the Montgomery County Planning Commission, the Delaware County Planning Department, the Greater Valley Forge TMA (GVF), Upper Merion Township and the DVRPC. The SC provided input at several meetings with SEPTA regarding the Tier 2 screening matrix during its development and application and the evaluation SEPTA conducted. The committee understands SEPTA's warrant to study alternatives that use a variety of existing transportation and utility corridors. The committee suggested the need for several measures including: "access to parks, trails and recreational areas," "the number of residences served," and identified the need to have a measure for "potential visual change".

The project's Technical Advisory Committee (TAC) serves as both a sounding board and resource for the project, providing an informed review of technical analyses, design guidance,

and operational strategies. Primary membership includes representatives from FTA, SEPTA, PennDOT District 6, PECO, the Pennsylvania Turnpike Commission, Montgomery County Planning Commission, Delaware County Planning Department, Norfolk Southern, Federal Highway Administration (FHWA), DVRPC, and Upper Merion Township. The committee understands SEPTA's warrant to study alternatives that use a variety of existing transportation and utility corridors. The committee suggested the need for taking into consideration public comment as well as noise and aesthetics if measurable at this point.

The project's Stakeholder Advisory Committee provides a forum to communicate and discuss local issues and ideas important to the development of the DEIS. Primary membership includes major property owners and employers in the study area, including the King of Prussia Mall, Chambers of Commerce, King of Prussia Business Improvement District, Valley Forge National Historical Park, Montgomery County Planning Commission, and the Delaware County Planning Department. The committee understands SEPTA's warrant to study alternatives that use a variety of existing transportation and utility corridors. The committee suggested no additional specific measures to be included in the Tier 2 screening but did assert that sufficient parking for park-and-ride access at terminal stations will be important and that rail travel times be as quick as possible on the extension. Additionally, members of the committee indicated preference for alternatives that go behind the mall.

The project's Agency Coordination Committee reviews technical methodologies to be used in the DEIS, the alternatives analysis process, and assists in the decision-making in regard to the locally preferred alternative. Primary membership includes representatives from FTA, SEPTA, FHWA, PennDOT District 6, Federal Railroad Administration, Pennsylvania Historic and Museum Commission, US Environmental Protection Agency, Pennsylvania Department of Environmental Protection, US Army Corps of Engineers, US Coast Guard, National Park Service, US Fish and Wildlife Service and Valley Forge National Historical Park. The committee understands SEPTA's warrant to study alternatives that use a variety of existing transportation and utility corridors. Members of the committee indicated that specific efforts to reach environmental justice communities are needed. Additionally members indicated that a station location on 1st Avenue would help provide pedestrian and bicycle access to VFNHP.

5.2.2 Stakeholders

A group of stakeholders regularly meet with SEPTA at key milestones. Attendees at these meetings include the KOP Business Improvement District (KOP-BID), the Greater Valley Forge Transportation Management Association, Upper Merion Township, and Montgomery County. The core stakeholders provided input at several meetings with SEPTA regarding the Tier 2 screening matrix during its development and application and the evaluation SEPTA conducted. The group understands SEPTA's warrant to study alternatives that use a variety of existing transportation and utility corridors. The group is concerned primarily with the cost of the project and the ability of the alternatives to serve commercial and office areas. In regard to the latter, the group sees the project focus to be providing access to jobs. The group also asserted that mall owners and major anchor tenants desire alternatives that go behind the mall instead of in front of it. The group suggested the need for several measures including: "potential visual change," "potential temporary access change," and suggested another measure for the criteria "Support for TOD". SEPTA added these measures and created "area of KOP Business Improvement District within ½ mile of stations" as a measure for supporting TOD. In further discussions with the core Stakeholders, SEPTA learned of the KOP-BID and Upper Merion Township's planning efforts to initiate a "Road Diet" for First Avenue to transform it into a

Complete Street. Complete Streets provide travel facilities and a safe environment for travel by all modes. Thus Upper Merion Township's plan for improving the environment for pedestrians and bicyclists on First Avenue increases the opportunities for transit to be successful. Complete Streets principles are compatible with and complementary to the use of transit. As a result, SEPTA decided to refine the alignments of the alternatives selected for Tier 3 that use Moore Road as a branch to a branch using a First Avenue alignment instead. Doing so also reduces impacts to waterways. More information on the Moore Road refinement to First Avenue can be found in Section 5.3 of this technical memorandum.

5.2.3 Public

During the week of November 17, 2014, SEPTA held an elected officials briefing, two public meetings and an employee/tenant meeting at the King of Prussia Mall. The purpose of these open houses was to offer the public an overview of recent DEIS activities, including the process for and results of the Tier 2 screening of the preliminary alternatives. The first public meeting was held on Monday, November 17, 2014 from 4pm to 8pm at the Radisson Hotel in Valley Forge. This meeting was preceded by an elected officials briefing. The second public meeting was held on Wednesday, November 19, 2014 at the Norristown Municipal Building. The employee/tenant meeting at the King of Prussia Mall was held on November 21, 2014 in the Community Room from 8:30am to 3pm.

As part of these meetings, SEPTA was available to discuss the screening process and its results and the retained alternatives that will be considered in Tier 3. At this meeting four retained alternatives were presented: PECO/TP 1, PECO/TP 3, PECO 2, and US Route 202-5. Attendees were invited to view maps of the retained alternatives and provide comments. A presentation on the Tier 1 and Tier 2 screening process was provided as well as an outline of next steps and how the public can stay involved. Attendees could ask questions of SEPTA after the presentation session, in addition to during the open house portion of the meeting.

Over 120 residents and stakeholders attended the public outreach meetings for the King of Prussia Rail Project during the week of November 17th, 2014. In terms of general comments about the project, overall, support for the King of Prussia Rail Project far outweighed comments opposed to the project. There was generally the most support for the Route 202 5 and the PECO/Turnpike Alternatives. Those in favor of US 202 5 referred to the greater number of stations proposed on that alignment and the accessibility to existing development along the highway as reasoning for their support. Supporters of the PECO alternatives referenced an assumption, based on the display mapping available, that these alignments would require fewer disturbances to adjacent properties as their reason for support. Several meeting attendees and written comments noted a concern for possible impacts on residential properties along the PECO alternatives.

Additional issues were also raised. One issue was whether there is a way for an alternative to serve more of the targeted destinations in the study area, meaning to serve the King of Prussia Mall as well as the Village at Valley Forge and the KOP Business Park. Safe access for walking and bicycling from stations to destinations like the KOP Business Park and VFNHP was raised as an issue as well as the need to provide for parking especially at terminal stations. Constructability issues such a prevalence of sinkholes and the effects of construction on traffic flow and congestion were also raised. Visual effects of the project were raised as well as the need to secure the railway right of way in terms of providing fencing or protective measures for safety. Concerns were also voiced in regard to the possible displacement of wildlife, stormwater

management and the possible effects on wetlands. Several attendees asked about possible funding sources for the project. Several attendees suggested public outreach be increased to reach more people in the study area to inform them of the project.

5.3 Recommendations for Advancement into Tier 3 Screening

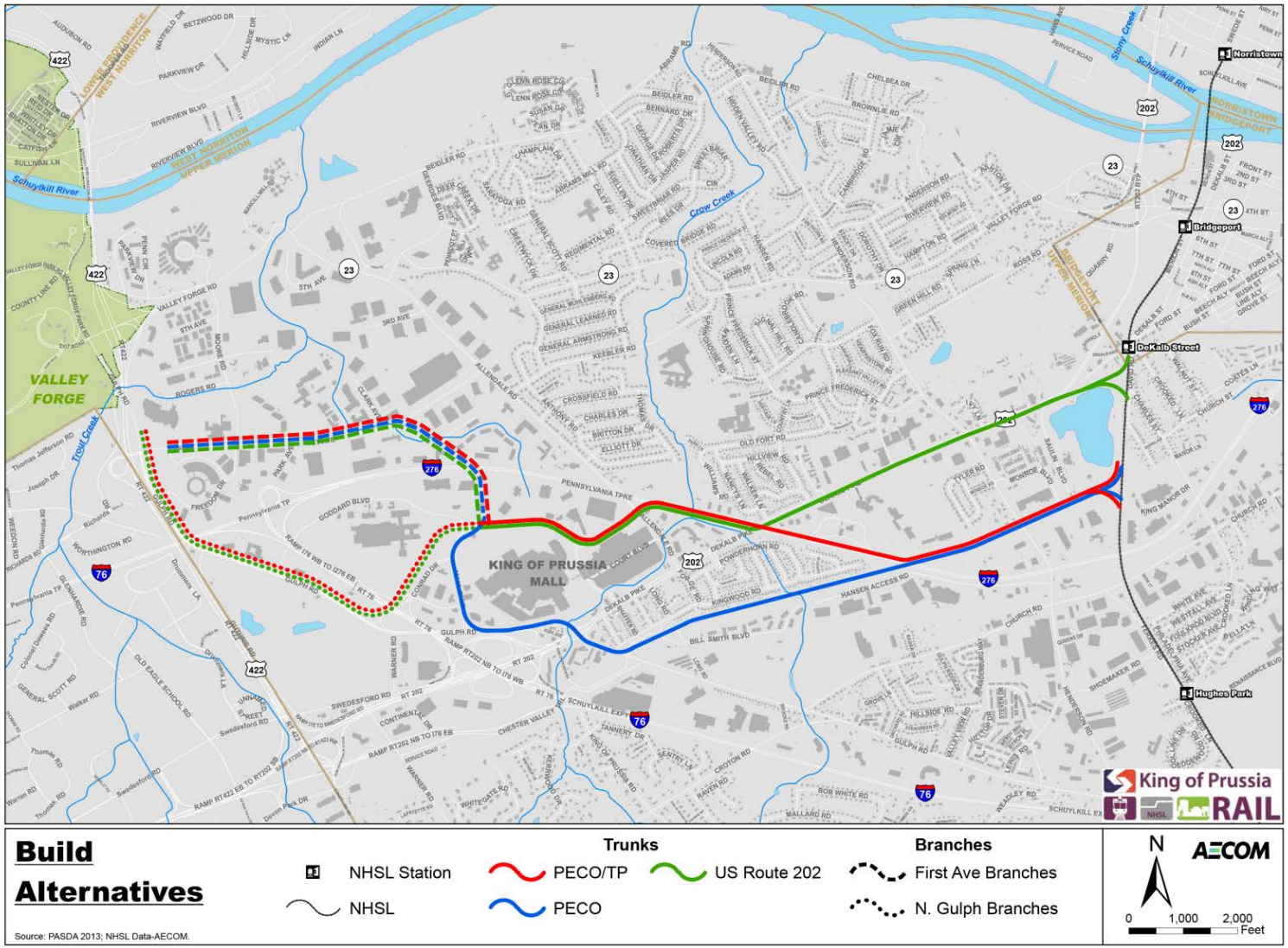
In this section, SEPTA provides its recommendations regarding the alternatives considered in the Tier 2 screening. Its recommendations take into consideration the quantified results of the Tier 2 screening shown in the matrix in Table 27 as well as other considerations in regard to fatal flaws that may be present in a particular alternative, feasibility to permit a particular alternative from an environmental perspective, as well as an assessment of the diversity of trunks and branches represented in the recommended list of alternatives to advance into detailed study in Tier 3. This includes input SEPTA received from committees, stakeholders and the public summarized in the foregoing section as well as additional input from core Stakeholders as discussed in this section as it relates to the use of First Avenue as a branch alignment instead of Moore Road.

The recommendation process in this section takes four forms. First, some alternatives are recommended for elimination from further consideration because they are flawed to the extent that they are not reasonably feasible. Second, others would be unreasonable from a permitting perspective. Third, some are eliminated because there are other, better performing alternatives that are recommended for further study in Tier 3 using the individual criteria measures in the matrix. And fourth, an assessment of the diversity of trunks and branches identifies the other alternatives that ought to be carried forward to Tier 3 screening. The alternatives identified for advancement for further study in Tier 3 and detailed within the DEIS are: PECO/TP – 1, PECO/TP – 3, PECO 2, and US Route 202-4 and US Route 202 – 5 and can be found on the map in Figure 11 showing their trunk and branch combination. Table 25 below provides information on the trunks, branches and stations for each of the build alternatives. As noted, the public, the project's Committees and core Stakeholders have had input into the process to recommend the alternatives for advancement into detailed study in Tier 3 and have endorsed the resulting recommendations. Details on the decision-making process employed are discussed in the following section.

Table 25 Build Alternatives

Build Alternative	Trunk	Branch	Number of Stations
PECO/TP - 1	PECO/TP	Gulph Road	6
PECO/TP - 3	PECO/TP	First Avenue	5
PECO 2	PECO	First Avenue	5
US Route 202 - 4	US Route 202	First Avenue	6
US Route 202 - 5	US Route 202	Gulph Road	7

Figure 11 Build Alternatives – Trunks and Branches



5.3.1 Tier 2 Decision Methodology and Results

As noted above, the main steps in the decision-making process were the following:

- Fatal flaw assessment, relative to the other alternatives
- Environmental/permitting feasibility assessment
- Tier 2 rating and criteria assessment
- Assessment of diversity of trunks and branches

Step 1: "Fatal Flaw" Assessment

The first step in the process involved a higher-level assessment to determine if any "fatal flaws" were applicable to the Tier 2 alternatives. This assessment identified two fatal flaws: 1) the inability to practically and reasonably mitigate vehicular traffic impacts from delay due to railroad crossing gates and rail signal pre-emption at intersections, thus causing increased congestion and, 2) the need to reconstruct the Turnpike bridge over Gulph Road. Further geometric improvements at intersections, particularly along North Gulph Road, no matter how extensive, will not be able to mitigate at-grade rail impacts in any significant manner. The introduction of at-grade rail crossings will result in an operational breakdown along the North Gulph Road corridor and most of its intersecting roadways. The operational breakdown will not be limited to the corridor but would have a ripple effect on other nearby roadways, either in terms of extensive queuing or traffic pattern shifts. However, increasing congestion is counter to this project's purpose and need; thus these alternatives are considered "fatally flawed". Further, the need to reconstruct the Turnpike bridge over Gulph Road to accommodate an at-grade rail extension would add very substantial capital costs and additional construction to the project, and as a result, this factor was considered a "fatal flaw". These two fatal flaws apply to all of the four at-grade alternatives: PECO-4, PECO/TP-4, Route 202-7, and Route 202-8. As a result, these alternatives were eliminated from further consideration.

Step 2: Environmental / Permitting Feasibility Assessment

The second step involved using available information on the location of environmental resources in order to assess and compare the extent of potential environmental impacts and the potential for not receiving necessary permits for the project. This assessment identified potentially significant environmental impacts (affecting a stream, buffer area, wetlands, and floodplain) for branches that follow the former North Abrams Industrial Track right of way, relative to the impacts that would occur on other branches.

Most of the "linear feet of stream impact" is in a vegetated stream and a stream buffer area, which means removal of all vegetation within the alignment bandwidth. Further, most of the "linear feet of stream impact" is also within floodplain, thereby being a concern for longitudinal impacts whether or not an alignment actually overlies the stream itself. And because the stream is within a steep ravine, clearing vegetation within the alignment bandwidth would require a larger than normal work area and extensive structural slope stabilization. Corollary reasons include: likelihood of flooding problems in the area now and in the future, topographic challenges for construction and long-term stabilization, and the effect of these issues on project cost.

As SEPTA is considering other alternatives with less impact on water resources, PECO-1, PECO/TP-2, Route 202-1 and Route 202-3 cannot achieve the United States Army Corps of

Engineer's requirement for the "least damaging practicable alternative" as defined in their Section 404(b)(1) guidelines for alternatives analysis. The inability to meet the Army Corps requirement would render the project unpermittable under Section 404 of the Clean Water Act. For this reason, the alternatives with the industrial track branch (PECO-1, PECO/TP-2, Route 202-1, and Route 202-3), were eliminated from further consideration.

Step 3: Tier 2 Rating/Criteria Assessment

The remaining eight alternatives were subject to a quantitative assessment, using five evaluation categories and 21 individual criteria measures as described in previous sections. The main categories are Engineering/Right-of-Way Feasibility, Ridership/Markets Served, System Connectivity, Support for TOD, and Environmental/Community Impacts. As previously noted, SEPTA and the consultant team, with input from the project committees, worked together to develop the methodology for this assessment. Based upon the assessment, the three highest-performing alternatives were Route 202-5, Route 202-6, and PECO/TP-1 (see Table 27).

Step 4: Assessment of Diversity of Trunks and Branches and Additional Input from Stakeholders

The top quantitatively-rated alternatives depended too heavily upon the successful development of engineering concepts and permitability of a single branch on North Gulph Road. The alignment may have potential issues not currently apparent with Tier 2 information. Ensuring that a diversity of branches are examined in Tier 3 (or in the DEIS) ensures that if a fatal flaw were discovered in Tier 3 on the North Gulph Road branch, it would not send the project back to repeat Tier 2. Including two branch corridors for alternatives also ensures that clear alignment differences are being analyzed between alternatives in Tier 3. As a result, three alternatives were added back into the analysis. Since most of the remaining alternatives rated somewhat similarly, they were re-added based on their ability to add a diversity of trunks and branches that the finally-selected alternatives will represent. This assessment was based upon selecting at least one alternative for each trunk and two alternatives for each branch. Applying this decision factor to the remaining alternatives results in selecting three additional alternatives, PECO-2 and PECO/TP-3, as well as US Route 202-4, to advance to Tier 3 or into the DEIS for detailed study. In particular, Alternative US Route 202-4 was brought back into the process as a build alternative because it is feasible and because core Stakeholder input on the transit access opportunities that would be present on a redesigned First Avenue as a Complete Street led SEPTA to reconsider it. A summary of the decision assessment process can be found in Table 26.

As mentioned previously, additional input from core Stakeholders resulted in refinements to the branch alignments of the alternatives, particularly the Moore Road branch. The idea of refining the Moore Road branch to use First Avenue was brought to SEPTA's attention by the KOP-BID. The Moore Road branch will be refined in Tier 3 to use First Avenue for the following reasons:

- First Avenue area was recently re-zoned by UMT for mixed use development, which is typically transit-supportive;
- The "Road Diet" or streetscape planning for First Avenue by KOP-BID and UMT would create a "complete streets" type environment that is conducive to accommodating transit;
- It is UMT's and KOP-BID's long term plan to implement a "Road Diet" along First Avenue by reducing the current four- lane roadway section into a three-lane roadway section with a landscaped median;

- Currently, First Avenue has limited infrastructure in place to accommodate pedestrian, bicycle and transit travel;
- Upon implementation of the "Road Diet", the additional space gained from the lane reduction could be used to improve the environment for pedestrian, bicycle, and transit travel and provide an improved streetscape;
- Comprehensive streetscape improvements on First Avenue would beautify the street frontages and enhance its place-making ability (the distinct identity as a desirable "place" to be) and provide a public infrastructure catalyst for new mixed-use development that the new zoning ordinance that has been adopted allows;
- With these improvements in place, First Avenue is envisioned as a gateway to the KOP Business Park;
- The King of Prussia Rail project and the foregoing activities work together to generate economic and place-making benefits that are greater than the sum of each part;
- Using First Avenue would reduce stream impacts compared to the original Moore Road alignment; and,
- A First Avenue alignment is shorter and cheaper than the Moore Road alignment, thereby improving rail travel times resulting in increased ridership potential and helping reduce capital and operating costs.

Table 26 Summary of Decision Assessment Process

Alternative	Branch	Step 1: At-Grade	Step 2: Industrial Track	Step 3: Tier 2 Evaluation	Step 4: 1+ Alternatives Per Trunk and 2 Per Branch	Final Alternative Set
PECO 1	**Industrial Track**		Eliminate	X	X	X
PECO 2	**Moore Rd**				Maintain	PECO 2
PECO 3	**Gulph Rd**				Eliminate	X
PECO 4	**Gulph Rd**	Eliminate	X	X	X	X
PECO / TP 1	**Gulph Rd**			Highest		PECO/TP 1
PECO / TP 2	**Industrial Track**		Eliminate	X	X	X
PECO / TP 3	**Moore Rd**				Maintain	PECO/TP 3
PECO / TP 4	**Gulph Rd**	Eliminate	X	X	X	X
202 1	**Industrial Track**		Eliminate	X	X	X
202 2	**Moore Rd**				Eliminate	X
202 3	**Industrial Track**		Eliminate	X	X	X
202 4	**Moore Rd**				Maintain	US Route 202 4
202 5	**Gulph Rd**			Highest		US Route 202 5
202 6	**Gulph Rd**			Highest	Eliminate	X
202 7	**Gulph Rd**	Eliminate	X	X	X	X
202 8	**Gulph Rd**	Eliminate	X	X	X	X

Table 27 Tier 2 Screening Results

ALTERNATIVE	ENGINEERING / RIGHT OF WAY NEEDS			RIDERSHIP / MARKET				SYSTEM CONNECTIVITY (within 1/2 mile of station areas)		SUPPORT FOR TOD (within 1/2 miles of station areas)		ENVIRONMENTAL / COMMUNITY IMPACTS										PERFORMANCE TALLIES				COMMENTS:
					(within 1/2 mile of station areas)										IMPACTS TO WATER RESOURCES				POTENTIAL VISUAL CHANGE (linear feet)		POTENTIAL TEMPORARY ACCESS CHANGE (number of driveways)							
	PRIVATE AREA AFFECTED BY GUIDEWAY (acres)	CAPITAL COST ($B, 2014$)	NUMBER OF INSTITUTIONS INVOLVED	NUMBER of 2040 DAILY PROJECT TRIPS	EXISTING NON-RESID AREA SERVED (M sf)	EXISTNG OFFICE AREA SERVED (M sf)	EXISTING # RESID UNITS SERVED (M sf)	EXISTING # OF PARK, TRAIL, RECREATIONAL AREAS SERVED	EXISTING # OF BUS SERVICE CONNECTIONS	AREA OF BUSINESS IMPROVEMENT DISTRICT (M sf)	# OF STATIONS WITH TRANSIT SUPPORTIVE ZONING (total of High / Moderate data)	Floodplains (acres)	Wetlands (acres)	Streams (feet)	IMPACTS TO PARKS / RECREATION / OPEN SPACE (acres)	Non-Resid	Residential	Non-Resid	Office	Residential	# OF PROPERTIES AFFECTED	High	Moderate	Low	Total High / Moderate	
PECO 1 - Front, Industrial	L	H	L	M	L	M	L	M	L	L	L	L	L	L	L	M	L	H	H	H	L	4	4	13	8	Overall poor performance in ridership/market, system connectivity, and environmental impacts; remote from/poor ability to serve residential, non-residential and parks; few existing bus connections; high number of institutions involved; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
PECO 2 - Front, Industrial, Moore ("Hook")	L	H	L	M	M	H	L	L	L	M	L	M	M	L	L	M	L	H	L	H	L	4	6	11	10	Relatively poor performance in ridership/market, system connectivity, and environmental impacts; remote from/poor ability to serve residential, non-residential and parks; few existing bus connections; high number of institutions involved.
PECO 3 - Front, Gulph	L	M	M	H	L	H	M	L	L	M	L	H	H	H	L	H	L	M	L	H	L	7	5	9	13	Overall poor performance in ridership/market, system connectivity, and environmental impacts; remote from/poor ability to serve residential, non-residential and parks; few existing bus connections; high number of institutions involved; other better performing alternatives without as many downsides.
PECO 4 - Front, Gulph (at-grade)	L	H	M	H	L	H	M	L	L	M	L	M	H	H	L	H	L	M	L	H	L	7	6	9	13	Unable to mitigate intersections affected; extraordinary cost/inconvenience to reconstruct new Turnpike underpass.
PECO/TP 1 - Behind, Gulph	M	L	M	H	M	H	H	L	M	H	H	H	H	H	H	M	M	M	L	H	H	11	7	3	18	High performer in most measures, especially ridership/market and enviornmental/community impacts.
PECO/TP 2 - Behind, Industrial	M	H	L	M	L	L	M	M	L	L	L	L	L	L	M	H	M	H	H	H	M	5	7	9	12	Relatively low performer in ridership/market, system connectivity, and environmental community impacts; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
PECO/TP 3 - Behind, Industrial, Moore ("Hook")	M	H	L	M	M	L	L	L	M	L	L	M	M	L	H	M	M	H	M	H	M	4	10	7	14	Relatively low performer in ridership/market, system connectivity, and moderate in environmental community impacts.
PECO/TP 4 -Behind, Gulph (at-grade)	L	M	M	H	M	H	H	L	M	H	H	M	H	H	H	M	M	M	L	H	H	10	3	3	13	Unable to mitigate intersections affected; extraordinary cost/inconvenience to reconstruct new Turnpike underpass.
202 1 - Front, Industrial	M	M	M	M	M	M	M	H	M	M	L	L	L	L	M	L	M	L	M	M	L	1	13	7	14	Relatively low performer in ridership/market, support for TOD, and environmental community impacts; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
202 2 - Front, Industrial, Moore ("Hook")	H	M	M	M	H	M	L	H	M	M	L	M	M	L	H	L	M	L	L	M	L	4	10	7	14	Relatively low performer in ridership/market, support for TOD, and environmental community impacts; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
202 3 - Behind, Industrial	M	H	M	M	L	L	M	M	M	L	L	L	L	L	M	M	H	M	H	M	L	3	10	8	13	Relatively low performer in ridership/market, support for TOD, and environmental community impacts; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
202 4 - Behind, Industrial, Moore ("Hook")	H	H	M	M	L	L	L	L	H	L	L	M	M	L	H	L	H	M	M	M	L	5	7	9	12	Relatively low performer in ridership/market, support for TOD, and environmental community impacts; likely unpermittable by Army Corps; other better performing alternatives without as many downsides.
202 5 - Behind, Gulph	M	L	**H**	H	L	M	H	L	H	H	M	H	H	H	H	M	H	M	L	M	H	11	6	4	17	High performer in most measures, especially ridership/market and enviornmental/community impacts.
202 6 - Front, Gulph	H	L	**H**	H	L	H	H	H	M	M	L	H	H	H	H	M	M	L	L	M	H	11	5	5	16	High performer in most measures, especially ridership/market and enviornmental/community impacts.
202 7 - Behind, Gulph (at-grade)	M	L	**H**	H	L	M	H	L	H	H	M	M	H	H	H	M	H	M	L	M	L	9	7	5	16	Unable to mitigate intersections affected; extraordinary cost/inconvenience to reconstruct new Turnpike underpass.
202 8 - Front, Gulph (at-grade)	H	M	**H**	H	L	H	H	H	M	M	L	H	H	H	H	M	M	L	L	M	L	10	6	5	16	Unable to mitigate intersections affected; extraordinary cost/inconvenience to reconstruct new Turnpike underpass.

KEY:
"High" or best performers relative to the other alternatives
"Moderate" performers relative to the other alternatives
"Low" or worst performers relative to the other alternatives

Behind: Alignment is behind the Mall
Front: Alignment is in front of the Mall
Industrial: Former Abrams Industrial Railroad Track
Gulph: North Gulph Road
Moore: Moore Road

NOTE: Scoring is relative to the other alternatives within a measure and was determined by considering the datasets for statistical significance, range and/or spread of values, or non-mathematical factors such as environmental regulations.