King of Prussia RAIL

NHSL

TIER 3 – NATURAL RESOURCES

TECHNICAL MEMORANDUM

Prepared for:

Southeastern Pennsylvania Transportation Authority (SEPTA)

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Executive Summary

The Federal Transit Administration (FTA) and Southeastern Pennsylvania Transportation Authority (SEPTA) are preparing a Draft Environmental Impact Statement (DEIS) that examines and evaluates a proposed extension of the existing Norristown High Speed Line (NHSL) to the King of Prussia area, known herein as the King of Prussia (KOP) Rail Project (Project). This technical memorandum supports the DEIS and examines the potential benefits and impacts of five Action Alternatives and the No Action Alternative on natural resources.

This technical memorandum provides background information on natural resources within the Project study area, including, geologic conditions, soils, forested areas, fields, wetlands, waterways and floodplains, groundwater recharge areas, wellhead protection areas, sole source aquifers, and threatened and endangered species. It assesses the benefits and impacts of the Action and No Action Alternatives on natural resources, and compares the effects of the alternatives on natural resources.

ES.1 Methodology

The evaluations reported in this technical memorandum used available natural resources data as well as field reconnaissance to quantify if possible, or qualify, the potential benefits and impacts of each alternative. The design year of analysis is 2040. The No Action Alternative is the year 2040 condition assuming implementation of committed transportation investment projects listed in the financially-constrained element of the Delaware Valley Regional Planning Commission's (DVRPC) long-range transportation plan, *Connections 2040 Plan for Greater Philadelphia*, excluding the Project. These projects are primarily major improvements and expansions to area highways, including US Route 422 and the Pennsylvania Turnpike.

The five Project Action Alternatives are: PECO-1st Ave., PECO/TP-1st Ave., PECO/TP-N. Gulph, US 202-1st Ave., and US 202-N. Gulph. Using the analogy of a tree, each Action Alternative is composed of one trunk and one branch, forming a single continuous alignment route from the existing NHSL to the western terminus of the Project. The trunks are the portion of an alternative running between the existing NHSL and the King of Prussia Mall; the trunks are PECO, PECO/TP, and US 202. The branches are the portion of an alternative between the King of Prussia Mall and the western terminus of the Project; the branches are 1st Ave. and N. Gulph.

The assessment considered three geographic areas: a transportation study area that encompasses the King of Prussia area of Upper Merion Township, a Project study area focused around each Action Alternative in the township, and a 69th Street Transportation Center study area that is focused within SEPTA's existing facility in Upper Darby Township. The transportation study area is bounded by the NHSL to the east, the Schuylkill River to the north, US Route 422 to the west, and the Schuylkill Expressway to the south. The Project study area is an area 500 feet on either side of the centerline of each Action Alternative, as well as ½ mile from the center point of all proposed stations. The 69th Street Transportation Center study area is 500 feet on either side of the proposed track and station platform modifications in Upper Darby Township.

ES.2 Affected Environment

The transportation study area has a large amount of non-residential development formed around a dense highway and roadway network. Key employment concentrations are along the Henderson Road corridor, DeKalb Pike, the King of Prussia Mall area, and the King of Prussia Business Park. Available information indicates that additional economic growth is anticipated to occur in the transportation study area through design year 2040, particularly in the Henderson Road corridor, the King of Prussia Mall area, and the King of Prussia Business Park. Due to the extensive development in the transportation study area, natural resources are found in limited quantities, and when present, have been heavily modified by man. Natural resources elements in the transportation study area that could influence decision-making as to the preferable alternative to advance include: forests and potential threatened and endangered species habitat, fields, wetlands, and groundwater recharge area.

ES.3 No Action Alternative

The No Action Alternative is the 2040 condition without the Project. In the No Action Alternative, future residential and non-residential development will occur according to the demographic projections of the Delaware Valley Regional Planning Commission (DVRPC). The No Action Alternative also includes all committed transportation projects, except for the Project, that DVRPC has identified in the financially-constrained element of *Connections 2040 Plan for Greater Philadelphia*, the long-range transportation plan. These projects include major improvements and expansions to area highways, particularly US Route 422 and the Pennsylvania Turnpike. These committed projects are likely to increase the amount of impervious surfaces in the transportation study area and may have direct or proximity effects on natural resources. The sponsors of these projects will be responsible for avoiding or minimizing such effects as they advance each project, addressing impacts through mitigation as warranted, and obtaining permits when their activities are regulated.

ES.4 Action Alternatives

Five Action Alternatives are under consideration in the DEIS and this technical memorandum. Each Action Alternative would extend NHSL service through King of Prussia along a new railroad line that branches off the existing NHSL and terminates near the intersection of 1st Avenue and N. Gulph Road at the Valley Forge Casino Resort (VFCR). The alignments of the Action Alternatives vary; each Action Alternative would be primarily aligned within existing public transportation and utility rights-of-way. The Action Alternatives are:

- PECO-1st Ave.
- PECO/TP-1st Ave.
- PECO/TP-N. Gulph
- US 202-1st Ave.
- US 202-N. Gulph

Of these, SEPTA has identified PECO/TP-1st Ave. as the recommended Locally Preferred Alternative.

With the exception of the PECO utility corridor, existing transportation rights-of-way are developed lands that support few natural resources. Table ES-1 summarizes the findings of this

technical memorandum for the Action and No Action Alternatives. The US 202-N. Gulph and US 202-1st Ave. Alternatives are the best performing Action Alternatives, as they would have the fewest potential impacts to natural resources. In contrast, the PECO-1st Ave. Alternative would have the most potential impacts to natural resources, primarily due to the large amount of pervious surface area affected along the proposed alignment. The magnitude of potential impacts of the PECO/TP-1st Ave. (the recommended locally preferred alternative) and PECO/TP-N. Gulph Alternatives fall in between. Key differences among the Action Alternatives are in the amounts of disturbance to soils, forests, fields, wetlands, and potential threatened and endangered species habitats, as well as in the amounts of reduction in groundwater recharge area due to increases in impervious pavement and structures.

The Action Alternatives perform similarly in terms of geologic conditions, waterways and floodplains, wellhead protection areas, and sole source aquifers. The results for these parameters do not distinguish among the alternatives.

Table ES-1: Natural Resources Impacts – Action and No Action Alternatives

	No Action Alternative	Action Alternatives				
		PECO-1st Ave.	PECO/TP-1st Ave.	PECO/TP-N. Gulph	US 202-1st Ave.	US 202-N. Gulph
Geologic Conditions - Karst Risk	Risk	Similar Risk				
Amount of Soil Disturbance and Groundwater Recharge Reduction (Acres)	Not measured	12.9	9.8	11.0	3.9	4.9
Amount of Forest and potential threatened and endangered Species Habitat Affected (Acres)	Not measured	2.9	5.4	3.7	2.8	1.1
Amount of Fields Affected (Acres)	Not measured	8.0	3.5	3.5	0	0
Amount of Wetlands Affected (Acres)	Not measured	0	0.05	0.05	0.05	0.05
Amount of Waterways and Floodplains Affected (Acres)	Not measured	No Anticipated Impact				
Number of Wellhead Protection Areas Affected	Not measured	4	4	4	4	4
Sole Source Aquifer Affected	Not measured	No Anticipated Impact				

Notes: Red shading indicates worst performing alternatives; green shading indicates best performing alternatives.

ES.5 Minimization and Mitigation Strategies

As the Project advances, SEPTA will focus on methods to avoid or minimize conflicts with natural resources. SEPTA will design and construct the Action Alternative it ultimately selects in the EIS process, taking into special consideration the potential effects its actions could have on natural resources. SEPTA will consider means to avoid impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts by utilizing a variety of best management practices (BMPs) including, but not limited to, State

erosion and sediment control BMPs and stormwater management BMPs. The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the regulatory agencies overseeing the activity after a Locally Preferred Alternative is selected and reported in the Final EIS.

1.0 Introduction

The Federal Transit Administration (FTA), in cooperation with the Southeastern Pennsylvania Transportation Authority (SEPTA), is preparing a Draft Environmental Impact Statement (DEIS) under the National Environmental Policy Act of 1969 (NEPA) that examines and evaluates a proposed extension of the existing Norristown High Speed Line (NHSL) to the King of Prussia area, known herein as the King of Prussia (KOP) Rail Project (Project). King of Prussia is a section of Upper Merion Township, Montgomery County, PA (Figure 1: Transportation Study Area (Appendix B).

2.0 Project Description

The DEIS and this technical memorandum examine five Action Alternatives and the No Action Alternative described in the following subsections.

2.1 No Action Alternative

The No Action Alternative assumes no improvements to the transportation system in the transportation study area other than those contained in the financially constrained element of *Connections 2040 Plan for Greater Philadelphia*, the long-range transportation plan of the Delaware Valley Regional Planning Commission (DVRPC). Table 2-1.1 lists the committed No Action Alternative projects within the transportation study area.

Table 2-1.1: Committed No Action Alternative Projects in the Transportation Study Area

Project	Type	Description
New US Route 422 Bridge crossing over Schuylkill River	Highway	New 4-lane bridge westbound; replace bridge eastbound.
Widen US Route 422 from US Route 202 to PA 363	Highway	Widen this 2-mile segment from 4 lanes to 6.
Full interchange at US Route 422 and PA 363	Highway	Complete to a full interchange, with movements in both directions.
PA Turnpike widening from Morgantown exit to Valley Forge	Highway	Widen to 6 lanes throughout.
Lafayette Street extension and new Turnpike exit in Norristown	Highway	Construction on extension underway. Construction on Turnpike exit could start in 2018.
First Avenue Streetscape and Multi-use Trail (known also as the 1st Avenue Road Diet project)	Highway	Funded through statewide TAP program. Road Diet, streetscaping and multi-use trail along the length of 1st Avenue to enhance multi-modal access.
Relocate PA 23/Valley Forge Road and North Gulph Road	Highway	Move roadway 300 feet east of current entrance with Valley Forge National Historical Park to improve operations and reduce traffic impacts with the Park, and create a new Gateway entrance.
Widen Henderson Road and South Gulph Road	Highway	Widen South Gulph Road from Crooked Lane to I-76 intersection at Gulph Mills, and widen Henderson Road from South Gulph to Shoemaker Road.
Chester Valley Trail Extension	Multimodal	Extend the Chester Valley Trail to connect with the Schuylkill River Trail in Norristown, a 3.5 mile extension.

Source: DVRPC, *Connections 2040 Plan for Greater Philadelphia.*

The No Action Alternative projects consist primarily of planned capacity and operational improvements to transportation study area roadways, particularly US Route 422 and the Pennsylvania Turnpike. All but one roadway project operates at the periphery of the

transportation study area; the 1st Avenue "road diet" project is within the transportation study area. Montgomery County's Chester Valley Trail Extension is also within the transportation study area. Other than these two projects, parts of the transportation study area would not be served by the No Action Alternative projects. In addition to these planned projects, the No Action Alternative consists of transit service levels, highway and transit networks, traffic volumes, and forecasted demographics for the horizon year 2040.

2.2 Action Alternatives

Figures 2 through 6 (Appendix B) illustrate the Action Alternatives, described as follows:

- **PECO-1st Ave. Alternative**: The PECO-1st Ave. Action Alternative would use a portion of the PECO electric utility corridor as its trunk, passing in front of (to the south of) the King of Prussia Mall, turning north to use a portion of the Norfolk Southern Railroad (NS) Industrial Track before turning west along 1st Avenue as its branch and ending near the intersection of 1st Avenue and N. Gulph Road near the Valley Forge Casino Resort (VFCR).

- **PECO/TP-1st Ave. Alternative:** The PECO/TP-1st Ave. Action Alternative would use portions of the PECO electric utility corridor and PA Turnpike as its trunk, passing behind (to the north of) the King of Prussia Mall, turning north to use a portion of the NS Industrial Track before turning west along 1st Avenue as its branch and ending near the intersection of 1st Avenue and N. Gulph Road near the VFCR.

- **PECO/TP-N. Gulph Alternative:** The PECO/TP-N. Gulph Action Alternative would use portions of the PECO electric utility corridor and PA Turnpike as its trunk, passing behind (to the north of) the King of Prussia Mall, turning south to connect to N. Gulph Road before turning west along the N. Gulph Road as its branch and ending near the intersection of 1st Avenue and N. Gulph Road near the VFCR.

- **US 202-1st Ave. Alternative:** The US 202-1st Ave. Action Alternative would use portions of the US Route 202 corridor and the PA Turnpike right-of-way as its trunk, passing behind (to the north of) the King of Prussia Mall, turning north to use a portion of the NS Industrial Track before turning west along 1st Avenue as its branch and ending near the intersection of 1st Avenue and N. Gulph Road near the VFCR.

- **US 202-N. Gulph Alternative:** The US 202-N. Gulph Action Alternative would use portions of the US Route 202 corridor as its trunk, passing behind (to the north of) the King of Prussia Mall, turning south to connect to N. Gulph Road before turning west along the N. Gulph Road as its branch and ending near the intersection of 1st Avenue and N. Gulph Road near the VFCR.

As part of each Action Alternative, two tracks would be provided on primarily elevated guideway. However, a short at-grade section would be provided in the turnoffs adjacent to the existing NHSL. In the PECO and PECO/TP Trunks, the tracks would also be at grade on a hilltop area within the PECO corridor a short distance west of Henderson Road.

The Action Alternatives include five to seven proposed station areas: Henderson Road, the Court, Mall Boulevard North, Plaza, 1st Ave. East, and the terminal stations 1st & Moore or Convention Center. The Henderson Road and 1st & Moore stations would include park-and-ride

facilities, currently configured as a surface lot at the Henderson Road station and a multi-story garage structure at 1st & Moore.

As the elevated guideway approaches the western terminal stations (1st & Moore or Convention Center), the two-track guideway structure would widen from approximately 34 feet to a three-track cross-section approximately 50 feet wide. In the widened area, the third track would provide SEPTA with the necessary track capacity for efficient train operations at the terminal station and along the alignment in those areas.

SEPTA would add trains to the NHSL to serve King of Prussia. Some trains that currently turn back at Hughes Park would continue to King of Prussia. In addition, new trains would provide service between Norristown Transportation Center and King of Prussia. SEPTA proposes to use the same vehicles that currently operate on the NHSL and the existing track and guideway. With the exception of providing a new wye junction with the NHSL to enable Project trains to connect to the NHSL, SEPTA proposes no physical changes to the NHSL guideway or its related infrastructure. In the PECO-1st Ave., PECO/TP-1st Ave. and PECO/TP-N. Gulph Alternatives, the wye would be in the vicinity of the PECO corridor crossing of the NHSL, north of I-276. In the US 202-1st Ave. and US 202-N. Gulph Alternatives, the wye would be just south of Old DeKalb Pike. The proposed wye junction would consist of connecting the new Project guideway and track to the existing NHSL guideway and track.

Extending NHSL service into King of Prussia would require SEPTA to add one new station track at SEPTA's 69th Street Transportation Center in Upper Darby Township, Delaware County (Figure 7). The new track would be aligned along the north side of the existing NHSL tracks, stopping at the existing building along the north side of the existing northern platform. The ballast embankment supporting the existing NHSL tracks would be widened to the north to accommodate the new track. Adjacent to the northern platform, the new track would be supported on an elevated guideway structure. The purpose of using structure rather than continuing the embankment up to the building is to avoid impacting the existing bus stop and turnaround area underneath and adjacent to the new track.

The northern platform would be widened to serve the new track. As with the existing NHSL service, the new track and widened platform would be designed to enable level passenger boarding. The existing windbreak wall along the northern edge of the existing platform would be removed and rebuilt along the northern edge of the proposed guideway structure. Elements to be removed include a short section of existing turnout track along the proposed alignment as well as an existing stairway used by passengers exiting from the north platform and by SEPTA personnel. The existing track embankment retaining wall would be relocated to the north edge of the new embankment and the existing track turnout would be replaced. Other portions of the 69th Street Transportation Center would not be affected or changed by the proposed Project.

3.0 Methodology

In this document, each Action Alternative is composed of two parts:

- Trunk: Using the analogy of a tree, each Action Alternative has a main trunk, which is the part of the alignment beginning at the existing NHSL and ending at the King of Prussia Mall.
- Branch: Extending from the trunk of a tree is a branch. In each Action Alternative, the branch extends west from the King of Prussia Mall to the western Project terminus near the Valley Forge Casino Resort.

The Action Alternatives are presented and analyzed by trunk and branch. For evaluation purposes the trunks and branches are then combined into the respective Action Alternatives for reporting potential impacts. Fourteen station areas, including two park-and-rides, were also analyzed.

The following sections describe the study areas and the methodology employed during this study.

3.1 Study Area Descriptions

The assessment considered three geographic areas: a transportation study area that encompasses the King of Prussia area of Upper Merion Township, a Project study area focused around each Action Alternative in the township, and a 69th Street Transportation Center study area that is focused within SEPTA's existing facility in Upper Darby Township. The transportation study area is bounded by the NHSL to the east, the Schuylkill River to the north, US Route 422 to the west, and the Schuylkill Expressway to the south. The Project study area is an area 500 feet on either side of the centerline of each Action Alternative, as well as ½ mile from the center point of all proposed stations. The Action Alternatives and their associated study areas are depicted in Figures 2 through 6 in Appendix B.

The 69th Street Transportation Center study area is 500 feet on either side of the proposed track and station platform modifications in Upper Darby Township. The 69th Street Transportation Center study area is depicted in Figure 7 in Appendix B.

3.2 General

The natural resources screening scope of work for this report included:

- Review of Federal and State records
- Study area reconnaissance

The methodology associated with each of the specific items listed above is discussed in Sections 3.2.1 and 3.2.2. Section 4.0, Affected Environment, presents the information obtained from the historical records review, a review of federal and state records, and the Project study area reconnaissance. In Section 5.0, Environmental Impacts, the environmental impacts caused by each of the Action Alternatives are discussed. In Section 6.0, a comparison of the Action Alternatives is discussed and the best performing alternative is determined.

3.2.1 Review of Federal, State, and Municipal Records

Information from federal, state, and municipal environmental records, identifying natural resources was obtained from a variety of sources including but not limited to the following: the Pennsylvania Department of Environmental Protection (PADEP) eMapPA database accessed through the PADEP website; the Pennsylvania Geospatial Data Clearinghouse, Pennsylvania Spatial Data Access (PASDA) website; the PA Geological Survey (PaGEODE) Interactive Map;

The National Resources Conservation Service (NRCS) Web Soil Survey; the Pennsylvania Department of Conservation and Natural Resources (DCNR) *Physiographic Provinces of Pennsylvania* map; the *Sinkholes and Karst-related Features of Montgomery County, Pennsylvania, Open-File Report 93-02*, (Kochanov 1993); the *Earthquake Epicenters in and Near Pennsylvania Map* (Fail 2004); the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Map; the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM); the *Sole Source Aquifer Determination for the New Jersey Coastal Plain Aquifer System*; the Pennsylvania Natural Heritage Program (PNHP), Pennsylvania Natural Diversity Inventory (PNDI) receipts, the EDR® DataMap™ Well Search Report, and the EDR® Radius Map™ Report. Additional sources are identified in Section 4.0 under each topic.

3.2.2 Study Area Reconnaissance

To assess specific environmental criteria as they pertain to the study, field reconnaissance of the Project and 69th Street Transportation Center study areas was completed on May 14, 2015 and December 4, 2015, respectively.

4.0 Affected Environment

4.1 Natural Resources

This section describes the ecological resources present in the Project and 69th Street Transportation Center study areas, including geologic conditions, soils, forested areas, fields, wetlands, waterways and flood hazard areas, groundwater recharge areas, wellhead protection areas, sole source aquifers, and threatened and endangered species.

4.1.1 Geologic Conditions

Geologic conditions were investigated to determine if there are existing geologic conditions such as karst-related features or seismic zones that could be a factor in design, construction, or operation and maintenance of the Project.

4.1.1.1 Regulatory Context

Geologic resources are generally not regulated. Soils, bedrock, and groundwater are not isolated media and may affect or be affected (generally through construction activities) by other resources such as wetlands, streams, or lakes, which are subject to regulation. These interactions are managed under regulatory programs found in their respective sections below.

4.1.1.2 Methodology

Surficial geology, bedrock geology, karst formations within the Project study area were identified using the Pennsylvania Spatial Data Access (PASDA) – geology layer, the PaGEODE – PA Geological Survey Interactive Map, the Pennsylvania Department of Conservation and Natural Resources (DCNR) *Physiographic Provinces of Pennsylvania* map, and *Sinkholes and Karst-related Features of Montgomery County, Pennsylvania, Open-File Report 93-02* (Kochanov 1993). Seismic epicenters located within 20 miles of the Project area were identified using *Earthquake Epicenters in and Near Pennsylvania Map* (Fail 2004). A field reconnaissance of the Project study area was completed on May 14, 2015 and December 4, 2015 to verify observable karst features.

4.1.1.3 Existing Features

Montgomery County is predominantly an undulating plain with scattered low hills and ridges. Each Action Alternative is located within portions of both the Piedmont Lowland and the Gettysburg-Newark Lowland Sections of the Piedmont Province of Pennsylvania. Elevations range from 140 feet to over 190 feet (NVGD 1929).

Delaware County encompasses a variety of topography, including intertidal marsh communities located along the Delaware River, rolling hills, and steep slopes associated with stream corridors. Elevations range from sea level to 500 ft. (NGVD 1929). The 69th Street Transportation Center study area spans two geologic provinces, the Piedmont Lowland Section and the Atlantic Coastal Plan Lowland and Intermediate Upland Section. Elevations in the study area range from 90 feet to 100 feet (NGVD 1929).

Karst is a type of topography that is present in areas underlain by carbonate bedrock (limestone, dolomite), and is caused by bedrock dissolving and erosion. Karst formations are

characterized by sinkholes, geologic surface depressions, caves, and subsurface drainage. (Kochanov 93). Sinkholes are feature of bedrock collapse, the result of localized, gradual or rapid sinking of the land surface to a variable depth; they are roughly circular outline.

Mapped areas of karst features are indicators of those places where subsidence is considered to be more likely to occur; however, subsurface karst features can occur where there is no discernable surface expression indicating their location (Kochanov, 93). Surface expression of sinkholes and closed depressions in an area change over time due to weathering, land development, and individual sinkhole repairs. General locations of known karst features in the Project study area are depicted on the DCNR Karst Features Map in Appendix C. In addition to the karst features depicted on the map, the field reconnaissance of the Project study area identified an unmapped sinkhole located in the PECO right-of-way, at 40°05'11.06" N, 75°22'38.98" W, approximately 155 feet northeast of a PECO transmission tower.

Numerous karst features are located in and near the Project study area. For the purpose of this study, the majority of the features are found in groups in the vicinity of the following locations: PECO right-of-way, a residential development bounded by Powderhorn Road and Kingwood Road, King of Prussia Mall, and the Valley Forge Casino and Resort. 195 Karst features (sink holes and surface depressions) are located within the transportation study area. No karst features are located within one mile of the 69th Street Transportation Center study area.

The Project study area overlies a combination of the following bedrock formations: Conestoga, Elbrook, Ledger, and Stockton.

- The Conestoga Formation consists of medium-gray, impure limestone with black, graphitic shale partings. It is conglomeratic at the base. In Chester County, it includes micaceous limestone, phyllite, and alternating dolomite and limestone. The total thickness is at least 300 feet (Geyer and Wilshusen, 1982). Formed during the Ordovician and Cambrian Period, the main rock type is limestone.

- The Elbrook Formation consists of light-gray to yellowish-gray, finely laminated siliceous limestone having interbeds of dolomite, calcareous shale, and silty limestone. It is cherty and well bedded. The beds are mostly thick, but flaggy and massive beds also occur. It is about 3,000 feet thick (Geyer and Wilshusen, 1982). Formed during the Cambrian Period, the main rock type is calcareous shale.

- The Ledger Formation is a light-gray, locally mottled, massive, pure, coarsely crystalline dolomite that is siliceous in the middle part. The beds, which are moderately well developed and massive, weather to rust-stained, granular, cherty layers. It is approximately 2,000 feet thick (Geyer and Wilshusen, 1982). Formed during the Cambrian Period, the main rock type is dolomite.

- The Stockton Formation crops out in the Newark basin. It is composed of light-gray to buff, coarse-grained, arkosic sandstone and red to purplish-red sandstone, shale, siltstone, and mudstone. Its thin to flaggy beds are well developed. Its maximum thickness is approximately 3,300 feet (Geyer and Wilshusen, 1982). Formed during the Triassic Period, the main rock type is arkosic sandstone.

The 69th Street Transportation Center study area overlays the Wissahickon Formation. The Wissahickon formation includes many different lithologies at metamorphic grades from greenschist to granulite. Lithologies mapped illustrate the variety of rock types within the formation including: mica schist, mafic gneiss, augen gneiss, and grantoid rock types. In Delaware County, they are interlayered with amphibolite resembling back-arc basin basalt (Blackmer & Bosbyshell, 2002).

Six faults are mapped within the transportation study area. Faults #1 and #2 are located approximately 0.32 miles apart and run parallel to one another in a northwest-southeasterly direction. The faults are separated by the St. Augustine Cemetery. Faults #3-6 are clustered in the vicinity of the I-76/I-276 interchange. Of the cluster, Fault #3 is the primary fault from which the remaining three faults radiate. Faults #3-5 run in a southwest-northeasterly direction. Fault #6 runs in a northwest-southeasterly direction. Coordinates for the fault's beginning and ending points are located in Table 4-1.1 below.

Table 4-1.1: Fault Locations

Fault	Begin Point (Lat/Long)	End Point (Lat/Long)
1	40.09428°/-75.36522°	40.08745°/-75.35921°
2	40.09205°/-75.37037°	40.08653°/-75.36539°
3	40.09060°/-75.41534°	40.09783/-75.37552°
4	40.09087°/-75.41414°	40.10334°/-75.40058°
5	40.09179°/-75.40916°	40.10058°/-75.39389°
6	40.09297°/-75.40161°	40.08771°/-75.37449°

Source: DCNR. USGS Seismic map and data for Pennsylvania.

No faults are located within one mile of the 69th Street Transportation Center study area.

A review of the USGS *2014 Pennsylvania Hazard Map* has concluded that the transportation study area has a 2% chance of a 10-14 PGA earthquake in fifty years. The DCNR *Earthquake Epicenters in and Near Pennsylvania* map depicts twenty-seven seismic events having occurred within twenty miles of the transportation study area (Table 4.1-2). Although three seismic events occurred within the last thirty-five years, no seismic activity has been recorded in the last twenty-five years. Twenty-nine seismic events have occurred within twenty miles of the 69th Street Transportation Center study area (Table 4-1.3). Three seismic events have been recorded within the last twenty-five years.

Table 4-1.2: Seismic Events within 20 Miles of Transportation Study Area

Map Number	Date	Magnitude
7	1980/03/05a	3.5
8	1980/03/05b	3.1
10	1980/03/11a	3.5
12	1980/05/02a	2.8
13	1980/05/02b	3.0
20	1984/05/10	2.2
23	1989/02/02	--
24	1990/03/30	1.8
500	14 events from 1724/08/16 – 1840/11/14	--
501	1737/12/08	--
503	1763/03/22	--
711	1900/04/29	--
714	1921/01/26	3.3

Source: DCNR. USGS Seismic map and data for Pennsylvania.

A review of the USGS *2014 Pennsylvania Hazard Map* has concluded that the transportation study area has a 2% chance of a 10-14 PGA earthquake in fifty years. The DCNR *Earthquake Epicenters in and Near Pennsylvania* map depicts twenty-seven seismic events having occurred within twenty miles of the transportation study area (Table 4.1-2). Although three seismic events occurred within the last thirty-five years, no seismic activity has been recorded in the last twenty-five years. Twenty-nine seismic events have occurred within twenty miles of the 69th Street Transportation Center study area (Table 4-1.3). Three seismic events have been recorded within the last twenty-five years.

Table 4-1.3: Seismic Events within 20 Miles of 69th Street Transportation Center

Map Number	Date	Magnitude
6	1980/03/02	2.8
7	1980/03/05a	3.5
8	1980/03/05b	3.1
10	1980/03/11a	3.5
12	1980/05/02a	2.8
43	1996/07/05	2.6
105	1973/02/28	3.8
169	1993/02/26	2.5
183	1997/04/16	1.6
500	14 events from 1724/08/16 – 1840/11/14	--
501	1737/12/08	--
503	1763/03/22	--
711	1900/04/29	--
714	1921/01/26	3.3
720	1944/01/08	3.2

Source: DCNR. USGS Seismic map and data for Pennsylvania.

4.1.2 Soils

Soil conditions were investigated to determine the soils development compatibilities and limitations for construction, stormwater management, and farmland preservation. Under 7 CFR 657.4 the NRCS identified soil mapping units within the State that qualify as prime farmland, farmlands of statewide importance, and unique farmland. The Pennsylvania Bureau of Farmland Preservation is responsible for preserving prime farmland for agricultural production.

Areas considered as prime farmland or farmland of statewide importance are located within the transportation study area; however, the vast majority of these areas have undergone residential or commercial development, including areas within the PECO utility right-of-way. Although portions of the utility right-of-way contain undisturbed farmland soils, due to the right-of-way's dedicated use, agricultural activities are not permitted. In the existing condition, no agricultural activities occur within the transportation study area.

4.1.2.1 Regulatory Context

Pennsylvania regulates soil disturbance under PA Code Title 25 § 102 – Erosion and Sediment Control. § 102 requires persons proposing or conducting earth disturbance activities to develop, implement, and maintain Best Management Practices (BMPs) to minimize the potential for accelerated erosion and sedimentation in order to protect the water resources of the Commonwealth.

4.1.2.2 Methodology

Soils data within the Project study area was identified using the PASDA – soils layer and the National Resources Conservation Service (NRCS) Web Soil Survey.

4.1.2.3 Existing Features

The Project study area lies within part of one or more of the following soil associations:

1. Made land-Glenelg-Chester association: deep and moderately deep, well-drained soils underlain by schist and gneiss; on undulating uplands.
2. Made land-Duffield-Lawrenceville association: deep, well-drained soils underlain by limestone; on undulating uplands.
3. Lansdale-Penn-Readington association: deep and moderately deep, well-drained and moderately well drained soils underlain by shale and sandstone; on rolling uplands.
4. Manor-Glenelg-Made land association: moderately deep and deep, well-drained soils underlain by schist and gneiss; micaceous soils on hilly uplands.

Fifteen soil types are within the Project study area. Table 4-1.4 summarizes each soil type, hydrologic soil group, hydric soil, and suitability for important or prime farmland. Please note that the information provided is for the primary soil of the type and does not include minor inclusions.

Table 4-1.4: Soils in the Project Study Area

Symbol	Name	Hydrologic Soil Group	Surface Runoff	Hydric	Farmland Classification
DuB	Duffield silt loam, 3-8% slopes	B	Medium	No	All areas prime farmland
DuC	Duffield silt loam, 8-15% slopes	B	Medium	No	Farmland of statewide importance
Ha	Hatboro silt loam	B/D	Very high	Yes	Not prime farmland
LeA	Lawrenceville silt loam, 0-3% slopes	C	Low	No	All areas prime farmland
LeB	Lawrenceville silt loam, 3-8% slopes	C	Medium	No	Farmland of statewide importance
Me	Made land, schist and gneiss materials	C	Medium	No	Not prime farmland
UdlB	Udorthents, limestone, 0-8% slopes	C	Very high	No	Not prime farmland
UdlD	Udorthents, limestone, 8-25% slopes	C	Very high	No	Not prime farmland
UgB	Urban land, 0-8% slopes	--	High	No	Not prime farmland
UgD	Urban land, 8-25% slopes	--	Very high	No	Not prime farmland
UrA	Urban land, occasionally flooded	--	Very high	No	Not prime farmland
UrhB	Urban land – Duffield complex, 0-8% slopes	--	--	No	Not prime farmland
UrmD	Urban land – Glenelg complex, 8-25% slopes	--	--	No	Not prime farmland
UrxB	Urban land – Penn complex, 0-8% slopes	--	--	No	Not prime farmland
UudB	Urban land – Udorthents, limestone complex, 0-8% slopes	--	--	No	Not prime farmland
UusB	Urban land – Udorthents, shale and sandstone complex, 0-8% slopes	--	--	No	Not prime farmland
UusD	Urban land – Udorthents, shale and sandstone complex, 8-25% slopes	--	--	No	Not prime farmland

Source: Natural Resources Conservation Service Web Soil Survey, accessed 2015.

The hydrologic soil group is determined by the water transmitting soil layer with the lowest saturated hydraulic conductivity and depth to any layer that is more or less water impermeable or a depth to a water table. Group A soils have a low runoff potential when thoroughly wet and water is transmitted freely through the soil. Group B soils have moderately low runoff potential when thoroughly wet and water transmission through the soil is unimpeded. Group C soils have a moderately high runoff potential when thoroughly wet and water transmission through the soil is somewhat restricted. Group D soils have a high runoff potential and water transmission through the soil is restricted or very restricted (NRCS 2007). Group A and B soils allow for greater groundwater recharge than Group C and D soils. Group D soils allow for least amount of groundwater recharge. See Section 3.1.7 Groundwater Recharge.

4.1.3 Forests

Forest habitats provide both environmental and economic benefits including but not limited to the following: improve water quality, improve air quality, wildlife habitat, flood protection, reduction of greenhouse gases, recreational opportunities, scenic beauty, provides food, and forest products. Site conditions were investigated to determine if forest habitat exists within the Project study area and if so, to minimize impacts to the resource.

4.1.3.1 Regulatory Context

Forest resources are generally not regulated; however, activities occurring within forests that are also within other regulated areas (e.g. wetlands, waterways, riparian buffers) are managed under regulatory programs found in their respective sections within this chapter.

4.1.3.2 Methodology

Forest areas were identified using the PASDA – forest and aerial layers. To verify forest resources, a field reconnaissance of the Project and 69th Street Transportation Center study areas was completed on May 14, 2015 and December 4, 2015, respectively.

4.1.3.3 Existing Features

Both Montgomery and Delaware Counties lie within the Piedmont section of the oak-chestnut forest region of the eastern deciduous forest. Prior to settlement, the area was completely forested with the exception of clearings created and maintained by the indigenous population. Common canopy trees included red oak *(Quercus rubra)*, white oak *(Quercus alba)*, chestnut oak *(Quercus prinus)*, American beech (*Fagus grandifolia)*, American chestnut *(Castanea dentata)*, hickory *(Carya ssp.)*, red maple *(Acer rubrum)*, white ash *(Fraxinus americana)*, and yellow poplar *(Liriodendron tulipifera)*. Dryer south facing slopes were dominated by American chestnut, chestnut oak, black gum *(Nyssa sylvatica)* and sassafras *(Sassafras albidum)*, while moister and cooler north facing slopes and ravines were dominated by Eastern hemlock *(Tsuga canadensis)* (Rhoads, Block, 2007).

Presently, due to urban development, virtually all contiguous forest cover greater than 10 acres has been eliminated from the Project study area. Small irregular patches of forest remain; however, most have been highly fragmented by development. Small areas of trees are present adjacent to stream corridors, property boundaries, rail/roadway rights-of-way, and found in random locations throughout the Project study area. No large contiguous forested areas are located within the Project study area. Forested land in the vicinity of the 69th Street

Transportation Center study area is located approximately 100 feet north of the transportation center and is associated within the Cobbs Creek stream corridor.

4.1.4 Fields

Field habitats provide both environmental and economic benefits including but not limited to the following: improve water quality, improve air quality, wildlife habitat, flood protection, reduction of greenhouse gases, recreational opportunities, scenic beauty, and provides food. Site conditions were investigated to determine if field habitat exists within the Project study area and if so, to minimize impacts to the resource.

4.1.4.1 Regulatory Context

Field resources are generally not regulated; however, activities occurring within fields that are also within other regulated areas (e.g. wetlands, waterways, riparian buffers) are managed under regulatory programs found in their respective sections within this chapter.

4.1.4.2 Methodology

The presence and/or absence of fields, either fallow or in agricultural production, was conducted using the PASDA – aerial layer. To verify field resources, a field reconnaissance of the Project and 69th Street Transportation Center study areas was completed on May 14, 2015 and December 4, 2015, respectively.

4.1.4.3 Existing Features

Prior to urban development, much of Montgomery County was in agricultural production. In the existing condition, no active agricultural fields are located within the Project study area. Currently, the PECO utility right-of-way provides 42 acres of successional-field related habitat for a variety of species. Due to the right-of-way's dedicated use, agricultural activities are not permitted.

Based on the field reconnaissance of the Project study area conducted on May 14, 2015, the PECO utility right-of-way environment has developed three distinct habitat types. The portion of the right-of-way between Henderson Road and I-276 (12 acres) consists of mixed herbaceous plants and high shrubs dominated by common mugwort *(Artemisia vulgaris)*, goldenrod *(Solidago ssp.)*, raspberry *(Rubus spp.)*, multiflora rose *(Rosa multiflora)*, black locust *(Robinia pseudoacacia)*, and various grasses.

The portion of the right-of-way between I-276 and Long Road (30 acres) is comprised of two 15-acre habitats that are separated by the right-of-way centerline. The northern portion consists of perennial herbs and grasses. Adjacent property owners utilize the right-of-way for vegetable gardens and recreational areas. Aerial photographs confirm that a baseball diamond had been previously located within the right-of-way. It appears that property owners and/or unknown parties are mowing the area at regular intervals, maintaining lawn/grassland conditions. The southern portion of the right-of-way consists of mixed herbaceous plants and low shrubs dominated by common mugwort, goldenrod, raspberry, multiflora rose, Bradford pear *(Pyrus calleryana "Bradford")*, and various grasses.

4.1.5 Wetlands

Wetlands provide a variety of functions and values including water quality improvement, floodwater storage, fish and wildlife habitat, biological productivity and aesthetics. The presence/absence of wetlands was investigated to determine if such habitat exists within the Project study area and if so, to minimize impacts to the resource.

4.1.5.1 Regulatory Context

The Federal Government regulates wetlands primarily through Section 404 of the Clean Water Act (CWA). The act regulates the discharge of dredged or fill material into wetlands and other waters of the United States. The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) share the responsibility for implementing the permitting program under Section 404.

Federal Executive Order 11990 Protection of Wetlands requires all federal agencies to "minimize the destruction, loss or degradation of wetlands, and preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities." Unless no practical alternatives exist, federal agencies must avoid activities in wetlands that have the potential for adversely affecting the integrity of the ecosystem. Executive Order 11990 applies to both Federal agencies and "any federal undertaking, financed or assisted construction and improvements." "This order does not apply to issuance by Federal agencies or permits, licenses, or allocations to private parties for activities involving wetlands on non-Federal property."

The Pennsylvania Department of Environmental Protection (PADEP) regulates wetlands under the Dam Safety and Encroachment Act and the corresponding Dam Safety and Waterway Management Rules and Regulations (PA Code Title 25 § 105). The act defines a body of water as "any natural or artificial lake, pond, reservoir, swamp, marsh, or wetland." Chapter 105 define regulated waters of Pennsylvania as "watercourse, streams, or bodies of water and their floodways wholly or partly within or forming part of the boundary of this Commonwealth" and wetlands as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas.

Wetlands with a surface water connection to a navigable waterway are regulated at both the federal level and state levels. Wetlands without a surface water connection to a navigable waterway, or that are not adjacent to Waters of the United States, and do not possess a significant nexus to a Traditional Navigable Water, are regulated only at the state level. All wetlands, whether isolated or connected, are regulated under PA Code Title 25 § 105.

4.1.5.2 Methodology

The presence and/or absence of wetlands was assessed using the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Map and the PASDA – wetlands layer. The results concluded that no mapped wetlands would be impacted by the Project or 69th Street Transportation Center study areas. To supplement the desktop research, a field reconnaissance of the Project and 69th Street Transportation Center study areas was completed on May 14, 2015 and December 4, 2015, respectively. Stormwater management facilities that

contain wetland vegetation either by design or by natural colonization are not included in this assessment.

4.1.5.3 Existing Features

Four isolated wetland features are mapped within 500 feet of the Project study area. Bounded by U.S. Route 202 on the north, the Norristown High Speed Line (NHSL) right-of-way on the east, and Saulin Boulevard on the west, an inactive quarry has been classified "Lake/Freshwater Pond." Located approximately 500 feet west of the U.S. Route 202/Saulin Boulevard intersection, a former "Freshwater Pond" resulting from mining activities, has been filled and is currently the Staples/Petco parking area. A Freshwater Forested/Shrub wetland has been mapped approximately 1900 feet southwest of the I-276/PECO right-of-way intersection, along an unnamed tributary to Crow Creek (Crow Creek UNT) (ID: 133228911), between the Abrams Run Apartments and commercial development. This habitat has been converted into two stormwater management facilities. The remaining mapped wetland is located within the infield of the N. Gulph Road on-ramp to I-76E. This feature, mapped as a Freshwater Forested/Shrub wetland, does not exist.

The field reconnaissance identified four previously unmapped wetlands within the Project study area at the following locations:

- Intersection of Saulin Boulevard and abandoned railroad tracks – southeast corner. The wetland area serves as a recipient of stormwater drainage from stormwater management facilities associated with both Uncle Bob's Self Storage and the Henderson Square shopping center. This wetland has been modified to include a concrete low-flow channel to prevent erosion.

- Intersection of Crow Creek and I-276 Eastbound. The wetland area consists of a portion of the floodplain and stormwater drainage ditches associated with I-276.

- Intersection of access driveway serving Hyatt House and Toys-R-Us, via Mall Boulevard, and Trout Creek unnamed tributary (UNT). The wetland area consists of a portion of the floodplain. This wetland area receives stormwater drainage from multiple sources.

- N. Gulph Road, 700 feet northwest of the intersection of N. Gulph Road Northbound and Village Drive. This wetland area appears to receive stormwater runoff from the I-276 Toll Plaza located directly adjacent.

The field reconnaissance of the 69th Street Transportation Center study area identified one previously unmapped wetland in the vicinity of the transportation center. A forested wetland habitat, located approximately 100 feet north of the center, is associated with Cobbs Creek and an unnamed tributary. The wetland area consists of a portion of the Cobbs Creek floodplain.

4.1.6 Waterways and Floodplains

Floodplains are the lands on either side of a stream that are inundated when the capacity of the stream channel is exceed. Floods are exacerbated by the placement of fill within the floodplain. Waterways and floodplains were identified in order to minimize impacts to these areas. For the purpose of this section, the locations of the streams are described in general terms using

nearby landmarks as reference points. See Waterways and Floodplain Map found in Appendix C.

4.1.6.1 Regulatory Context

Federal Executive Order 11988 - Floodplain Management, requires all federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development whenever there is a practicable alternative available. "Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities."

Federal Executive Order 13690 – Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, creates a new flood risk reduction standard for federally funded projects. The Federal Flood Risk Management Standard is a flexible framework designed to increase resilience against flooding and help preserve the natural values of floodplains. The Standard ensures that agencies will expand management from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk. The Standard sets forth a process for further solicitation and consideration of public input, prior to implementation of the Standard.

The PADEP regulates floodplains under the Flood Plain Management Act and the corresponding Flood Plain Management Rules and Regulations (PA Code Title 25 § 106). PA Code Title 25 § 106.3 stipulates that "any obstruction constructed, owned or maintained by a public utility" must satisfy the requirements of the Act. Further, §106.1(iii) defines a public utility service as "railroad transportation of passengers or property." Chapter 105 defines an "obstruction" as "any encroachments located in, along or across, or projecting into a watercourse, floodway, or body of water, whether temporary or permanent."

Under the CWA, Section 305(b) and Section 303(d), the PADEP protects four stream water uses: aquatic life, fish consumption, potable water supply, and recreation (PA Code Title 25 §93.3).

4.1.6.2 Methodology

Flood-prone areas were identified using the PASDA – streams layer and the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the Project study area. To verify the vegetative cover within the floodplain/riparian zone, a field reconnaissance of the Project and 69th Street Transportation Center study areas was completed on May 14, 2015 and December 4, 2015, respectively.

4.1.6.3 Existing Features

Four waterways are located within the Project study area. From east to west they are; Crow Creek unnamed tributary (UNT) (Abrams Run), Crow Creek, Trout Creek UNT, and Trout Creek. Crow Creek UNT enters the Project study area from the south after exiting the Valley Forge Memorial Gardens. The stream flows northward past the Abrams Apartments, between Bill Smith Road and Hansen Access Road, passing through the PECO utility right-of-way and residential development until it meets the US Route 202/I-276 intersection. From the

intersection the stream flows on the south side of and parallel to I-276 in a westerly direction until it joins with Crow Creek at I-276.

The channel of Crow Creek UNT has been heavily modified. Within the PECO right-of-way, the channel and banks have been armored using gabion baskets, and riprap. No natural streambed material remains. Portions of the stream channel have been lined with concrete. Vegetation within the floodplain/riparian zone consists of mixed herbaceous plants, grasses, and low shrubs. Vegetation within the channel consists of shrubs and mixed hydrophytic vegetation. At I-276, Crow Creek UNT has been straightened and the channel and banks have been armored using gabion baskets and riprap. Adjacent vegetation consists of mature trees and shrubs. At the time of the field reconnaissance the stream was dry.

Crow Creek enters the Project study area from the south near I-76 Exit 328B. The stream flows northward to the US Route 202/N. Gulph Road intersection where the stream is then conveyed underground in a northeasterly direction approximately 3,100 feet, beneath the King of Prussia Mall, to the Allendale Road/Court Boulevard intersection. The stream is an open surface drainage from this point and continues northeast for additional ± 600 feet to the confluence with Crow Creek UNT and I-276. Once north of I-276, the stream continues on a northward course to the Schuylkill River.

Within the Project study area, the channel of Crow Creek has been heavily modified. With the exception of two locations, the entire stream is conveyed underground beneath the King of Prussia Mall. Between N. Gulph Road and the King of Prussia Mall parking lot, the stream maintains approximately 60 feet of open, concrete lined channel. Vegetation within the floodplain/riparian zone consists of lawn-type grasses and a few ornamental trees. Between the Allendale Road/Court Boulevard intersection and I-276, the stream maintains a natural appearance with mature upland trees, shrubs, etc. lining its banks.

Trout Creek UNT surfaces within the Project study area at the rear of 256 Mall Boulevard, King of Prussia. The stream flows in a northwesterly direction for ±800 feet until it intersects with I-276. North of I-276 the stream continues in a westerly direction as it winds around a commercial development served by American Avenue. There the stream continues on a westerly course parallel to American Avenue to the intersection with 1st Avenue. At 1st Avenue, the stream flows parallel to the south side of the roadway in a westerly direction for ±450 feet. Then the stream crosses the roadway and continues westward, parallel to the north side of the roadway for an additional ±520 feet, before turning north and exiting the Project study area.

Between its point of emergence and I-276, and the segment of Trout Creek UNT adjacent to American Avenue maintains a natural appearance with upland trees and shrubs lining its banks. However, along 1st Avenue, the stream channel has been heavily modified. The segment located on the eastbound side of the road has been straightened. Floodplain/riparian zone vegetation consists of mature trees and herbaceous plants. The shrub layer has been removed allowing for increased visibility for the adjacent business. On the westbound side of 1st Avenue, the steam channel has been straightened and the stream banks have been armored using gabion baskets. Vegetation within the floodplain/riparian zone consists of lawn-type grasses and a few ornamental trees.

Trout Creek enters the Project study area from the southwest in the vicinity of the Glen Hardie Country Club. The stream flows in a northeasterly direction to the N. Gulph Road/US Route 422

intersection. There the stream flows in an easterly direction beneath the Valley Forge Casino Resort parking lot to its confluence with Trout Brook UNT.

Within the Project study area, the channel of Trout Creek has been heavily modified. Upstream of N. Gulph Road, the stream maintains a natural appearance with mature upland trees and shrubs, etc. lining its banks. The channel is conveyed underground, between the Valley Forge Casino Resort, between N. Gulph Road and the resort parking area. Once north of the parking area, the stream maintains an open, straightened channel beyond the Project study area. Floodplain/riparian zone vegetation consists of mature trees, shrubs, and herbaceous plants.

The FEMA 100-year flood hazard area for each waterbody is located within the Project study area according to the FEMA FIRMs for the Project study area.

Two waterways are located within the 69th Street Transportation Center study area. Cobbs Creek and Cobbs Creek UNT are located northeast of the transportation center, approximately 370 feet and 150 feet, respectively. Cobbs Creek enters the Project study area from the northwest and flows in an easterly direction along the northern perimeter of the transportation center. Cobbs Creek UNT, depicted in the historic topographic maps dated, 1894, 1896, 1898, and 1901, emerges from beneath the transportation center and flows in a northeasterly direction to its confluence with Cobbs Creek.

As per Pennsylvania Code §93.3, Crow Creek UNT, Crow Creek, Trout Creek UNT, Trout Creek, Cobbs Creek and Cobbs Creek UNT are classified as WWF (warm water fisheries) by the PADEP. All of the waterways support migratory fish along some part of their length.

Crow Creek (ID: 133228907), upstream of its confluence with its tributary, is a Category 2 waterbody in that it supports aquatic life. Crow Creek (ID: 133228909), Crow Creek UNT (ID: 133228911), Trout Creek, Trout Creek UNT, Cobbs Creek (ID: 01172099) and Cobbs Creek UNT are Category 4c Waterbodies, Pollution not requiring a total maximum daily load (TMDL). All six waterbodies are impaired due to urban runoff/storm sewers, water/flow variability; habitat modification/channelization, siltation. In addition, Cobbs Creek (ID: 01172099) and Cobbs Creek UNT are also impaired due to pathogens and PCB contamination. The vast majority of the riparian buffers (150 feet from waterbody) no longer support natural vegetation and have been converted into industrial, commercial, or residential use.

4.1.7 Groundwater Recharge Areas

Groundwater recharge areas are areas that are not covered with impervious surfaces and allow stormwater to infiltrate through the soil naturally in order to recharge the aquifer. Hydrologic soil group affects the groundwater recharge rate.

4.1.7.1 Regulatory Context

Pennsylvania regulates stormwater management and groundwater recharge under the Pennsylvania Stormwater Management Act (Act 167) , MS4 Program, under PA Code Title 25 § 102 – Erosion and Sediment Control, and NPDES Permit Program for Stormwater Discharges. Associated with Construction Activities.

4.1.7.2 Methodology

Groundwater recharge areas were identified using the PASDA – aerial layer.

4.1.7.3 Existing Features

Soil types in the Project study area range from well to poorly drained because of their composition; i.e., amounts of sand, silt and other materials. Hydrologic characteristics, including the rate of water permeability and runoff among Project study area soils, also vary because of composition. The Pennsylvania Water Science Center, a division of the U.S. Geological Survey (USGS), collects, analyzes, and distributes hydrologic data and information regarding Pennsylvania's water resources. The estimated regional average annual recharge (1971-2000) for the Project study area is 8.01-10 inches.

4.1.8 Wellhead Protection Areas (WHPAs)

A Wellhead Protection Area (WHPA) is defined as the surface and subsurface area surrounding a public water supply well, well field, spring, or infiltration gallery through which contaminants are reasonably likely to move toward and reach the water source (PADEP 2002).

4.1.8.1 Regulatory Context

The Safe Drinking Water Act (SDWA) (42 U.S.C. §300f) was established to protect the quality of drinking water in the U.S. The Pennsylvania Bureau of Safe Drinking Water (PABSDW) is charged with managing the federally delegated drinking water program and implements both the federal and state SDWA and associated regulations. Under PA Code, Title 25, Chapter 109 - Safe Drinking Water, the PABSDW established the Wellhead Protection Program (WHPP) in which wellhead protection areas (WHPAs) are established to protect groundwater sources used by public water systems from contamination. In Pennsylvanian, the responsibility of wellhead protection is shared between the State, local governments, and water suppliers (PADEP 2002).

Chapter 109 defines a three-tiered wellhead protection area. Zone I is the innermost protective zone which ranges from a 100 to 400 feet radius depending on the source and aquifer characteristics. Zone II is the capture zone which by default is ½ mile radius around the source unless a hydrogeologic delineation is performed. Zone III is the area beyond zone II that contributes recharge to the aquifer within the capture zone. Collectively Zones II and III constitute the contributing area of the well (PADEP, 2000). The PADEP does not regulate private wells.

The Pennsylvania Water Resources Planning Act (Act 220) requires any commercial, industrial, agricultural or individual activity that withdraws or uses 10,000 gallons per day (GPD), averaged over any 30-day period, to register and periodically report their water use to the PADEP. Those activities that use less than 10,000 GPD may choose to register voluntary with the PADEP.

The Delaware River Basin Commission (DRBC) regulates large water withdrawals in Montgomery and Delaware counties. Any proposed surface or groundwater withdrawal in the basin the exceeding 100,000 GPD is subject to review by the DRBC. Further, the DRBC has established the Southeastern Pennsylvania Groundwater Protected Area where any groundwater withdrawal exceeding 10,000 GPD requires DRBC approval.

4.1.8.2 Methodology

Wellhead protection areas were identified using eMapPA, the EDR DataMap™ Well Search Report, and the EDR Radius Map™ Report. Appendix E and F contains the EDR® Well Search Report and the EDR Radius Map™ Report.

4.1.8.3 Existing Features

Five public water supply wells and their associated wellhead protection areas are located within the Project study area and are summarized in Table 4-1.5. Neither public water wells nor wellhead protection areas are located within the 69th Street Transportation Center study area. See the Wells and WHPA Maps found in Appendix C.

Table 4-1.5: Wells/Water Supply Facilities in Project Study Area

Map No.	Federal Well Number	State Well Number	PWS Purveyor
41	-	PASI30000044705	PWS ID No. PA1460073 Philadelphia Suburban Water Co, 762 Lancaster Ave. Bryn Mawr, PA 19010
42	-	PASI30000044575 PASI30000044513	PWS ID No. PA1460492 Sheraton Valley Forge Hotel Route 363 and 1st Avenue King of Prussia, PA 19406
54	USGS40001008443	PASI30000044088	PWS ID No. PA1460073 Philadelphia Suburban Water Co, 762 Lancaster Ave. Bryn Mawr, PA 19010
62	-	-	PWS ID No. PA1150423 Kimberton Country House 390 Valley Forge Plaza King of Prussia, PA 19406

Sources: eMapPA, the EDR DataMap, accessed 2015.

4.1.9 Sole Source Aquifers

Sole source aquifers are defined by the EPA as an aquifer which supplies 50% of the drinking water consumed in an area overlying the aquifer.

4.1.9.1 Regulatory Context

The Safe Drinking Water Act (SDWA) (42 USC § 300f, 300h-3(e) is the federal law that ensures the quality of America's drinking water. Section 1424e of the act authorizes the Sole Source Aquifer Program to allow communities to petition the EPA for protection when a community is dependent on a single source of drinking water and there is no possibility of a replacement water supply to be found. The program provides federal overview of federally-funded projects within a sole source aquifer. The EPA may review projects proposed for any area, and may deny federal financial assistance for any project that might contaminate an aquifer.

4.1.9.2 Methodology

Sole source aquifer data was obtained from the Designated Sole Source Aquifers in EPA Region III map and the Sole Source Aquifer Determination for the New Jersey Coastal Plain Aquifer System Federal Register Notice.

4.1.9.3 Existing Features

The proposed Project is located within the streamflow source zone, i.e. an upstream headwaters area which drains into the recharge zone, of the New Jersey Coastal Plain Sole Source Aquifer.

4.1.10 Threatened and Endangered Species

As defined by the U.S. Department of the Interior, a threatened species is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An endangered species is any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary of the Interior to constitute a pest (16 USC § 1532). Pennsylvania employs a similar definition for threatened and endangered species; however, Pennsylvania's definition only applies to species located within the Commonwealth. Pennsylvania defines a Special Concern Population as colonies, groups or single individuals of a plant species that the Department has determined to be a unique occurrence deserving protection. Among the factors that may be used to classify a plant population within this category are the existence of unusual geographic locations, unisexual populations or extraordinarily diverse plant populations.

4.1.10.1 Regulatory Context

Threatened and endangered species are regulated at the federal level under the Endangered Species Act of 1973 (ESA: 16 USC § 1531). Pennsylvania regulates threatened, endangered, and special concern animal and plant species under PA Code Title 58 § 75 – Endangered Species and PA Code Title 17 § 45 - Conservation of Pennsylvania Native Wild Plants.

4.1.10.2 Methodology

A Pennsylvania Natural Diversity Inventory (PNDI) records request was submitted to the Pennsylvania Natural Heritage Program (PNHP) for the Project study areas regarding the possible impacts to threatened and endangered species. The PNDI records search serves as a multi-agency review for threatened and endangered species. These agencies include: the DCNR, the Pennsylvania Game Commission (PGC), the Pennsylvania Fish and Boat Commission (PFBC), and the U.S. Fish and Wildlife Service (USFWS). Draft PNDI results were obtained for each Action Alternative; the draft results indicated a need for further consultation with the DCNR and/or PFBC depending on the Action Alternative selected as a result of the EIS process. Consultation would enable final PNDIs to be issued.

4.1.10.3 Existing Features

According to the draft PNDIs, waterways in the study area potentially support species of interest. However, no specific species of interest were identified in the draft PNDIs. The portion of the Project study area along US 202 is in the range of one known State endangered species,

southern red oak *(Quercus falcata)*. These species are under the jurisdiction of the PFBC and DNCR, respectively. No species of interest occur under the jurisdiction of the PGC or the USFWS. Since no federally regulated species have been identified within the Project study area, no further consultation is required under the Endangered Species Act. Further study/coordination will occur at the state level only. The results of the final PNDI request for the 69th Street Transportation Center portion of the study area concluded that no further review is required by any of the regulating agencies. See Appendix D for the PNDI Environmental Review Receipts for each of the Action Alternatives.

5.0 Environmental Impacts

The focus of this assessment is on the Project study areas. Although SEPTA would add trains on the existing NHSL as part of the Project, no new stations or rail infrastructure are proposed on the NHSL. As a result, no direct Project impacts on natural resources are anticipated to occur. Operating additional trains on the NHSL has the potential to increase the amount of oils and other lubricants that drip from vehicles onto the track and into stormwater runoff from the existing guideway. SEPTA's best management practices in regard to the application of such materials to vehicles would apply to avoid or minimize potential effects.

5.1 Natural Resources

This section describes the potential impacts of the Action and No Action Alternatives to ecological resources in the Project and 69th St. Transportation Center study areas, including geologic conditions, soils, forested areas, fields, wetlands, waterways and flood hazard areas, groundwater recharge areas, wellhead protection areas, sole source aquifers, and threatened and endangered species.

In this document, the Action Alternatives are presented and analyzed by trunk and branch. For evaluation purposes the trunks and branches are then combined into the respective Action Alternatives for reporting potential impacts. Figures 2 through 6 depict the Action Alternatives and the proposed station and park-and-ride facility locations in the Project study area; Figure 7 depicts the 69th Street Transportation Center study area.

5.1.1 Geologic Conditions

Geologic conditions may be a safety concern because subsurface conditions are favorable to karst features formation, the presence of geological faults, and historical seismic activity. As discussed previously, surface expression of sinkholes and closed depressions in an area change over time because of weathering, land development, and individual sinkhole repairs. Features discussed below, although mapped, may have been repaired and may now be indistinguishable in the field.

5.1.1.1 No Action Alternative

In the No Action Alternative, it is reasonable to expect that each proposed Project in the Project study area has the potential to experience risk from karst features, geological faults, and seismic activity. The sponsors of those projects will be responsible for determining and managing that risk.

5.1.1.2 Action Alternatives

Table 5-1.1 lists the number of karst features that are located within the Project study area of each Action Alternative. The PECO/TP-N. Gulph Alternative has the highest number of karst features (194) while the US 202-1st Ave. Alternative has the fewest (135).

Table 5-1.1: Karst Features

Alternative	Number of Features
PECO-1st Ave.	182
PECO/TP-1st Ave.	146
PECO/TP-N. Gulph	194
US 202-1st Ave.	135
US 202-N. Gulph	182

Source: Malick & Scherer, 2015.

Although the number of features differs somewhat among the alternatives, the high number of karst features suggests that each Action Alternative has a similarly high level of risk in terms of designing, constructing, operating and maintaining the Project in the Project study area. In each case, SEPTA would be responsible for designing the proposed Project with particular consideration of underlying geological conditions and for managing risks associated with implementing the Project in the Project study area.

5.1.1.2.1 Trunks

The number of karst features within the PECO Trunk, the PECO/TP Trunk, and the US 202 Trunk study areas is 119, 84, and 87, respectively.

5.1.1.2.2 Branches

The number of karst features within the N. Gulph Branch and 1st Ave. Branch study areas is 95 and 62, respectively.

5.1.1.2.3 Station and Park-and-Ride Areas

The number of karst features within the proposed station and park-and-ride study areas are as follows: DeKalb & Henderson, 10; DeKalb Plaza, 42; Henderson Road, 26; Court, 48; Mall Blvd. North, 33; Mall Blvd. West, 47; Plaza West, 36; Plaza 54; 1st Ave. East, 33; 1st & Moore, 31; North Gulph, 33; Convention Center, 44; Henderson Road Park-and-Ride, 28, and Convention Center Park-and-Ride, 41.

5.1.1.2.4 69th Street Transportation Center

No karst features are located within one mile of the 69th Street Transportation Center study area.

5.1.1.3 Minimization and Mitigation

As the Project advances, SEPTA will design and construct the selected Action Alternative taking into special consideration the potential effects the underlying geology could have on the Project and its environs. These considerations would begin during design with geotechnical studies along the selected alternative alignment to understand actual subsurface characteristics. With this understanding of actual characteristics, SEPTA would refine the alignment and design the structural supports in locations with suitable subsurface conditions. As subsurface conditions can be unpredictable, SEPTA would build flexibility and redundancy into the design of the guideway and other structures to minimize potential subsurface problems and effects.

SEPTA would also develop specific construction practices that would include provisions to minimize potential problems associated with subsurface conditions as the Project is built, such as minimizing the area of ground disturbance required to accomplish construction, controlling and directing water runoff away from disturbed construction areas to appropriate collection systems, and preparing and implementing a mitigation readiness plan in the event a subsurface problem is encountered.

5.1.2 Soils

For the purpose of this document, soil disturbance was calculated as the amount of land disturbed that is not currently covered by impervious surfaces such as pavement and buildings. Portions of each Action Alternative would be aligned in areas containing soils that are considered prime farmland or farmland of statewide importance. However, the vast majority of these areas have undergone residential or commercial development, including areas within the PECO utility right-of-way. Although portions of the utility right-of-way contain undisturbed farmland soils, due to the right-of-way's existing use, agricultural activities are not permitted.

In the existing condition, no agricultural activities occur within the Project study area. The proposed Project would not take any soils out of active agricultural production.

5.1.2.1 No Action Alternative

In the No Action Alternative, each project would disturb land and impact soils as a result of temporary ground disturbance during construction. Potential effects to farmland soils would be determined by each project sponsor based on the LOD identified for each project.

5.1.2.2 Action Alternatives

Potential soil disturbance areas are summarized in Table 5-1.2. The PECO-1st Ave. Alternative would disturb 12.9 acres of soil, of which 2.4 acres are prime farmland and 3.8 acres are farmland of statewide importance. The PECO/TP-1st Ave. Alternative would disturb 9.8 acres of soil, of which 3.2 acres are farmland of statewide importance. The PECO/TP-N. Gulph Alternative would disturb 11.0 acres of soil, of which 3.2 acres are farmland of statewide importance. The US 202-1st Ave. Alternative would disturb 3.9 acres of soil with no impacts to farmland soils. The US 202-N. Gulph Alternative would disturb 4.9 acres of soil with no impacts to farmland soils.

Table 5-1.2: Soil Disturbance Areas

Alternative	Prime Farmland Soils Disturbance (Acres)	Farmland of Statewide Importance Soil Disturbance (Acres)	Total Soil Disturbance (Acres)
PECO-1st Ave.	2.4	3.8	12.9
PECO/TP-1st Ave.	0	3.2	9.8
PECO/TP-N. Gulph	0	3.2	11.0
US 202-1st Ave.	0	0	3.9
US 202-N. Gulph	0	0	4.9

Source: Malick & Scherer, 2015.

5.1.2.2.1 Trunks

The PECO Trunk would disturb 7.0 acres of soil, of which 2.4 acres are prime farmland and 3.8 acres are farmland of statewide importance. The PECO/TP Trunk would disturb 4.0 acres of soil, of which 3.2 acres are farmland of statewide importance. The US 202 Trunk would disturb 1.5 acres of soil.

5.1.2.2.2 Branches

Neither the N. Gulph Branch nor the 1st Ave. Branch impacts prime farmland, farmland of statewide importance, or soils in general.

5.1.2.2.3 Station Areas

Soil disturbance resulting from the station areas are as follows: DeKalb & Henderson, 0.1 acres; DeKalb Plaza, 0.4 acres; Henderson Road, 1.5 acres; Court, 0.1 acres; Mall Blvd. North, no increase; Mall Blvd. West, 0.6 acres; Plaza West, 0.1 acres; Plaza, no increase; 1st Ave. East, 0.2 Acres; 1st & Moore, 0.3 acres; North Gulph, 0.2 acres; Convention Center, 0.3 acres; Henderson Road Park-and-Ride, 1.5 acres, and Convention Center Park-and-Ride, 0.3 acres.

5.1.2.2.4 69th Street Transportation Center

Improvements to the 69th Street Transportation Center would impact 0.5 acres of soil with no impacts to farmland soils.

5.1.2.3 Minimization and Mitigation

Construction activities that disturb soil can increase the potential for excess erosion if not properly addressed. Excess soil erosion from construction projects removes the soil layer and transports the sediments into surface waters contributing to sediment loading and pollution transported with sediments. Excess sediment collects in streams, rivers, lakes and other waterbodies reducing their water holding capacity and quality, negatively impacts aquatic life.

In order to address the requirements of pollution prevention at its construction sites, SEPTA will consider means to avoid the impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts utilizing Soil Erosion and Sediment Control Best Management Practices (BMPs) to reduce soil erosion and sediment loss. Soil Erosion and Sediment Control BMPs are techniques used to reduce or eliminate surface erosion; therefore, protecting water resources.

A partial list of temporary soil stabilization BMPs includes the following strategies:

- Preservation of existing vegetation
- Hydraulic mulch
- Temporary seeding
- Soil binders
- Geotextiles
- Wood mulching
- Earth dikes, drainage swales, and lined ditches

- Vegetated buffer
- Erosion seeding

A partial list of temporary sediment control BMPs include the following strategies:

- Silt fence
- De-silting basin
- Sediment traps
- Check dam
- Fiber rolls
- Gravel bag berm
- Street sweeping & vacuuming
- Sandbag barrier
- Straw bale barrier
- Storm drain inlet protection

The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.3 Forested Areas

Forest types impacted include riparian areas, upland forest and upland hedgerow. This assessment does not include individual stand-alone trees planted as part of professional landscape material. In the following sections, the amount of riparian forest that would be disturbed, if applicable, is shown in parenthesis after the total area of forest disturbance. The balance remaining constitutes upland forest.

5.1.3.1 No Action Alternative

In the No Action Alternative, each project has the potential to impact forest areas. The sponsors of each project would be responsible for identifying forest impacts.

5.1.3.2 Action Alternatives

The PECO-1st Ave. Alternative would result in 2.9 acres of disturbance to forest resources (1.5 acres of riparian forest). The PECO/TP-1st Ave. Alternative would result in 5.4 acres of disturbance to forest resources (2.8 acres). The PECO/TP-N. Gulph Alternative would result in 3.7 acres of forest resources (1.1 acres). The US 202-1st Ave. Alternative would result in 2.8 acres of disturbance to forest resources (2.2 acres). The US 202-N. Gulph Alternative would result in 1.1 acres of forest resources (1.5 acres).

5.1.3.2.1 Trunks

Disturbance to forest resources associated with the PECO, PECO/TP, and US 202 Trunk lines would be 0.8 acres, 3.3 acres (0.7 acres), and 0.7 acres (0.7 acres) respectively.

5.1.3.2.2 Branches

Disturbance to forest resources associated with the N. Gulph and 1st Ave. Branches would be 0.4 and 2.1 acres (1.5 acres) respectively.

5.1.3.2.3 Station Areas

With the exception of 1st Ave. East, no other station areas impact forest resources. The 1st Ave. East Station would result in 0.6 acres of disturbance.

5.1.3.2.4 69th Street Transportation Center

The proposed improvements would not impact forests.

5.1.3.3 Minimization and Mitigation

As the Project advances, SEPTA will design and construct the selected alternative taking into special consideration the potential effects its actions could have on forested areas. In order to address the forest impacts at construction sites, SEPTA will consider means to avoid the impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize the area it disturbs and mitigate impacts by replacing trees that are removed due to construction with small trees (≤15') suitable for city environment plantings under low overhead utility wires or in restricted spaces. Indigenous plant material would be utilized where reasonably feasible. SEPTA will also mitigate impacts to forest habitats through enhancement, by removing invasive species and augmenting existing indigenous vegetation with additional species where warranted.

The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.4 Fields

In the existing condition, no active agricultural fields are located within the Project study area. Currently, the PECO right-of-way provides 42 acres of successional-field related habitat for a variety of species. Due to the corridor's dedicated use, agricultural activities are not permitted.

5.1.4.1 No Action Alternative

In the No Action Alternative, each project has the potential to impact fields. Project sponsors would be responsible for identifying the impacts of their projects on fields.

5.1.4.2 Action Alternatives

The PECO-1st Ave. Alternative would impact 8.0 acres of field habitat; the PECO/TP-1st Ave. Alternative would impact 3.5 acres of field habitat. The PECO/TP-N. Gulph Alternative would impact 3.5 acres of field habitat. Neither the US 202-1st Ave. Alternative nor the US 202-N. Gulph Alternative would impact fields.

5.1.4.2.1 Trunks

Disturbance to fields associated with the PECO and PECO/TP Trunks would be 8.0 acres and 3.5 acres, respectively. The US 202 Trunk would not impact fields.

5.1.4.2.2 Branches

Neither the N. Gulph Branch nor the 1st Ave. Branch would impact fields.

5.1.4.2.3 Station Areas

The proposed station areas would not impact fields.

5.1.4.2.4 69th Street Transportation Center

The proposed improvements would not impact fields.

5.1.4.3 Minimization and Mitigation

As the Project advances, SEPTA will design and construct the selected alternative taking into special consideration the potential effects its actions could have on fields.

5.1.5 Wetlands

5.1.5.1 No Action Alternative

In the No Action Alternative, each project has the potential to impact wetlands. Project sponsors would be responsible for assessing their project's impacts, minimizing effects and providing mitigation if warranted.

5.1.5.2 Action Alternatives

Portions of four of the Action Alternatives would cross potential wetland areas associated with Crow Creek. The following Action Alternatives potentially would disturb 0.05 acres of wetland area due to minor vegetative clearing. Small trees (≤15') and understory vegetation would remain. No fill would be placed in wetlands.

- PECO/TP-1st Ave.
- PECO/TP-N. Gulph
- US 202-1st Ave.
- US 202-N. Gulph

5.1.5.2.1 Trunks

Both the PECO and US 202 Trunks potentially would disturb 0.05 acres of wetland area due to minor vegetative clearing. Small trees (≤15') and understory vegetation would remain. No fill would be placed in wetlands.

5.1.5.2.2 Branches

There are no anticipated impacts to wetlands by the Branches.

5.1.5.2.3 Station Areas

There are no anticipated impacts to wetlands by the stations areas.

5.1.5.2.4 69th Street Transportation Center

The proposed improvements would not impact wetlands.

5.1.5.3 Minimization and Mitigation

Under Section 404 of the CWA and PA Code Title 25 § 105, impacts to waters of the U.S., including wetlands and open water features, must be avoided, minimized, or mitigated to ensure that there is no net loss of functions and values of wetland habitats.

As the Project advances, SEPTA would design and construct the selected alternative taking into special consideration the potential effects its actions could have on wetlands. Specifically, SEPTA will consider means to avoid wetland impacts through design refinements. Each of the Action Alternatives would use an elevated guideway in the vicinity of potential wetland areas, minimizing wetland impacts. The elevated guideway would be a sufficient length to completely span the affected wetland areas and at an elevation that does not prohibit sunlight or precipitation from reaching the ground; therefore, vegetative growth is not impeded. The low vegetation (herbaceous, shrub, and small tree) community would be minimally impacted.

If warranted, SEPTA would mitigate potential impacts to wetlands in coordination with the US Army Corps of Engineers (ACOE) and PADEP. The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with ACOE and PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.6 Waterways and Floodplains

This section describes potential impacts of the Action and No Action Alternatives on the four waterways in the Project study area: Crow Creek UNT (Abrams Run), Crow Creek, Trout Creek UNT, and Trout Creek, and the two waterways in the 69th Street Transportation Center study area: Cobbs Creek and Cobbs Creek UNT.

5.1.6.1 No Action Alternative

In the No Action Alternative, each project has the potential to impact waterways and floodplains. Project sponsors would be responsible for identifying the impacts of their projects on these resources and for determining means to avoid or minimize impacts, and for determining appropriate mitigation, if warranted.

5.1.6.2 Action Alternatives

Each Action Alternative would cross waterways and floodplains; however, each Action Alternative would use an elevated guideway in the vicinity of waterways and floodplains, minimizing impacts to the resources. The elevated guideway would be at a sufficient length to completely span the waterway and floodplain and at an elevation that exceeds the flood hazard elevation. No fill would be placed in waterways or floodplains; therefore, no impacts are anticipated. Disturbances to riparian zone vegetation are discussed in Section 5.1.3 Forest Areas.

5.1.6.2.1 Trunks

No fill would be placed in waterways or floodplains; therefore, no impacts are anticipated. Disturbances to riparian zone vegetation are discussed in Section 5.1.3 Forest Areas.

5.1.6.2.2 Branches

No fill would be placed in waterways or floodplains; therefore, no impacts are anticipated. Disturbances to riparian zone vegetation are discussed in Section 5.1.3 Forest Areas.

5.1.6.2.3 Station Areas

There are no anticipated impacts to waterways or floodplains caused by the station areas.

5.1.6.2.4 69th Street Transportation Center

The proposed improvements would not impact Cobbs Creek. Further investigation would be required to determine the path of Cobbs Creek UNT that is conveyed beneath the transportation center.

5.1.6.3 Minimization and Mitigation

Under Section 404 of the CWA and PA Code Title 25 § 105, impacts to waters of the U.S., including wetlands and open water features, must be avoided, minimized, or mitigated to ensure that there is no net loss of functions and values of wetland or waterways.

Waterway and floodplain impacts have been minimized by utilizing an elevated guideway that would be constructed at a sufficient length to completely span the waterway and floodplain, and at an elevation that exceeds the flood hazard elevation. No fill would be placed in the waterway or floodplain. Disturbances to riparian zone vegetation are discussed in Section 5.1.3 Forest Areas.

SEPTA will consider means to avoid the impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts. Mitigation for riparian zone vegetation is discussed in Section 5.1.3 Forest Areas.

The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with ACOE and the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.7 Groundwater Recharge Areas

Development can dramatically alter the hydrologic response of an area and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or return that portion that has infiltrated into the ground back into the atmosphere. Development can remove this beneficial vegetation and replace it with turf grass lawns and a variety of impervious surfaces, thereby reducing these benefits. Development activities can also in increased rates and volumes of stormwater runoff/pollution from a site resulting in increased flooding, increased sedimentation and erosion, decreased wildlife and environmental modification and loss.

Impacts to groundwater recharge areas are caused by the replacement of pervious surface (lawns, fields, forests, etc.) with impervious surface (asphalt, concrete, etc.). Soils in hydrologic soil group A and B have a high recharge rate while the recharge rate is diminished in hydrologic group C and D.

5.1.7.1 No Action Alternative

In the No Action Alternative, each project that would add new impervious surfaces has the potential to impact groundwater recharge areas, likely reducing the total area of pervious land available for recharge. The sponsors of these projects would be responsible for determining the change in recharge area due to their projects, and addressing that impact.

5.1.7.2 Action Alternatives

Each Action Alternative would increase impervious surface area. Table 5-1.3 compares the net increase of impervious surfaces for each of the Action Alternatives.

In general terms, the highest increase in impervious surface results in the highest reduction in groundwater recharge ability. The impervious surface calculations performed for this report are based on the following assumptions:

- The portion of the elevated guideway located directly over existing impervious surfaces does not constitute new impervious surface.
- The portion of the elevated guideway located over pervious land (not covered with pavement or buildings) would be at a height that does not prohibit sunlight or precipitation from reaching the ground; therefore, vegetation growth would not be impeded.
- The portion of the guideway, stations, etc., located on pervious land is considered new impervious surface, and for the purpose of this document, also corresponds to each Action Alternative's soil disturbance.

Table 5-1.3: Reduction in Groundwater Recharge Area

Action Alternative	Net Increase in Impervious Surface/Groundwater Recharge Reduction (Acres)
PECO-1st Ave.	12.9
PECO/TP-1st Ave.	9.8
PECO/TP-N. Gulph	11.0
US 202-1st Ave.	3.9
US 202-N. Gulph	4.9

Source: Malick & Scherer, 2015.

5.1.7.2.1 Trunks

Each trunk would increase impervious surface area. The net increase in impervious surfaces in the PECO Trunk, the PECO/TP Trunk, and The US 202 Trunk study areas would be 7.0 acres, 4.0 acres, and 1.5 acres, respectively.

5.1.7.2.2 Branches

Neither the N. Gulph Branch nor the 1st Ave. Branch would increase impervious surface area.

5.1.7.2.3 Station Areas

Among the station areas, the net increase in impervious surface area and corresponding reduction in groundwater recharge within the station areas, is as follows: DeKalb & Henderson, 0.1 acres; DeKalb Plaza, 0.4 acres; Henderson Road, 1.5 acres; Court, 0.1 acres; Mall Blvd. North, no increase; Mall Blvd. West, 0.6 acres; Plaza West, 0.1 acres; Plaza, no increase; 1st Ave East, 0.2 Acres, 1st & Moore, 0.3 acres; North Gulph, 0.2 acres; Convention Center, 0.3 acres; Henderson Road Park and Ride, 1.5 acres, and Convention Center Park and Ride, 0.3 acres.

Henderson Road station area and the Henderson Road Park-and-Ride would result in the highest net increase in impervious surfaces (1.5 acres), while there is no increase in impervious surfaces at the Mall Boulevard West and Plaza station areas.

5.1.7.2.4 69th Street Transportation Center

The net increase in impervious surface area and corresponding reduction in groundwater recharge within the transportation center is 0.5 acres.

5.1.7.3 Minimization and Mitigation

In order to address the requirements of stormwater water quantity, quality, and recharge, SEPTA will consider means to avoid the impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts utilizing the stormwater management BMPs. Stormwater Management BMPs are techniques, non-structural or structural controls, used to manage the quantity and improve the quality of stormwater runoff. The goal is to reduce or eliminate the contaminants collected by stormwater and capture stormwater for later release in natural volumes and rates.

Effective management of stormwater runoff offers a multitude of benefits including:

- Flood control
- Improved water quality of streams, rivers and other water bodies
- Protection of water resources
- Protection of wetlands and ecosystems
- Protection of public health

A partial list of commonly used stormwater BMPs include the following:

- Rain gardens
- Grassed swales
- Green parking design
- Permeable pavement and pavers
- Rain cisterns
- Riparian buffers
- Retention, and bio-retention basins
- Dry and wet detention basins

- Infiltration basins
- Forebays
- Inlet protection devices
- Swirl concentrators
- Wet vaults
- Green roofs

The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.8 Wellhead Protection Areas (WHPAs)

The Project study area contains four WHPAs for the public water supply wells listed in Table 4-1.5, and identified as Map Nos. 41, 42, 54, and 62. The 69th Street Transportation Center study area does not contain a WHPA.

5.1.8.1 No Action Alternative

In the No Action Alternative, each project sponsor is responsible for determining potential impacts to wellhead protection areas and addressing those impacts.

5.1.8.2 Action Alternatives

Each Action Alternative is within WHPA, Zone II, of the public water supply wells identified as Map Nos. 41, 42, 54, and 62. No impacts are anticipated.

5.1.8.2.1 Trunks

Each trunk is within WHPA, Zone II, for Map Nos. 54 and 62. No impacts are anticipated.

5.1.8.2.2 Branches

Each branch is within WHPA, Zone II, for Map Nos. 41, 42, and 62. No impacts are anticipated.

5.1.8.2.3 Station Areas

The station areas in a WHPA, Zone II, are as follows: DeKalb & Henderson, Map No. 54; DeKalb Plaza, Map No. 54; Henderson Road, Map No. 54; Court, Map No. 62; Mall Boulevard North, Map No. 62; Mall Boulevard West, Map No. 62; Plaza, Map No. 62; Plaza West, Map No. 62; First Avenue East, Map No. 62, 1st & Moore, Map Nos. 41 and 42; North Gulph, not located within a WHPA; Convention Center, Map Nos. 41 and 42; Henderson Road Park-and-Ride, Map No. 54, and Convention Center Park-and-Ride, Map Nos. 41 and 42. No impacts are anticipated.

5.1.8.2.4 69th Street Transportation Center

The 69th Street Transportation Center study area is not within a wellhead protection area. No impacts are anticipated.

5.1.8.2.5 Minimization and Mitigation

Impacts to WHPAs can be mitigated through limiting development within the WHPA and implementation of stormwater management BMPs, specifically the requirements of stormwater water quantity, quality, and recharge, as described in Section 5.1.7 – Groundwater Recharge Areas.

5.1.9 Sole Source Aquifers

As per the Designated Sole Source Aquifers in EPA Region III map and the Sole Source Aquifer Determination for the New Jersey Coastal Plain Aquifer System, tributaries to the Delaware River located in South Eastern Pennsylvania are located within the streamflow source zone of the New Jersey Coastal Plain Sole Source Aquifer.

5.1.9.1 No Action Alternative

Under the No Action Alternative, potential for impact to sole source aquifers would remain unchanged.

5.1.9.2 Action Alternatives

The Action Alternatives are located within the streamflow source zone of the New Jersey Coastal Plain Sole Source Aquifer. Therefore, the each alternative has the potential for effects due to soil disturbance and stormwater runoff as described in Sections 5.1.2 and 5.1.6.

5.1.9.2.1 Trunks

Potential effects are the same as for the Action Alternatives in Section 5.1.9.2.

5.1.9.2.2 Branches

Potential effects are the same as for the Action Alternatives in Section 5.1.9.2.

5.1.9.2.3 Station Areas

Potential effects are the same as for the Action Alternatives in Section 5.1.9.2.

5.1.9.2.4 69th Street Transportation Center

Potential effects are the same as for the Action Alternatives in Section 5.1.9.2.

5.1.9.3 Minimization and Mitigation

In order to protect the aquifer, SEPTA will consider means to avoid the impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts utilizing a variety of BMPs, including but not limited to following: the erosion and sediment control BMPs (Section 5.1.2) and stormwater management BMPs (Section 5.1.6). The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

5.1.10 Threatened and Endangered Species

According to the draft PNDIs, further consultation with the PFBC would be required for each one of the five Action Alternatives because each would cross at least one study area waterway. PFBC has jurisdiction over aquatic resources; no specific species of interest was identified in the PNDI. The draft PNDI for US 202-1st Ave. and US 202-N. Gulph identifies the Action Alternative as being in the range of one known State endangered species, southern red oak *(Quercus falcata)*. Since these alternatives differ from the others in the use of US 202, the area where this plant species has the potential to occur is in the vicinity of US 202. Further consultation with the PFBC would be required if one of these alternatives is selected to finalize the PNDI and to resolve potential impacts to aquatic species. No further review is required by the PGC or by the USFWS. Since no federally regulated species have been identified within the Project study area, no further consultation is required under the Endangered Species Act. Further study/coordination will occur at the state level only. The results of the PNDI request for the 69th Street Transportation Center concluded that no further review is required by any of the regulating agencies. See Appendix D for the PNDI Environmental Review Receipts for each of the Action Alternatives.

Southern red oak is a forest-related species; however, southern red oak also can be found as a stand-alone specimen. As the species is forested related, the area of potential impacts is identical to the forest impacts (Section 5.1.3).

5.1.10.1 No Action Alternative

In the No Action Alternative, the sponsors of each project are responsible for determining the occurrence of and potential for impact to threatened and endangered species.

5.1.10.2 Action Alternatives

The PECO-1st Ave. Alternative potentially would result in 2.9 acres of disturbance to forest resources. The PECO/TP-1st Ave. Alternative potentially would result in 5.4 acres of disturbance to forest resources. The PECO/TP-N. Gulph Alternative potentially would result in 3.7 acres of forest resources. The US 202-1st Ave. Alternative potentially would result in 2.8 acres of disturbance to forest resources The US 202-N. Gulph Alternative potentially would result in 1.1 acres of forest resources.

5.1.10.2.1 Trunks

Potential disturbance to forest resources associated with the PECO, PECO/TP, and US 202 Trunks would be 0.8 acres, 3.3 acres, and 0.7 acres respectively.

5.1.10.2.2 Branches

Potential disturbance to forest resources associated with the N. Gulph and 1st Ave. Branches would be 0.4 and 2.1 acres respectively.

5.1.10.2.3 Station Areas

With the exception of the 1st Ave. East Station, no other station areas potentially impact forest resources. The 1st Ave. East Station potentially would result in 0.6 acres of disturbance.

5.1.10.2.4 69th Street Transportation Center

No impacts to forest resources are anticipated.

5.1.10.3 Minimization and Mitigation

In order to address the potential impacts to threatened and endangered species, SEPTA will consider means to avoid impacts through design refinements. Where impacts cannot be avoided, SEPTA will work to minimize and mitigate impacts through consultation with the DCNR regarding the aforementioned species. If warranted, SEPTA will conduct a survey of the forested areas to determine the presence and/or absence of both species. In the event either species is found within the Project study area, SEPTA will develop a Critical Habitat/Endangered Species Mitigation Plan (CMP) for the Project. The CMP will include BMPs and mitigation opportunities for the identified species. BMPs will include but are not limited to the following:

- Contractor training and construction oversight by qualified environmental professionals.
- Exclusion fences to mark the limits of allowable construction disturbance and to protect rare species from inadvertent disturbance.

In the event that adverse impacts cannot be avoided, a restoration plan may be required to restore the critical habitat or if applicable, relocate the population through transplantation.

The appropriate minimization and mitigation measures will be selected by SEPTA in coordination with the PADEP after a Locally Preferred Alternative is selected and reported in the FEIS.

6.0 Results

This section summarizes the potential environmental impacts of the Action Alternatives, Trunks, Branches, station areas, park-and-rides, and 69th Street Transportation Center improvements on natural resources, compares the Action Alternatives in this regard, and recommends the alternative with least environmental impact. Tables 6-2.1, 6-2.2, and 6-2.3 illustrate a comparison between each of the Action Alternatives and their potential environmental impacts. Green colored fields represent the best performing alternatives with the least environmental impacts; red colored fields represent the worst performing alternatives with most environmental impacts.

6.1 Comparative Discussion

6.2.1 No Action Alternative

Projects in the No Action Alternative have the potential to impact natural resources. Project sponsors will be responsible for identifying natural resources, assessing the effects of their projects on those resources, and complying with applicable regulations.

6.2.2 Action Alternatives

As shown in Table 6-2.1, the US 202-N. Gulph and US 202-1st Ave. Alternatives are the best performing Action Alternatives, as they would have the fewest potential impacts to natural resources. In contrast, the PECO-1st Ave. Alternative would have the most potential impacts to natural resources, primarily due to the large amount of pervious surface area affected along the PECO Trunk. Key differences among the Action Alternatives are in the amounts of disturbance to soils, forests, fields, wetlands, and potential threatened and endangered species habitats, as well as reduction in groundwater recharge area due to increases in impervious pavement and structures.

The Action Alternatives perform similarly in terms of geologic conditions, waterways and floodplains, wellhead protection areas, and sole source aquifers. The results for these parameters do not distinguish among the alternatives.

6.2.3 Trunks

As shown in Table 6.2-1, the US 202 Trunk is the best performing trunk; the US 202 Trunk would be primarily aligned over existing impervious surfaces, resulting in the fewest potential impacts to natural resources. In contrast, the PECO Trunk would have the most potential impacts to natural resources, primarily due to the large amount of pervious surface area affected along the PECO Trunk. The potential impacts of the PECO/TP Trunk fall in between those of the other trunks. Key differences among the trunks are similar to those for the Action Alternatives: the amounts of disturbance to soils, forests, fields, wetlands, and potential threatened and endangered species habitats, as well as reduction in groundwater recharge area due to increases in impervious pavement and structures.

The trunks perform similarly in terms of geologic conditions, waterways and floodplains, wellhead protection areas, and sole source aquifers. The results for these parameters do not distinguish among the trunks.

6.2.4 Branches

As shown in Table 6-2.2, the N. Gulph Branch is the best performing branch. As the N. Gulph Branch would be primarily aligned over existing impervious surfaces, it would impact the fewest natural resources, namely a small area of forest and potential threatened and endangered species habitats. The branches perform similarly in terms of other natural resources parameters: geologic conditions, soils, fields, wetlands, waterways and floodplains, wellhead protection areas, sole source aquifers, and reduction in groundwater recharge area due to increases in impervious pavement and structures. The results for these parameters do not distinguish among the branches.

6.2.5 Station Areas and Park-and-Ride Facilities

As shown in Table 6-2.3 and 6-2.4, the Mall Boulevard North and Plaza station areas are the best performing station areas as each would not impact natural resources. In contrast, the Henderson Road and 1st Ave. East station areas would have the most potential impacts to natural resources. The potential impacts of the other station areas are in between. The key resources that distinguish the station areas are: soil disturbance, forest and potential threatened and endangered species habitat effects, and reduction in groundwater recharge area due to increases in impervious surfaces.

Examining the station areas by Action Alternative, the station areas associated with the US 202-1st Ave. Alternative would have the least impact on soil disturbance and reduction in groundwater recharge as the station areas are proposed primarily where pavement and structures already exist. In contrast, the station areas associated with the PECO/TP-N. Gulph Alternative potentially would have the most impacts on soil disturbance and groundwater recharge area reduction. In terms of forests and potential effects on threatened and endangered species habitat, the PECO/TP-N. Gulph and US 202-N. Gulph Alternatives would have the least potential impacts, while the other Action Alternatives would have greater potential impacts. Overall, the station areas perform similarly in terms of geologic conditions, fields, wetlands, waterways and floodplains, wellhead protection areas, and sole source aquifers. The results for these parameters do not distinguish among the station areas.

The Convention Center Park-and-Ride is the best performing park-and-ride facility as it would have the least natural resources impacts. Key resource areas that distinguish the park-and-ride facilities are soil disturbance and reduction in groundwater recharge area. The Henderson Road Park-and Ride facility would have larger areas of soil disturbance and reduction in groundwater recharge area. The park-and-ride facilities do not distinguish themselves in terms of geologic conditions and no impacts are expected to occur related to forests, fields, wetlands, waterways and floodplains, wellhead protection areas, sole source aquifers, and potential threatened and endangered species habitat.

6.2.6 69th Street Transportation Center

Table 6-2.5 summarizes the potential natural resources impacts of the any one of the Action Alternatives at 69th Street Transportation Center. Improvements to the 69th Street Transportation Center would impact 0.5 acres of soil and groundwater recharge area. Further investigation would be required to determine the path of Cobbs Creek UNT that is conveyed beneath the transportation center. No other impacts to natural resources are anticipated.

6.3 Environmental Permits

This section identifies the environmental permits that may be required to implement the Action and No Action Alternatives.

6.3.1 No Action Alternative

Depending on the nature and extent of the activities to be undertaken to implement the projects in the No Action Alternative, federal state, and local permits and approvals may be required. As described in this technical memorandum, a number of natural resources within the Project study area are protected by law such as waterways, wetlands, and threatened and endangered species habitats; disturbing regulated resources will require obtaining approvals from the regulating authorities. The sponsors of the No Action Alternative projects will be responsible for determining applicable regulations and for obtaining permits and approvals from the appropriate authorities.

6.3.2 Action Alternatives

Implementing any one of the Action Alternatives would require disturbing land to the extent that a PADEP Chapter 102 National Pollutant Discharge Elimination System (NPDES) Permit would be required to protect waterways from soil erosion and sediment migration during construction. Regarding waterways, each Action Alternative may also require a Pennsylvania State Programmatic General Permit (PASPGP-4), provides both Federal USACE Section 404 authorization and State general permit authorization where the guideway crosses existing waterways.

As the Project advances, SEPTA will examine ways to avoid or minimize impacts to regulated natural resources, and will obtain permits and approvals, as appropriate.

Table 6-2.1: Potential Natural Resources Impacts – Action and No Action Alternatives

	No Action Alternative	Action Alternatives				
		PECO-1st Ave.	PECO/TP-1st Ave.	PECO/TP-N. Gulph	US 202-1st Ave.	US 202-N. Gulph Rd
Geologic Conditions - Karst Risk	Risk	Similar Risk				
Amount of Soil Disturbance and Groundwater Recharge Reduction (Acres)	Not measured	12.9	9.8	11.0	3.9	4.9
Amount of Forest and potential threatened and endangered Species Habitat Affected (Acres)	Not measured	2.9	5.4	3.7	2.8	1.1
Amount of Fields Affected (Acres)	Not measured	8.0	3.5	3.5	0	0
Amount of Wetlands Affected (Acres)	Not measured	0	0.05	0.05	0.05	0.05
Amount of Waterways and Floodplains Affected (Acres)	Not measured	No Anticipated Impact				
Number of Wellhead Protection Areas Affected	Not measured	4	4	4	4	4
Sole Source Aquifer Affected	Not measured	No Anticipated Impact				

Notes: Red shading indicates worst performing alternatives; green shading indicates best performing alternatives.
Source: Malick & Scherer, 2015.

Table 6-2.2: Potential Natural Resources Impacts – Guideway

		No Action Alternative	Trunks			Branches		Action Alternatives				
			PECO	PECO/TP	US 202	N. Gulph	1st Ave.	PECO-1st Ave.	PECO/TP-1st Ave.	PECO/TP-N.Gulph	US 202-1st Ave.	US 202-N. Gulph
Geologic Conditions	Karst Formations	Risk	Similar Risk									
Soils	Prime Farmland (Acres)	un	2.4	0	0	0	0	2.4	0	0	0	0
	Farmland of statewide importance (Acres)	un	3.8	3.2	0	0	0	3.8	3.2	3.2	0	0
	Total Disturbance (Acres)	un	7.0	4.0	1.5	0	0	9.0	5.9	6.5	2.5	3.0
Forests (Acres)		un	0.8	3.3	0.7	0.4	2.1	2.9	5.4	3.7	2.8	1.1
Fields (Acres)		un	8.0	3.5	0	0	0	8.0	3.5	3.5	0	0
Wetlands (Acres)		un	0	0.05	0.05	0	0	0	0.05	0.05	0.05	0.05
Waterways and Floodplains (Acres)		un	No Anticipated Impact									
Groundwater Recharge Area Reduction (Acres)		un	7.0	4.0	1.5	0	0	9.0	5.9	6.5	2.5	3.0
Wellhead Protection Areas		un	2	2	2	3	3	4	4	4	4	4
Sole Source Aquifers		un	No Anticipated Impact									
Threatened and Endangered Species (Acres)		un	0.8	3.3	0.7	0.4	2.1	2.9	5.4	3.7	2.8	1.1

Notes: un = to be defined by No Action Alternative project sponsors; red shading indicates worst performing alternatives; green shading indicates best performing alternatives. Some Trunk and Branch study areas overlap; totals for Action Alternatives are adjusted to eliminate overlaps.
Source: Malick & Scherer, 2015.

Table 6-2.3: Potential Natural Resources Impacts – Station Areas

		No Action Alternative	Stations									
			DeKalb & Henderson	DeKalb Plaza	Henderson Road	Court	Mall Blvd North	Mall Blvd West	Plaza West	Plaza	1st Ave. East	1st & Moore Station
Geologic Conditions	Karst Formations	Risk	Similar Risk									
Soils	Prime Farmland (Acres)	un	No Anticipated Impact									
	Farmland of statewide importance (Acres)	un	No Anticipated Impact									
	Total Disturbance (Acres)	un	0.1	0.4	1.5	0.1	0	0.6	0.1	0	0.2	0.3
Forests (Acres)		un	0	0	0	0	0	0	0	0	0.6	0
Fields (Acres)		un	No Anticipated Impact									
Wetlands (Acres)		un	No Anticipated Impact									
Waterways and Floodplains (Acres)		un	No Anticipated Impact									
Groundwater Recharge Reduction (Acres)		un	0.1	0.4	1.5	0.1	0	0.6	0.1	0	0.2	0.3
Wellhead Protection Areas		un	1	1	1	1	1	1	1	1	1	2
Sole Source Aquifers		un	No Anticipated Impact									
Threatened and Endangered Species		un	0	0	0	0	0	0	0	0	0.6	0

Notes: un = to be defined by No Action Alternative project sponsors; red shading indicates worst performing alternatives; green shading indicates best performing alternatives.
Source: Malick & Scherer, 2015.

Table 6-2.4: Potential Natural Resources Impacts – Station Areas and Park-and-Ride Facilities

		Station Areas		Park-and-Ride Facilities		Total Station Area Impacts by Action Alternative				
		North Gulph	Convention Center	Henderson Road	Convention Center	PECO-1st Ave.	PECO/TP-1st Ave.	PECO/TP-N. Gulph	US 202-1st Ave.	US 202-N. Gulph
Geologic Conditions	Karst Formations	Similar Risk				Similar Risk				
Soils	Prime Farmland (Acres)	No Anticipated Impact				No Anticipated Impact				
	Farmland of statewide importance (Acres)	No Anticipated Impact				No Anticipated Impact				
	Total Disturbance (Acres)	0.2	0.3	1.5	0.3	2.1	2.1	2.7	1.1	1.6
Forests (Acres)		0	0	0	0	0.6	0.6	0	0.6	0
Fields (Acres)		No Anticipated Impact				No Anticipated Impact				
Wetlands (Acres)		No Anticipated Impact				No Anticipated Impact				
Waterways and Floodplains (Acres)		No Anticipated Impact				No Anticipated Impact				
Groundwater Recharge Reduction (Acres)		0.2	0.3	1.5	0.3	2.1	2.1	2.7	1.1	1.6
Wellhead Protection Areas		0	2	1	2	7	7	7	7	7
Sole Source Aquifers		No Anticipated Impact				No Anticipated Impact				
Threatened and Endangered Species		0	0	0	0	0.6	0.6	0	0.6	0

Notes: un = to be defined by No Action Alternative project sponsors; red shading indicates worst performing alternatives; green shading indicates best performing alternatives.
Source: Malick & Scherer, 2015.

Table 6-2.5: Potential Natural Resources Impacts – 69th Street Transportation Center

		69th Street Transportation Center
Geologic Conditions	Karst Formations	No Impact; No Resource Present
Soils	Prime Farmland (Acres)	No Impact; No Resource Present
	Farmland of statewide importance (Acres)	No Impact; No Resource Present
	Total Disturbance (Acres)	0.5
Forests (Acres)		No Impact; No Resource Present
Fields (Acres)		No Impact; No Resource Present
Wetlands (Acres)		No Impact; No Resource Present
Waterways and Floodplains (Acres)		No Anticipated Impact
Groundwater Recharge Reduction (Acres)		0.5
Wellhead Protection Areas		No Impact; No Resource Present
Sole Source Aquifers		No Anticipated Impact
Threatened and Endangered Species		No Impact; No Resource Present

Source: Malick & Scherer, 2015.

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APPENDIX A

Acronyms

Acronyms

AA	Alternatives Analysis
ASTM	American Society of Testing and Materials
BEA	Bureau of Economic Analysis
BID	Business Improvement District
BLS	Bureau of Labor Statistics
BLVD	Boulevard
CAA	Clean Air Act
CBD	Central Business District
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHOP	Children's Specialized Hospital
CN	Canadian National Railway
CO	Carbon
CSX	CSX Railroad
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DVRPC	Delaware Valley Regional Planning Commission
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESRI	Ecological Systems Research Institute
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
FTA	Federal Transit Administration
GHG	Greenhouse Gas
GIS	Geographic Information Systems
KOP	King of Prussia
LEP	Limited English Proficient
LPST	Leaking Petroleum Storage Tanks
LWCF	Land and Water Conservation Fund
MBTA	Migratory Bird Treaty Act
MCMC	Michigan City Municipal Coach
MED	Metra Electric District
MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NHSL	Norristown High Speed Line
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NS	Norfolk Southern Railroad
NTD	National Transit Database
NTHP	National Trust for Historic Preservation
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	Operating and Maintenance
OCS	Overhead Contact System
PADEP	Pennsylvania Department of Environmental Protection
PHMC	Pennsylvania Historical and Museum Commission
PM	Particulate Matter
PST	Petroleum Storage Tanks
ROW	Right-of-way
SCC	Standard Cost Categories
SEPTA	Southeastern Pennsylvania Transportation Authority
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
TAZ	Traffic Analysis Zone
TOD	Transit Oriented Development
TP	Pennsylvania Turnpike
USACE	United States Army Corps of Engineers
U.S.C	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
V/C	Volume to Capacity
VFNHP	Valley Forge National Historical Park
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WQC	Water Quality Certification

APPENDIX B

Figures

APPENDIX C

Maps

APPENDIX D

Pennsylvania Natural Heritage PNDI Receipts

APPENDIX E

EDR® DataMap™ Well Search Report