state college area
CONNECTOR

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Engineering Technical Memorandum for the State College Area Connector Planning and Environmental Linkages Study

pennsylvania
DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

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1 INTRODUCTION

The Pennsylvania Department of Transportation (PennDOT), in cooperation with the Federal Highway Administration (FHWA) and coordination with the Centre County Metropolitan Planning Organization (CCMPO), is conducting a State College Area Connector (SCAC) Planning and Environmental Linkages (PEL) Study. The SCAC PEL Study is a collaborative and integrated study approach to transportation planning that considers the environment, community, and local and regional economic goals in the planning phase of transportation decision making. The PEL Study results and decisions will be used as part of the overall project development process that is consistent with the National Environmental Policy Act (NEPA) environmental review process for project(s) identified in the PEL Study[1].

This study is intended to identify transportation problems within the PEL study area, while considering the vision and communities' aspirations and identify potential solutions to address the transportation challenges. This technical memorandum documents the engineering components developed for alternatives screening or considered but not advanced for screening in the SCAC PEL Study.

2 ALTERNATIVE DEVELOPMENT

The engineering effort completed as part of this study builds on prior studies and the historical effort completed over the past 20+ years. The original study, known as the South Central Centre County Transportation Study (SCCCTS), identified a range of potential alternatives that satisfied the purpose and needs as defined at the time. The *2019 Data Refresh Report for the Route 322/144/45 Corridors; Centre County, Pennsylvania* (known as the data refresh report) was completed by PennDOT in 2019 that updated traffic and environmental resources. The data refresh report was used as a basis to initiate this PEL Study.

2.1 Build Alternative

The Build Alternatives presented in the SCCCTS project were used as the starting point to develop the PEL Study Build Alternative corridors. The horizontal and vertical geometry of each was evaluated and modified where needed to comply with current design criteria for the required design speed. This criterion is indicated in **Table 1** in **Appendix A**. Build Alternative corridors were also modified to avoid/minimize impacts to critical environmental resources such as cemeteries, bat caves, archaeological features, and Section 4(f)/6(f) resources. Further modifications were also made to minimize impacts to features that were not present at the time the SCCCTS corridors were developed. New Build Alternative corridors were also developed south of existing US 322.

[1] For more information on the ability to link planning decisions into the NEPA process see

- 23 CFR 450 Appendix A – Linking the Transportation Planning and NEPA Process. https://www.govinfo.gov/content/pkg/CFR-2010-title23-vol1/pdf/CFR-2010-title23-vol1-part450-appA.pdf
- 23 CFR 450.212 Transportation planning studies and project development. https://www.govinfo.gov/content/pkg/CFR-2010-title23-vol1/pdf/CFR-2010-title23-vol1-part450.pdf
- 23 USC 168 Integration of planning and environmental review. https://www.govinfo.gov/content/pkg/USCODE-2015-title23/pdf/USCODE-2015-title23-chap1-sec168.pdf

Each of the conceptual Build Alternative corridors use a common roadway template to approximate the typical footprint required by each alternative. A consistent corridor width was then applied along the length of each alternative corridor. The corridor width contained the roadway typical section, embankment slopes, drainage swales, and local roadway network modifications. The proposed typical section initially used in the development of corridor footprints is shown in **Figure 1**.

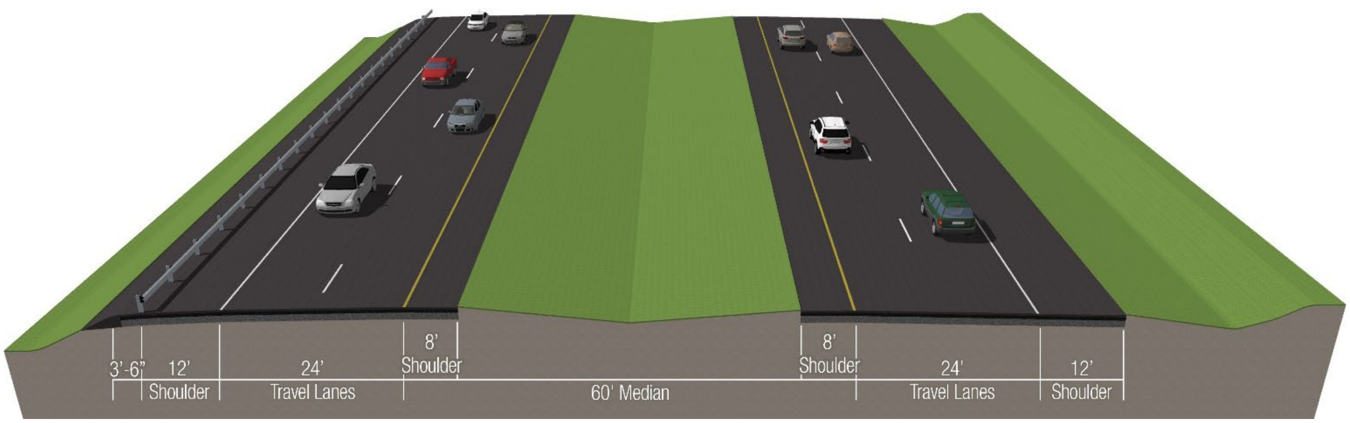


Figure 1 – Build Alternative Typical Section

There are two general Build Alternative corridor families considered to address the transportation purpose and needs within the PEL study area. One corridor family generally follows the existing US 322 from a terminus at Potters Mills Gap to the Mount Nittany Expressway near Boalsburg. The second corridor family generally follows PA 144 from a terminus at Potters Mills Gap to I-99 near Pleasant Gap.

2.2 Upgrade Existing Alternative

In addition to the Build Alternative corridors, an “Upgrade Existing” Alternative was developed along existing US 322 . The Upgrade Existing Alternative had different design criteria, as presented in **Table 1 in Appendix A**. A consistent corridor width was also applied along the Upgrade Existing Alternative. The corridor width contained the roadway typical section, embankment slopes, drainage swales, and local roadway network modifications. The proposed typical section for the Upgrade Existing Alternative is shown in **Figure 2**.

Along existing PA 144, the severity and number of horizontal curves and steepness of vertical grades together with community and socio-economic impacts through the densely developed borough of Centre Hall make an “Upgrade Existing” Alternative unfeasible and impractical. Accordingly, no Upgrade Existing alternative was developed for the PA 144 corridor.

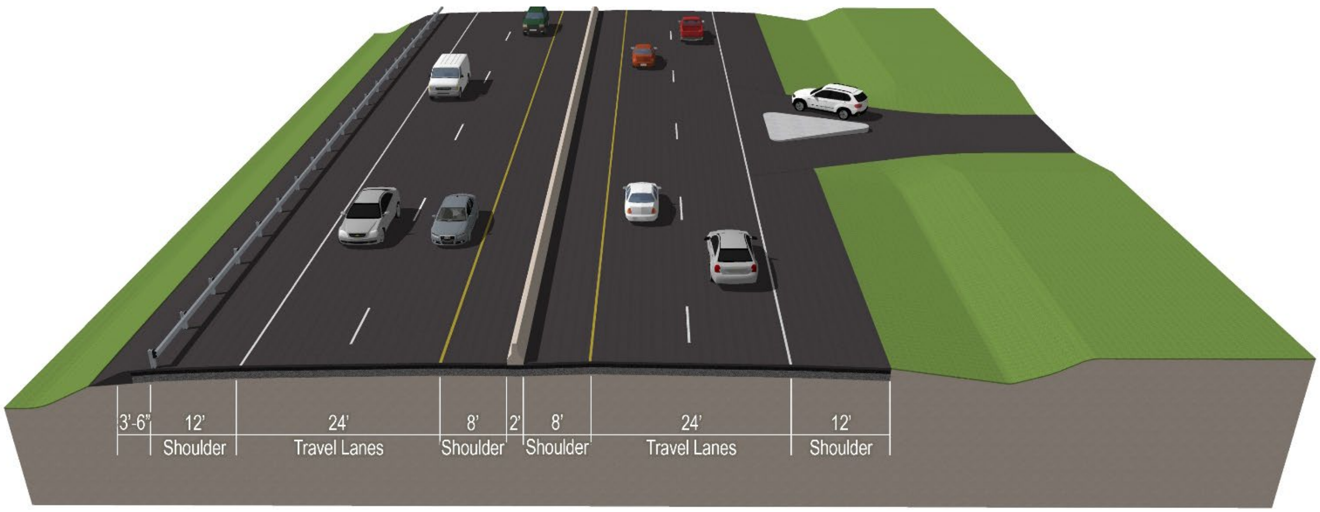


Figure 2 – Anticipated Upgrade Existing Alternative Typical Section

2.3 Alternative Refinement

2.3.1 Limited Access Build Alternatives

Each of the Build Alternative corridors were initially developed using the following parameters, as established in PennDOT Publication 13M (Design Manual Part 2) and the FHWA manual, A Policy on Geometric Design of Highways and Streets (also known as the AASHTO Green Book).

- Design speed – 70 miles per hour (mph)
- Max grade – 4%
- Four (4) travel lanes; full width outside shoulders
- Median width – 60-feet wide if grass; 18-feet wide when paved with concrete barrier separation.
- Fill/Embankment Slope – 2:1 (Horizontal:Vertical)
- Cut slopes ≤ 20-feet – 2:1 (Horizontal:Vertical)
- Cut slopes > 20-feet deep – 1:1 (Horizontal:Vertical)

Following the Fall 2021 Public Meetings, refinements to the design criteria were made to reduce the corridor footprints and associated potential resource impacts, where practical. The most consequential of these changes included the reduction in design speed from 70 mph to 60 mph and a reduction in proposed median widths. According to the latest edition of the AASHTO Green Book, freeways in rural areas are generally designed with design speeds of 50 to 85 mph with 70 mph being the most common design speed. In more urbanized corridors, design speeds of 60 mph are commonly provided due to social and environmental sensitivity. Similarly, in more mountainous terrain where a higher design speed would be less practical due to cost and increased environmental impacts, design speeds of 50 to 60 mph are consistent with driver expectancy and may be used. The selected design speed is used to determine the various geometric design features of the roadway, factoring in topography, anticipated operating speed, adjacent land use, and functional roadway classification. For expressways and Interstate facilities, PennDOT typically sets the design speed 5 mph greater than the posted speed limit. On the US 322 Build Alternative corridors, a 60-mph design speed was selected based on the urban context of the area, particularly at the western end of the corridor, where a higher design speed would result in greater social and environmental impacts, and in consideration of the existing posted speeds on the adjacent roadway sections at either end of the corridor. The recently completed US 322 Potters Mills Gap project at the eastern terminus of the study area used a 60-mph design speed with a posted speed of 55 mph. The same speeds occur on the US 322 Mount Nittany Expressway to the west. A 60-mph design speed was also selected for the PA 144 Build Alternative corridors based on the more mountainous terrain encountered in traversing Nittany Mountain and the existing 60-mph design speed of the US 322 Potters Mills Gap project at the southern terminus of the corridor.

The change from an initial design speed of 70 mph to a 60-mph design speed based on the context and terrain of both corridors was determined to satisfy the study's purpose and need related to driver expectation and system continuity, while also minimizing potential impacts and providing a consistent evaluation of each corridor for comparison purposes.

Median widths were reduced from 60-feet to 36-feet through the majority of the corridor to limit the footprint (**Figure 3**). In more urbanized areas along the US 322 corridor, the median was further reduced to 18-feet to avoid substantial residential impacts and minimize impacts to other sensitive resources. An 18-foot median was also incorporated on the PA 144 Build Alternative north of PA 45 to reduce the volume of excavation and excess material generated by the cut across Nittany Mountain (**Figure 4**).

Design criteria tables for a 70 mph and 60 mph for the Build Alternative corridors are presented in **Appendix A** for comparative purposes of the various geometric design features of the roadway.

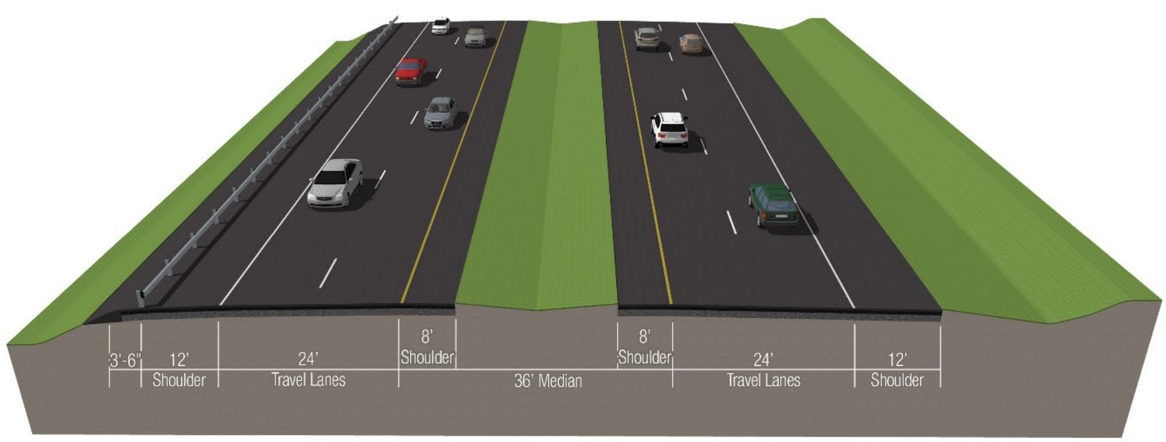


Figure 3 – Standard Proposed Median Typical Section for the Build Alternative

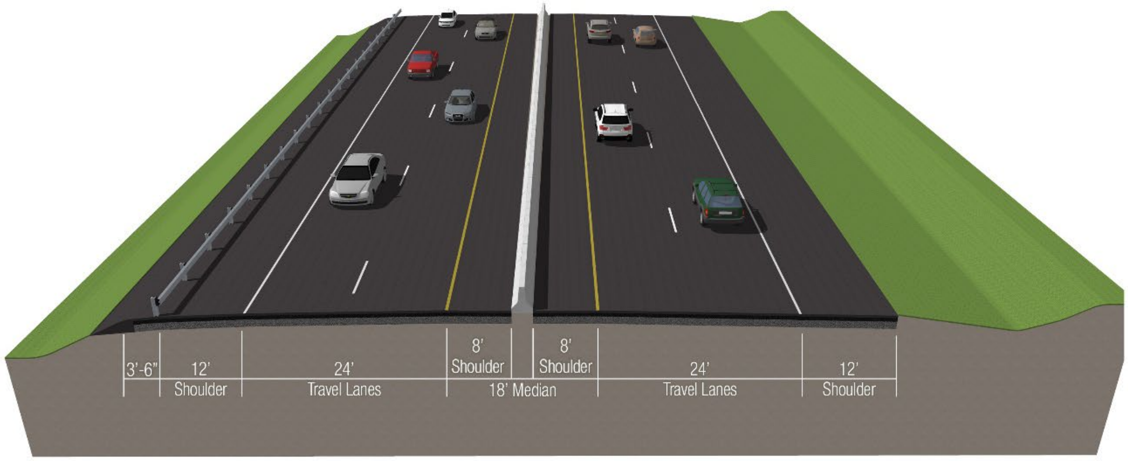


Figure 4 – Minimum Median Typical Section for the Build Alternative

2.3.2 Determination of Corridor Width

Roadway templates were developed for each Build Alternative corridor based on the parameters outlined above depicting travel lanes, shoulders, median, and side slopes. Grade lines were established to generally follow the existing topography with an attempt to limit the height of cuts or fills required as measured along the baseline. The template was applied to the vertical alignment to determine where the proposed excavation or embankment intersected with the existing ground, generating an initial corridor footprint. A 25 to 50-foot buffer was applied to each side of the corridor and a conceptual disturbance area was determined. A uniform width was then established that generally contained the entire footprint as a corridor width for which detailed engineering alignments could be developed in subsequent phases of project development. The conceptual corridor width was presented on exhibits and used when determining surface impacts.

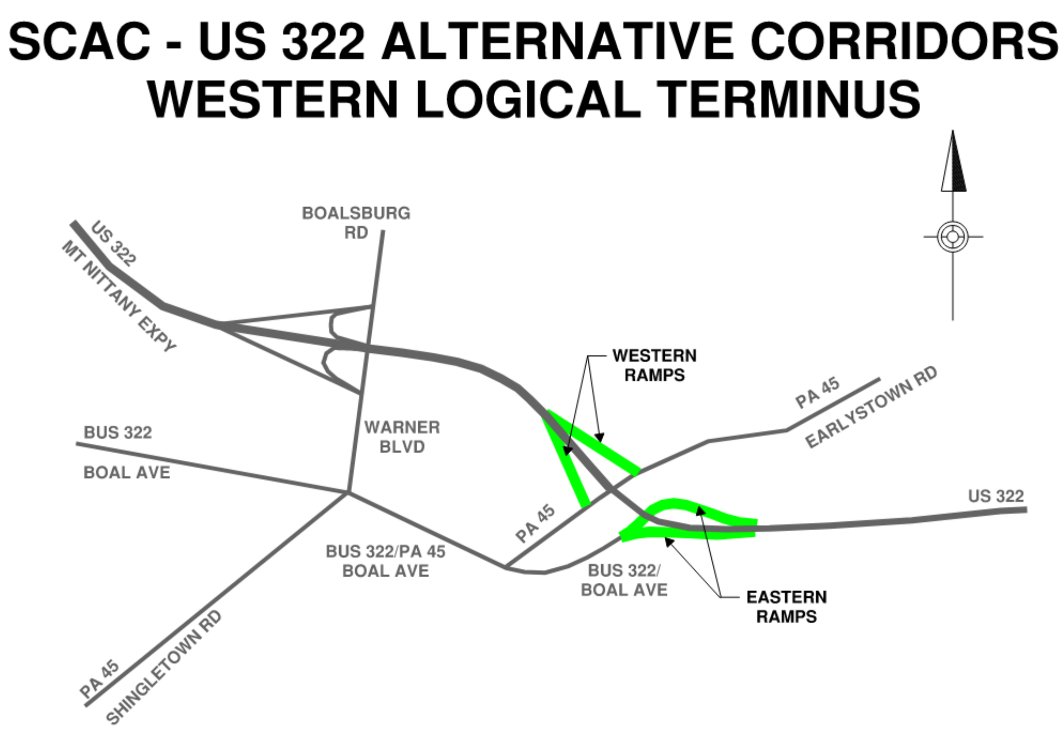
The corridor width was expanded in interchange areas to include the additional potential impact areas associated with ramps and cross street adjustments. Where a Build Alternative corridor overtopped the existing US 322 roadway, a two-lane service road was added adjacent to the new build alternative to provide the necessary local road network connectivity. The corridor width was expanded in these areas to include potential service roads and local road improvements required to complete the specific alternative corridor.

At this time, each Build Alternative corridor uses a common baseline both horizontally and vertically for each direction of travel. As the study advances and the number of alternatives is reduced, more detailed engineering will be performed. Detailed engineering designs could involve using independent baselines for each direction, bifurcating the vertical alignments, or using asymmetrical curvature in an attempt to further reduce the overall alignment footprint and associated impacts.

2.3.3 Interchange Considerations

For both the US 322 and PA 144 Build Alternatives, the alternative corridors being considered require modifications to the existing interchanges at each logical terminus. The logical termini for the US 322 Build Alternative are at the Mount Nittany Expressway to the west and at the US 322/PA 144 interchange at Potters Mills Gap (PMG) to the east. The logical termini for the PA 144 Build Alternative are at the US 322/PA 144 PMG interchange to the south and at the I-99/PA 26 interchange to the north.

For the US 322 alternative corridors, the western terminus is the Mount Nittany Expressway at or near the interchange with PA 45/Earlystown Road. The current configuration of this partial or split interchange with PA 45/Earlystown Road only includes ramps on the western side of PA 45/Earlystown Rd: a US 322 EB off-ramp to PA 45 and a US 322 WB on-ramp from PA 45, referred to herein collectively as the western ramps. The remainder of the interchange movements are accommodated for and located to the east of the US 322/PA 45/Earlystown Road western ramps, but do not connect directly to PA 45/Earlystown Rd. The eastern ramps are formed by a direct connection of US 322 Business/Boal Avenue to US 322 EB via a ramp along the south side of US 322, and a US 322 WB to US 322 Business/Boal Avenue via a ramp under existing US 322. With all the US 322 alternative corridors being considered, these eastern ramps are currently expected to be eliminated; however, more detailed traffic and environmental studies will be performed to determine if the western ramps will be modified or if new/relocated ramps to/from the east will be constructed.



The eastern terminus of the US 322 alternative corridors is the recently constructed PA 144 interchange at Potters Mills Gap. For all alternative corridors, the interchange will remain a full access interchange, accommodating all existing movements to and from US 322/PA 144. Depending on the alternative selected, the ramp connections may be modified to match the new alignment geometry.

For the PA 144 alternative corridors, the southern terminus is the recently constructed US 322/PA 144 interchange at Potters Mills Gap. As is the case for the US 322 alternative corridors, all movements between US 322 and PA 144 will be accommodated with potential modifications to ramp connections to match the new alignment geometry. The northern terminus of the PA 144 alternative corridors is the I-99/PA 26 interchange in Pleasant Gap. At this location, existing single lane ramps will be replaced with two-lane ramps to connect the new four-lane expressway to I-99 north and south.

Each of the Build Alternative corridors are approximately 9 miles in length from either the Mount Nittany Expressway in Boalsburg or the I-99 Interchange near Pleasant Gap to the PA 144/US 322 interchange in Potters Mills. Based on the corridor length and initial traffic analysis completed to date for the PEL Study, a new interchange located approximately midpoint along each of the corridors is being considered. The inclusion of a midpoint interchange could potentially improve the connectivity of local traffic with the new limited-access facility. Advanced traffic studies will be completed in the next phase of the project to evaluate to what extent traffic volumes within the local road network will be affected by this access point to the proposed expressway provided. The proposed midpoint interchange is included for both the US 322 family of corridors as well as the PA 144 family of corridors. Each of the PA 144 alternatives shows the interchange directly with PA 45. For the US 322 alternatives, several options for a mid-point interchange are considered. These options include a midpoint interchange directly with PA 45 (US 322-2 & US 322-3), a midpoint interchange located between PA 45 and US 322 with a new connector road between PA 45 and US 322 (US 322-1OEX, US322-1S), or a midpoint interchange located south of US 322 near Taylor Hill Road with a new (or potentially relocated) connections to US 322 and the local road network (US 322-4 & US 322-5).

For the US 322-1OEX and US 322-1S alternatives, a connector road in addition to and from the new interchange to PA 45 is included in the PEL Study. This connector road was included since Sharer, Wagner, and Tusseyville Roads, all of which connect PA 45 and US 322, are narrow, winding, and in some instances unpaved roadways that are incapable of safely supporting increased traffic demand in their current condition. Also, the connector road was initially located to provide a direct link from PA 45 to the new expressway while limiting impacts to farmlands designated as Agricultural Security Areas and/or having conservation easements. The improvements that would be needed on the existing roads listed above along with the proposed interchange would have more impacts on the existing farmlands than the potential location of the new PA 45 Connector. As the preliminary engineering advances, should the traffic analysis confirm that the connector road is necessary to meet the travel demand and the transportation purpose and need, the specific alignment and placement of the connector road may be modified to maximize effectiveness and minimize impacts. Conversely, should the traffic analysis show that the connector roadway is not needed to address travel demand and does not meet the project purpose and need, it may be eliminated from consideration. Additionally, if construction of the connector road would adversely affect traffic operations and safety on PA 45, additional improvements specifically to PA 45 would be included as part of the SCAC project.

The project team has recently collected current traffic counts and turning movements within the project area. As the project advances through the NEPA (environmental clearance) process, we will use this data to create a more refined traffic model along with a more detailed assessment of environmental impacts to determine whether a midpoint interchange and/or connector road is in fact warranted. The PEL Study reflects inclusion of the interchange for each alternative as a worst-case scenario in evaluating impacts. For the PEL Study, simple single lane, diamond interchange ramp configurations are included at most locations, unless the existing terrain makes this impractical. This provides a reasonable comparison of operational performance and impacts for each of the Build Alternatives. As the corridors advance into the preliminary engineering and environmental investigation, more detailed engineering will be completed, including potential modifications to the location and ramp configuration that minimize specific property impacts and optimize interchange performance.

2.3.4 Bridge Structures

Bridge structures have been included within each Build Alternative corridor based on an initial assessment of topography, features, and local roadway network connectivity. Specifically, this assessment reviewed the feature being crossed (waterway, resource, local roadway) and the feasibility of bridging the feature in a reasonable manner. For local roads, the availability of other side road crossings and associated roadway network connectivity and the ability to provide the required vertical clearance in determining whether to include a bridge crossing was considered. Other structures, such as retaining walls, noise walls, or box culverts, have not been thoroughly investigated at this time. These features will be considered as more detailed engineering is performed for the alternatives advanced in the PEL Study.

3 ALTERNATIVE LOCATIONS

The following provides an overview and rationale for the Build Alternative corridor locations.

3.1 Build Alternative

There were six US 322 Build Alternative corridors and three PA 144 Build Alternative corridors developed for analysis (**Appendix B**).

3.1.1 US 322-1S Build Alternative

This corridor alternative begins at the existing interchange with PA 45 near Boalsburg and follows the existing US 322 to a point east of the Elks Club Road/Bear Meadows Road intersection. The alternative includes bridges over PA 45 and Boal Avenue and eliminates the ramp connections at these two locations. In this area, a two-lane service road will be provided on the north side of the limited access highway to provide connectivity to the local road network. The alternative passes along the Harris Township Maintenance Facility and the Centre Estates/Huntington Park Apartments and bridges over a realigned Bear Meadows Road. The limited access expressway then proceeds generally parallel to and north of existing US 322 and bridges over Sharer Road. An interchange is proposed near Iron Horse Lane and the Harley Davidson Center. The interchange includes a new, two-lane connector road that extends from existing US 322 to PA 45. The corridor continues east where it bridges over Wagner Road before crossing to the south side of existing US 322 near Neff Road in Tusseyville. The corridor parallels the existing road, crosses over Sinking Creek and Dogtown Road as well as Mountain Back Road and connects to the newly constructed PA 144 interchange. The corridor generally uses a 300 to 350-foot corridor width to determine impacts with adjustments to allow for the areas with the two-lane, parallel service road (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This alternative, which is 8.29 miles long, has 2 locations where the maximum grade is anticipated to be used, totaling 3,200 linear feet, or 7.3% of the overall length. The deepest excavation is approximately 80 feet, and the highest fill is 75 feet. There are 10 bridge structures, ranging in length from 50 to 1,600 feet with a maximum height of 70 feet.

3.1.2 US 322-2 Build Alternative

This corridor alternative begins at the existing the Mt. Nittany Expressway Oak Hill full access interchange, proceeds past the Oak Hall Regional Park property, and turns sharply northward behind Linden Hall. The corridor crosses over Linden Hall Road, Cedar Run, and Brush Valley Road, then turns eastward and crosses Houser Road and Lenawee Lane before turning southward. The corridor crosses Lower Brush Valley Road and PA 45. An interchange is proposed at PA 45, east of Sharer Road, including a new, two-lane connector road that extends from existing US 322 to PA 45. The corridor continues east behind the Harley Davidson Center, continuing eastward where it bridges over Wagner Road before crossing to the south side of existing US 322 near Neff Road in Tusseyville. The corridor parallels the existing road, crosses over Sinking Creek and Dogtown Road as well as Mountain Back Road and connects to the newly constructed PA 144 interchange. The corridor generally uses a 350-foot corridor width to determine impacts (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This alternative, which is 8.36 miles long, has 1 location where the maximum grade is anticipated to be used, totaling 1,700 linear feet, or 3.9% of the overall length. The deepest excavation is approximately 60 feet, and the highest fill is 75 feet. There are 13 bridge structures, ranging in length from 50 to 1,600 feet with a maximum height of 70 feet.

3.1.3 US 322-3 Build Alternative

This corridor alternative begins at the existing Oak Hall interchange, proceeds past the Oak Hall Regional Park property, and turns sharply northward. The corridor crosses over Linden Hall Road and Cedar Run before turning southward and crossing back over Cedar Run and Linden Hall Road. The corridor impacts the northern portion of the Linden Hall community and crosses Linen Hall

Road and PA 45. An interchange is proposed at PA 45 west of Sharer Road, including a new, two-lane connector road that extends from existing US 322 to PA 45. The corridor continues east and crosses Sharer Road, continues behind the Harley Davidson Center, continuing eastward where it bridges over Wagner Road before crossing to the south side of existing US 322 near Neff Road in Tusseyville. The corridor parallels the existing road, crosses over Sinking Creek and Dogtown Road as well as Mountain Back Road and connects to the newly constructed PA 144 interchange. The corridor uses a 350-foot corridor width to determine impacts (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This alternative, which is 9.68 miles long, has 2 locations where the maximum grade is anticipated to be used, totaling 3,200 linear feet, or 6.3% of the overall length. The deepest excavation is approximately 85 feet, and the highest fill is 100 feet. There are 12 bridge structures, ranging in length from 50 to 1,600 feet with a maximum height of 75 feet.

3.1.4 US 322-4 Build Alternative

This corridor alternative begins at the existing interchange with PA 45 near Boalsburg and extends the tangent alignment across new bridges over PA 45, Boal Avenue and Discovery Drive until turning eastward as it rises onto a ridge along of Tussey Mountain. The new corridor impacts the Boalsburg Technology Park and Calvary Harvest Church properties. The corridor passes between residential neighborhood and the Tussey Mountain Ski Resort with a proposed bridge carrying Bear Meadows Road over the limited access facility. The corridor continues along the ridge behind most of the residential communities and the Shaner Recreational Park complex. An interchange is proposed with a relocated Taylor Hill Road. The corridor then proceeds generally parallel to and south of existing US 322 and bridges over Church Hill Road, Dogtown Road, and Red Mill Road and connects to the newly constructed PA 144 interchange. This alternative uses a 350-foot corridor width to determine impacts (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This alternative, which is 8.58 miles long, has 1 location where the maximum grade is anticipated to be used, totaling 1,700 linear feet, or 3.7% of the overall length. The deepest excavation is approximately 70 feet, and the highest fill is 80 feet. There are 8 bridge structures, ranging in length from 50 to 1,500 feet with a maximum height of 60 feet.

3.1.5 US 322-5 Build Alternative

This corridor is similar to US 322-4 Build Alternative except the western end connection to the Mount Nittany Expressway. This corridor alternative begins at the existing interchange with PA 45 near Boalsburg and follows the existing US 322 alignment to a point east of the Elks Club Road/Bear Meadows Road intersection. The new corridor includes bridges over PA 45 and Boal Avenue and eliminates the ramp connections at these two locations. In this area, a two-lane service road will be provided on the north side of the limited access highway to provide connectivity to the local road network. The alternative passes along the Harris Township Maintenance Facility and the Centre Estates/Huntington Park Apartments and bridges over a realigned Bear Meadows Road. The corridor then turns southeastward and climbs the ridge and passes behind the Nittany Grove residential community before turning eastward. From this point to the eastern connection to the interchange with PA 144 at Potters Mills Gap, the corridor is identical to Build Alternative 322-4. The corridor continues along the ridge behind most of the residential communities and the Shaner Recreational Park complex. An interchange is proposed with a relocated Taylor Hill Road. The corridor then proceeds generally parallel to and south of existing US 322 and bridges over Church Hill Road, Dogtown Road, and Red Mill Road and connects to the newly constructed PA 144 interchange. The alternative uses a 350-foot corridor width to determine impacts (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This corridor, which is 8.36 miles long, has 1 location where the maximum grade is anticipated to be used, totaling 1,700 linear feet, or 3.9% of the overall length. The deepest excavation is approximately 70 feet, and the highest fill is 80 feet. There are 7 bridge structures, ranging in length from 120 to 1,500 feet with a maximum height of 60 feet.

3.1.6 US 322-1OEX Build Alternative

This corridor is a hybrid of other Build Alternatives, attempting to maximize the use of the existing US 322 alignment. This corridor alternative begins at the existing interchange with PA 45 near Boalsburg and follows the existing US 322 alignment to a point east of the Elks Club Road/Bear Meadows Road intersection. The new corridor includes bridges over PA 45 and Boal Avenue and eliminates the ramp connections at these two locations. In this area, a two-lane service road will be provided on the north side of the limited access highway to provide connectivity to the local road network. The alternative passes along the Harris Township Maintenance Facility and the Centre Estates/Huntington Park Apartments and bridges over a realigned Bear Meadows Road. The limited access expressway then proceeds generally parallel to and north of existing US 322 and bridges over Sharer Road. An interchange is proposed near Iron Horse Lane and the Harley Davidson Center. The interchange includes a new, two-lane connector road that extends from existing US 322 to PA 45. The corridor continues east where it bridges over Wagner Road before overtopping the existing US 322 alignment near Neff Road in Tusseyville. The corridor passes under a proposed bridge carrying Church Hill Road over the expressway and bridges over Dogtown Road and Sinking Creek. The limited access facility continues over top of existing US 322, bridging over Mountain Back Road before connecting with the newly constructed PA 144 interchange. The alternative generally uses a 450-foot corridor width to determine impacts on each end that overtops existing US 322 and a 350-foot corridor width where no service road is required (**Appendix B**).

The maximum allowable vertical grade as noted above is 4%. This corridor, which is 6.17 miles long, has one location where the maximum grade is anticipated to be used, totaling 2,200 linear feet, or 6.6% of the overall length. The deepest excavation is approximately 60 feet, and the highest fill is 45 feet. There are 11 bridge structures, ranging in length from 50 to 1,400 feet with a maximum height of 40 feet.

3.1.7 PA 144-1 Build Alternative

This corridor alternative begins at the newly constructed Potters Mills PA 144 interchange and would proceed in a northerly direction and bridge Red Mill Road near Goodhart Road. It would proceed northerly and bridge McCool Road (T-411) and Airport Road (SR 2008) near its intersection with Goodhart Road. The corridor would pass on the east side of an archaeological site paralleling existing PA 144 and bridge Easy Street. The corridor would then curve to the west at PA 45 and pass behind the businesses and bridge Rudy Lane. An interchange would be proposed at PA 45 between Rudy Lane and Williams Road to provide local access. The corridor would then proceed to the north and bridge Upper Brush Valley Road to the east of Black Hawk Village mobile home park. The corridor would proceed north through Black Hawk Gap and curve to the east and bridge existing PA 144 to the north of Lower Greens Valley Road. The corridor would continue in a northeasterly direction across Mount Nittany and cross through the Glenn O. Hawbaker, Inc. Pleasant Gap Quarry Facility and bridge PA 26 at the existing PA 26 ramps with an interchange proposed for local access. The corridor terminates at the existing PA 26/ I-99 interchange. The corridor generally uses a 325-foot to 350-foot corridor width to determine impacts from the point of beginning to north of PA 45. The corridor width expands to 750-foot as it passes through the steep terrain of Nittany Mountain (**Appendix B**).

This corridor is 10.3 miles long, has 3 locations where the maximum 4% grade is anticipated to be used, totaling 25,600 linear feet, or 47.1% of the overall length. The deepest excavation is approximately 200 feet, and the highest fill is 95 feet. There are 15 bridge structures, ranging in length from 150 feet to 1,200 feet with a maximum height of 125 feet.

3.1.8 PA 144-2 Build Alternative

This corridor alternative would follow the PA 144-1 Build Alternative from its beginning at the newly constructed Potters Mills PA 144 interchange to the north at Upper Brush Valley Road. After it crosses Upper Brush Valley Road, the corridor would shift in an easterly direction through Black Hawk Gap. The corridor would proceed in a northerly direction and bridge existing PA 144 to the north of Lower Greens Valley Road. It would continue in a northeasterly direction across Mount Nittany and cross through the Glenn O. Hawbaker, Inc. Pleasant Gap Quarry Facility and bridge PA 26 at the existing PA 26 ramps with an interchange proposed for local access. The corridor terminates at the existing PA 26/ I-99 interchange. The corridor generally uses a 325-foot to 350-foot corridor width to determine impacts from the point of beginning to north of PA 45. The corridor width expands to 750-foot as it passes through the steep terrain of Nittany Mountain (**Appendix B**).

This corridor is 10.5 miles long, has 3 locations where the maximum 4% grade is anticipated to be used, totaling 22,600 linear feet, or 40.8% of the overall length. The deepest excavation is approximately 130 feet, and the highest fill is 150 feet. There are 15 bridge structures, ranging in length from 150 feet to 1,200 feet with a maximum height of 175 feet. An approximately 2,500 linear foot retaining wall would be needed where the corridor crosses PA 144 due to the proximity of PA 45 and Gap Run Creek.

3.1.9 PA 144-3 Build Alternative

This corridor alternative would begin at the newly constructed Potters Mills PA 144 interchange and proceed in a northerly direction and bridge Red Mill Road near Goodhart Road. It would proceed northerly and bridge McCool Road (T-411) and Airport Road (SR 2008) southwest of its intersection with Goodhart Road and would pass on the west side of an archaeological site. It would continue northwesterly and bridge PA 45 near Williams Road. An interchange would be proposed at PA 45 to provide local access. The corridor would continue north and then curve to the west through Black Hawk Gap after it bridges Upper Brush Valley Road. It would proceed north and the curve to the east and bridge existing PA 144 to the north of Lower Greens Valley Road. The corridor would continue in a northeasterly direction across Mount Nittany and cross through the Glenn O. Hawbaker, Inc. Pleasant Gap Quarry Facility and bridge PA 26 at the existing PA 26 ramps with an interchange proposed for local access. The corridor would terminate at the existing PA 26/ I-99 interchange. The corridor uses a 325-foot to 350-foot corridor width to determine impacts from the point of beginning to north of PA 45. The corridor width expands to 750-foot as it passes through the steep terrain of Nittany Mountain (**Appendix B**).

This corridor is 9.7 miles long, has 3 locations where the maximum 4% grade is anticipated to be used, totaling 18,900 linear feet, or 37.0% of the overall length. The deepest excavation is approximately 170 feet, and the highest fill is 95 feet. There are 13 bridge structures, ranging in length from 165 feet to 1,200 feet with a maximum height of 130 feet. An approximate 2,100 linear foot retaining wall would be needed where the corridor crosses PA 144 due to the proximity of PA 45 and Gap Run Creek.

3.2 US 322 Upgrade Existing Alternative

The US 322 Upgrade Existing Alternative follows the existing US 322 centerline alignment and includes four lanes, a paved median with concrete barrier separation, and full-width shoulders. The alternative is designed as a controlled-access highway, with at-grade intersections and jughandle turnarounds strategically located to maintain local road network connectivity. It provides a design speed of 55 mph and uses a maximum vertical grade of 6% is anticipated to be used. The corridor extends from the Mount Nittany Expressway to the newly constructed 322/144 interchange at Potters Mills Gap. A 250-foot corridor width is used to measure impacts. Left turns are allowed from US 322 at designated at-grade intersections; however, left turns from side roads or driveways will be prohibited (**Appendix B**).

4 OTHER ALTERNATIVES CONSIDERED

The following sections document alternatives ideas that were considered but not advanced for further investigation.

4.1 PA 144 Upgrade Existing Alternative

An initial review of the existing geometry identified multiple locations with substandard conditions including sharp horizontal curves and steep vertical grades. The portion of existing alignment as it proceeds up and over Nittany Mountain is substandard even for the posted speed limit of 35 mph. There is a series of eight reverse curves and grades as steep as 9% that grossly exceed current design standards.

To increase this to 55 mph and widen to the 4-lane standard typical section with a barrier separated median would stray from the existing centerline, becoming in effect, a new, offline build alternative. The adjacent property impacts, particularly through the Borough of Centre Hall, would be substantial and cost prohibitive.

4.2 PA 144 Tunnel Build Alternative Option

A conceptual tunnel alternative was investigated. The tunnel corridor would begin on the northeast side of PA 144 and end at the curve before PA 26. Based on the AASHTO Green Book a typical two-lane tunnel section is 44 feet in width (2-12’ lanes, 10’ right shoulder, 5’ left shoulder, and 2.5’ curb/sidewalk on each side), therefore the overall width would be approximately 88 feet. The length of tunnel required is estimated to be 7000 feet.

A tunnel alternative was dismissed from previous studies due to initial construction and long-term maintenance costs. Other factors that would deem tunneling as infeasible include excessive impacts to the existing underground mining operations and quarries, and the probability of encountering pyritic material during blasting and excavation operations. The cost of handling and disposal or treatment of the pyritic material would add to the costs of this alternative. The PA Turnpike Commission is currently advancing a project to eliminate the Allegheny Tunnel by constructing 3.8 miles of new roadway, in part, because of the traffic, safety, and the cost of refurbishing and operating the tunnel. Additionally, trucks carrying hazardous materials would not be allowed to traverse the tunnel, therefore would remain on the local roadway network.

4.3 PA 144 – Quarry Avoidance Build Alternative Option

Alternatives and impacts were considered to avoid the existing, active surface mining operations at the Glenn O. Hawbaker, Inc. Pleasant Gap Facility. An avoidance alternative was added to each of the PA 144 Build Alternatives that followed each respective corridor. The avoidance alternative would bridge existing PA 144 and continue in a northeasterly direction paralleling the Bald Eagle State Forest between the Forest and the Glenn O. Hawbaker, Inc. Pleasant Gap Quarry Facility. The avoidance corridor would then curve to the northwest around the active quarry and cross PA 64 at the Felder Road/Gilltown Road intersection with a proposed local access interchange. The alternative would terminate at the existing PA 26/ I-99 interchange. The avoidance corridor width expanded to 800-foot as it passed through the steep terrain of Nittany Mountain.

A quarry avoidance alternative was dismissed due to the additional cost of construction and maintenance. Also, quarry avoidance would have higher forest land impacts and would cause additional fragmentation of the large Nittany Mountain forested area in a region that is relatively undisturbed. The probability of encountering bat habitats or swarming areas near bat caves would also be high.

4.4 PA 144 Nittany Mountain Crossing Build Alternative Option (at McBride Gap)

This alternative would follow the PA 144–3 corridor beginning at the Potters Mills Gap Interchange and proceed north through the proposed PA 45 interchange. From this point, the corridor would proceed north and west through the McBride Gap, across the Rockview State Correctional Institution property to reach I-99 at the Harrison Road interchange, west of Pleasant Gap. An initial review of this corridor was performed and found it would have the highest forest land impact of all proposed alternatives and would cause additional fragmentation of the large Nittany Mountain forested area in a region that is relatively undisturbed. The alternative would also extend between two known bat caves (approximately 1.2 miles from the Rockview Cave and 1.8 miles from the J-4 cave) which increases the concern for the high forest impacts since this area is within the swarming areas of protected bat species. In addition, the alternative would extend almost entirely through the Rockview State Correctional Institute property and through the associated National Register boundary of the NRHP-eligible Rockview SCI Historic District (as currently defined). These issues would be major right-of-way acquisition issues that would most likely impede the development of the alternative. There are also security concerns with developing a corridor through prison property that would most likely increase the cost of construction and maintenance and possibly add to the obstruction of wildlife movement typically accommodated/mitigated in natural areas by constructing wildlife corridors using enhanced culvert designs that would in turn add to prison security concerns. Lastly, as the alternative would extend through the natural gap created by Logan Branch (McBride Gap), it would cross through the Logan Branch headwaters and encroach into the vicinity of the State Correctional Institutes (SCI's) reservoir that serves as one of the SCI's water supply sources. The PA Fish and Boat Commission has identified Logan Branch as the largest tributary to Spring Creek, accounting for about 1/3 of the total flow and it is designated a High Quality/Cold Water Fishes stream that is also a Class A Trout stream.

4.5 US 322-1N Build Alternative

A variation of the US 322-1S Build Alternative corridor was considered. This variation was identical from the western project limit east through the proposed interchange near Iron Horse Lane and the Harley Davidson Center to Tusseyville. At Tusseyville, this corridor continued to the north of existing US 322 and connected to the recently constructed PA 144 interchange with 322 at Potters Mulls Gap. While the engineering performance, earthwork, and cost of 322-1N was similar to the 322-1S alternative, its impact to the Sinking Creek floodplain, natural heritage inventory and the high-quality wetland system would be excessive. Because there were a similar number of residential and farm impacts as 322-1S, there was no significant advantage to using this alternative. Therefore, 322-1N was dismissed from further study.

4.6 "One Way Pair" Alternative

Based on a comment from the April 2022 public meeting, an evaluation was completed on an alternative corridor concept using the western portions of existing US 322 and PA 45 within the study area to carry one-way traffic eastbound and westbound respectively. This concept would provide a new four-lane, limited access facility paralleling existing US 322 from Potters Mills to just west of Tusseyville, where the westbound lanes would diverge and traverse north to tie into PA 45, then follow PA 45 as a one-way, limited access highway to Boalsburg where it would rejoin US 322 at the Mt. Nittany Expressway. Conversely, one-way, eastbound traffic would follow existing US 322 from the end of the Mount Nittany Expressway in Boalsburg to Tusseyville and the convergence point. Along the one-way sections of roadway, two-lane service roads would provide access to adjacent properties and local side roads.

Although the concept used the existing roadways to the extent possible with the intent of limiting impacts, the need to provide a limited access facility and still maintain local access via service roads, resulted in impacts which exceeded other build alternatives. On PA 45 in particular, substantial widening would be required to provide lane and shoulder widths that meet current design standards for a limited access facility. Constructing the service roads also results in an increase in the number of displacements along with impacts to the natural resources adjacent to the existing roadway. In addition, there would be an increase in noise levels over existing conditions, particularly along PA 45, and additional structure costs associated with the service roads and grade separation needed to connect and maintain access to the local road network.

5 DEVELOPMENT OF PLANNING-LEVEL COST ESTIMATES

An approximate cost-per-foot of Build Alternative corridor estimate was developed to compare order-of-magnitude initial construction cost for each alternative in 2021 dollars. The calculations and assumptions used to derive these costs are included in **Appendix C**. The per foot cost includes the following items:

- Mainline Travel Lane pavement
- Shoulders
- Paved or grass median.
- Drainage system – including inlets, pipe, and pavement base drain.
- Seed, mulch, and Stormwater management features
- Guide rail and R/W Fence
- Signing, Pavement markings and delineators

The length of each corridor (minus structure length) was multiplied by the per foot cost for each condition of roadway (mainline, interchange ramp, service road, paved or grass median, etc.) to determine a base construction cost for each alternative. Structure costs, based on approximate bridge deck area, were estimated, and added. Earthwork cost was based on the proposed template superimposed on the existing ground surface and measuring the volume of excavation (cut) or embankment (fill) as generated from the digital terrain model. Roadway cuts deeper than 20 feet were assumed to be rock. A higher unit cost was used for the cost of borrowing material from an off-site source. Known underground utility impacts were also identified and a linear foot/or perpendicular crossing cost was applied.

Once this subtotal was determined, uniform percent of construction cost adjustments were applied for Erosion Control, Mobilization, and Traffic Control.

From a right-of-way perspective, PennDOT conducted a planning-level investigation to determine estimated right-of-way costs for each of the Build Alternative corridors. These estimates considered residential and commercial relocations and partial land acquisition, geography of the relocations, current market averages in the geographies, and potential mineral right losses. As the proposed Build Alternatives only have conceptual engineering and full right-of-way plans have not been developed, this planning-level right-of-way analysis provides a baseline cost for comparing the Build Alternative corridors during the PEL Study. As the project progresses into the NEPA studies and preliminary design phase of project development, the engineering design and footprint will be refined. With refined engineering, right-of-way limits will be identified, and more precise right-of-way costs determined.

A summary of the quantities used in developing the cost estimate for each corridor alternative is found in **Appendix C** along with the planning level construction and right-of-way acquisition cost estimates .

APPENDIX A – DESIGN CRITERIA

Table 1

DESIGN CRITERIA TABLE

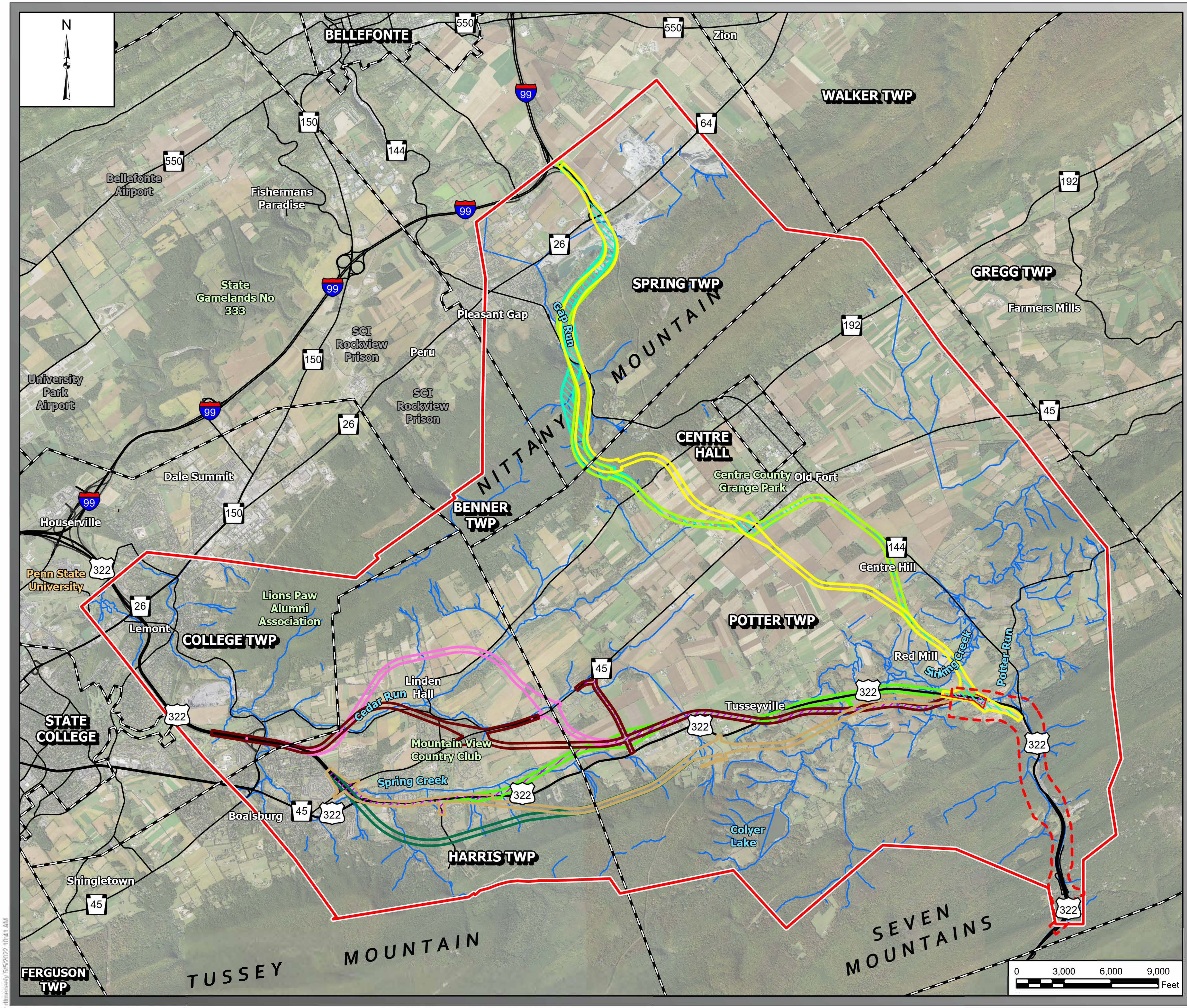
Design Element	Build Alternative	Upgrade Existing Alternative	Limited Access Ramps
ALIGNMENTS			
FUNCTIONAL CLASSIFICATION	Limited Access Freeway	Rural Principal Arterial	Limited Access Freeway
TYPOLOGY	Rural Non-Interstate	Rural Regional Arterial	Rural Non-Interstate
DESIGN SPEED	70 MPH AASHTO 2018, 8.2.1; DM-2, Table 1.8	55 MPH DM-2, Table 1.3	35 MPH to 60 MPH AASHTO 2018, Table 10-1
PAVEMENT WIDTH	4 or more 12' Lanes DM-2, Table 1.8	11' To 12' DM-2, Table 1.3	12' Lanes Minimum AASHTO, 2018, Table 3-27
SHOULDER WIDTH	barrier; DM-2, Table 1.8	8' To 10' DM-2, Table 1.3	8' Paved Right, 4' Paved Left DM-2, 4.7.C
TURNING LANE	See Ramps	11' To 12'	12' Lanes Minimum AASHTO, 2018, Table 3-27
FILL SLOPES	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-43	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-46	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-43
CUT SLOPES	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up; 1:6 slope down maximum to 1:12 slope down minimum in median. DM-2, Page 1-41	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up DM-2, Page 1-46	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up; 1:6 slope down maximum to 1:12 slope down minimum in median. DM-2, Page 1-41
CROSS SLOPES	Maximum 8%, Minimum 2% DM-2, Table 1.8	Maximum 8%, Minimum 2% DM-2, Table 1.3	Maximum 8%, Minimum 2% DM-2, Table 1.8
VERTICAL GRADES	0.5% Minimum, DM-2, Table 1.8 Rolling Terrain: 4% Maximum, AASHTO, 2018, Table 8-1	0.5% Minimum, DM-2, Table 1.3 Rolling Terrain: 5% Maximum, AASHTO, 2018, Table 7-2	0.5% Minimum, DM-2, Table 1.8 7% (Desirable) AASHTO 2018, Table 10-2 5-7% (30 MPH, to 3-5% (50 MPH)
HORIZONTAL CURVATURE	R= 1810' @ 8% Superelevation AASHTO, 2018, Table 3-10	Minimum R= 960' @ 8% Superelevation	214' (30 MPH) to 758' (50 MPH) @ 8% Superelevation AASHTO, 2018, Table 3-10
SIGHT DISTANCE (MINIMUM STOPPING)	730' (Level) AASHTO, 2018, Table 3-1	495' (55 MPH) AASHTO, 2018, Table 7-1	200' (30 MPH), 425' (50 MPH) AASHTO, 2018, Table 3-1
DESIGN VEHICLE	WB -62 AASHTO, 2018, Page 2-55	WB -62 AASHTO, 2018, Page 2-55	WB -62 AASHTO, 2018, Page 2-55
MEDIAN WIDTHS	10' to 100' DM-2, Table 1.8	4' to 6' DM-2, Table 1.3	10' Minimum for 2-Way Ramps DM-2, 4.7.C

Table 2

DESIGN CRITERIA TABLE

Design Element	Build Alternative	Upgrade Existing Alternative	Limited Access Ramps
ALIGNMENTS			
FUNCTIONAL CLASSIFICATION	Limited Access Freeway	Rural Principal Arterial	Limited Access Freeway
TYPOLOGY	Rural Non-Interstate	Rural Regional Arterial	Rural Non-Interstate
DESIGN SPEED	60 MPH AASHTO 2018, 8.2.1; DM-2, Table 1.8	45 MPH - 55 MPH DM-2, Table 1.3	30 MPH to 50 MPH AASHTO 2018, Table 10-1
PAVEMENT WIDTH	4 or more 12' Lanes DM-2, Table 1.8	11' To 12' DM-2, Table 1.3	12' Lanes Minimum AASHTO 2018, Table 3-27
SHOULDER WIDTH	10' Right 8' Left, 4' Left with median barrier; DM-2, Table 1.8	8' To 10' DM-2, Table 1.3	8' Paved Right, 4' Paved Left DM-2, 4.7.C
TURNING LANE	See Ramps	11' To 12'	12' Lanes Minimum AASHTO, 2018, Table 3-27
FILL SLOPES	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-43	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-46	6' Rounding, 1:4 slopes less than 15'; 1:3 slopes greater than 15' or 1:2 slopes w/o rounding, with guiderail DM-2, Page 1-43
CUT SLOPES	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up; 1:6 slope down maximum to 1:12 slope down minimum in median. DM-2, Page 1-41	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up DM-2, Page 1-46	1:6 slope down, 15' wide minimum to 1:4 slope up, 5' wide minimum to 1:2 slope up; 1:6 slope down maximum to 1:12 slope down minimum in median. DM-2, Page 1-41
CROSS SLOPES	Maximum 8%, Minimum 2% DM-2, Table 1.8	Maximum 8%, Minimum 2% DM-2, Table 1.3	Maximum 8%, Minimum 2% DM-2, Table 1.8
VERTICAL GRADES	0.5% Minimum, DM-2, Table 1.8 Rolling Terrain: 4% Maximum, AASHTO, 2018, Table 8-1	0.5% Minimum, DM-2, Table 1.3 Rolling Terrain: 5% Maximum, AASHTO, 2018, Table 7-2	0.5% Minimum, DM-2, Table 1.8 7% Maximum (Desirable), Table 10-2 5-7% (30MPH) to 3-5% (50MPH) AASHTO 2018, Page 10-93
HORIZONTAL CURVATURE	R= 1200' @ 8% Superelevation AASHTO, 2018, Table 3-10	Minimum R= 960' @ 8% Superelevation	214' (30 MPH) to 758' (50 MPH) @ 8% Superelevation AASHTO, 2018, Table 3-10
SIGHT DISTANCE (MINIMUM STOPPING)	570' (60 MPH, Level) AASHTO, 2018, Table 3-1	495' (55 MPH) AASHTO, 2018, Table 7.1	200' (30 MPH), 425' (50 MPH) AASHTO, 2018, Table 3-1
DESIGN VEHICLE	WB -62 AASHTO, 2018, Page 2-55	WB -62 AASHTO, 2018, Page 2-55	WB -62 AASHTO, 2018, Page 2-55
MEDIAN WIDTHS	10' to 100' DM-2, Table 1.8	4' to 6' DM-2, Table 1.3	10' Minimum for 2-Way Ramps DM-2, 4.7.C

APPENDIX B – FIGURES



LEGEND

- Potters Mills Gap Transportation Project
- PEL Study Area
- Municipal Boundaries
- Streams

US 322 Alternatives

- US322 1 OEX
- US322 1 S
- US322 2
- US322 3
- US322 4
- US322 5

SR 144 Alternatives

- SR144 1
- SR144 2
- SR144 3

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

INDEX MAP

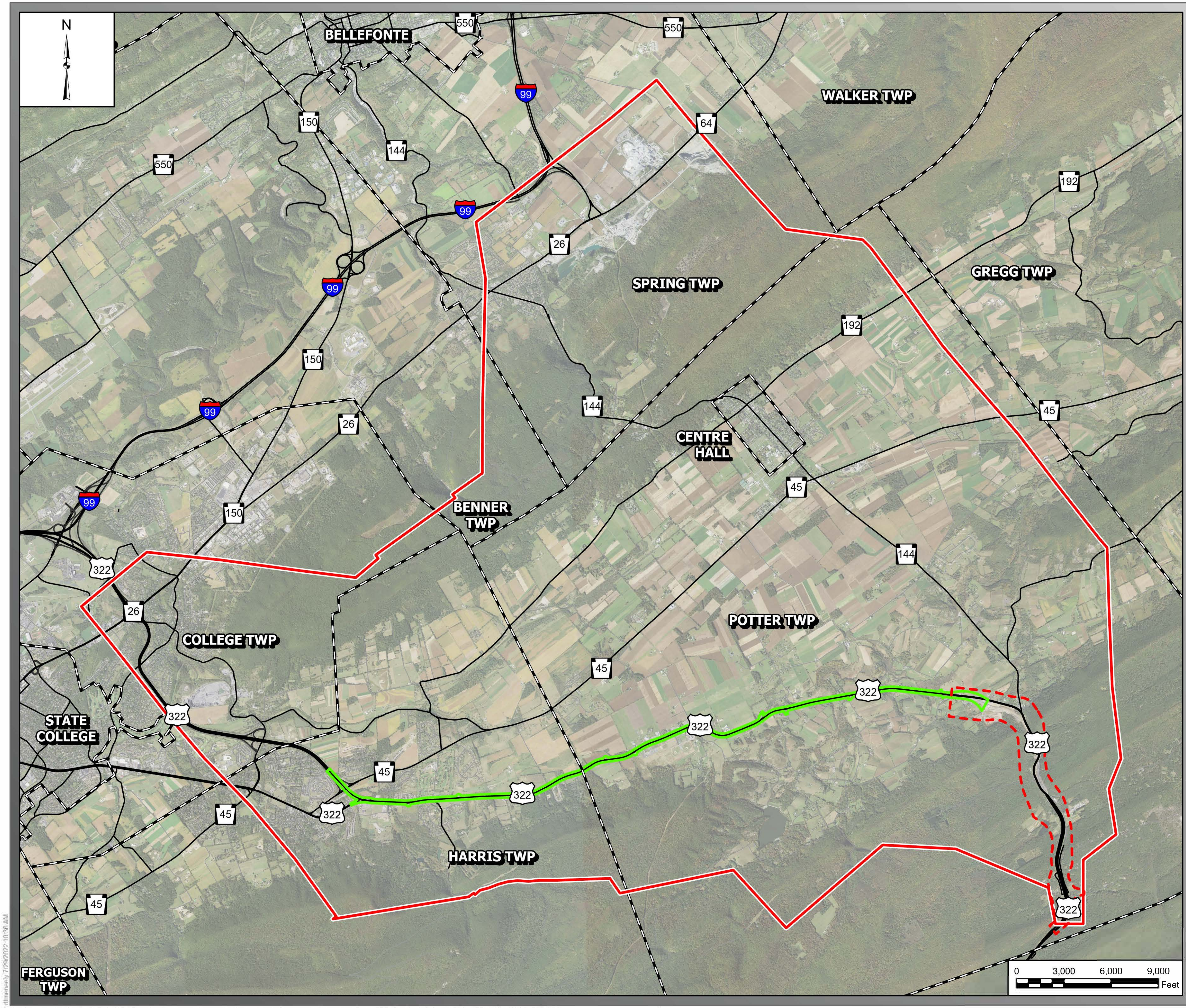
State College Area Connector PEL Study

PROPOSED ALTERNATIVE CORRIDORS

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Appendix B	1 Inch = 6,000 Feet

Service Layer Credits: NAIP: Esri, USDA Farm Service Agency, Community: Centre County Government, data.pa.gov, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS



LEGEND

- Potters Mills Gap Transportation Project
- PEL Study Area
- Municipal Boundaries
- US322 1 Existing Upgrade

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INDEX MAP

State College Area Connector PEL Study

US 322 UPGRADE EXISTING ALTERNATIVE

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Appendix B	1 Inch = 6,000 Feet

APPENDIX C – PLANNING LEVEL COST ESTIMATES

DRAFT PRELIMINARY ALTERNATIVES POTENTIAL IMPACTS (MARCH 2022)

	US 322 Corridor						PA 144 Corridor					
	322-1-OEX Valley 1	**322-1-S Valley 1**	**322-2 Valley 2**	**322-3 Valley 3**	**322-4 Ridgeside 1**	**322-5 Ridgeside 2**	**144-1**	**144-2**	**144-3**	**Average Impact Value**	**Lower Magnitude of Impact**	**Higher Magnitude of Impact**
Potential Limit of Disturbance Area (acres)	463	446	482	493	429	432	772	772	746	559	429	772
Length of Main Line Construction (miles)	8.3	8.3	10.0	9.7	8.6	8.4	10.3	10.5	9.7	9.3	8	10
Total Excavation (Cut) (cubic yards)	3,170,000	3,648,000	4,611,000	4,822,000	3,458,000	2,593,000	0	0	0	2,478,000	0	4822000
Total Embankment (Fill) (cubic yards)	2,023,000	2,521,000	3,554,000	3,901,000	5,340,000	6,699,000	6,512,214	10,899,862	7,677,478	5,458,617	2023000	10899862
Bridge Deck Area (square feet)	501,575	486,810	617,530	763,530	387,850	366,940	344,468	411,130	325,030	467,207	325030	763530
Construction Cost (in 2021 dollars)	$415,639,750	$402,000,000	$488,000,000	$559,000,000	$405,000,000	$467,000,000	$562,000,000	$823,000,000	$611,000,000	$525,848,861	$402,000,000	$823,000,000
Cost/Mile 322 construction (in 2021 dollars)	$50,000,000	$48,000,000	$49,000,000	$58,000,000	$47,000,000	$56,000,000	$55,000,000	$79,000,000	$63,000,000	$56,111,111	$47,000,000	$79,000,000
Use Range for each Alternative Cost	$405M to $430M	$390M to $415M	$475M to $500M	$545M to $570M	$390M to $415M	$455M to $480M	$550M to $575M	$680M to $705M	$455M to $480M	$480M to $510M		

Value that is greater than 110% of the Average Value

Value that is less than 90% of the Average Value

Alt 322 - 1-OEX

Roadway Cost	Total LF	Total Price LF
Mainline with Grass Median	18,479	$27,718,500
Mainline with Paved Median	20,836	$33,337,600
Ramps	9,655	$5,793,000
Arterials	30,832	$18,499,200
Local Roads	2,328	$931,200
Total		$86,279,500

Earthwork Cost	Total CY	Total Price
Total Excavation (SOIL)	2,529,000	$25,290,000
Total Excavation (FILL)	2,023,000	$0
Total Excavation (ROCK)	641,000	$6,410,000
Placing Material	2,023,000	$0
Dispose Excess Mat'l	1,147,000	$0
Total		$31,700,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59’)	0	$0
Bridge (Span Length 60-99’)	0	$0
Bridge (Span Length 100’ +)	501,575	$175,551,250
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$175,551,250

Subtotal 1		$293,530,750

Percentage Based Items		Total Price
E&S	3%	$8,806,000
Mobilization	10%	$29,353,000
MPT	5%	$14,677,000
Total		$52,836,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation	0	$0

Subtotal 2		$346,366,750

Contingency	20%	$69,273,000

TOTAL 322-1 - OEX $415,639,750.00

Alt 322 - 1-S

Mainline with Grass Median	27,415	$41,122,500
Mainline with Paved Median	11,924	$19,078,400
Ramps	9,655	$5,793,000
Arterials	16,620	$9,972,000
Local Roads	2,328	$931,200
Total		$76,897,100

Earthwork Cost	Total CY	Total Price
Total Excavation (SOIL)	2,579,000	$25,790,000
Total Excavation (FILL)	2,521,000	$0
Total Excavation (ROCK)	1,069,000	$10,690,000
Placing Material	2,521,000	$0
Dispose Excess Mat'l	1,127,000	$0
Total		$36,480,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59’)	0	$0
Bridge (Span Length 60-99’)	0	$0
Bridge (Span Length 100’ +)	486,808	$170,382,800
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$170,382,800

Subtotal 1		$283,759,900

Percentage Based Items		Total Price
E&S	3%	$8,513,000
Mobilization	10%	$28,376,000
MPT	5%	$14,188,000
Total		$51,077,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation	0	$0

Subtotal 2		$334,836,900

Contingency	20%	$66,967,000

TOTAL 322-1-S $401,803,900.00

Alt 322 - 2

Mainline with Grass Median	44,277	$66,415,500
Mainline with Paved Median	2,395	$3,832,000
Ramps	9,985	$5,991,000
Arterials	9,715	$5,829,000
Local Roads	0	$0
	0	
Total		$82,067,500

Earthwork Cost	Total CY	Total Price
Total Excavation (CUT)	3,061,000	$30,610,000
Total Excavation (FILL)	3,554,000	$0
Total Excavation (ROCK)	1,550,000	$15,500,000
Placing Material	3,554,000	$0
Dispose Excess Mat'l	1,057,000	$0
Total		$46,110,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59’)	0	$0
Bridge (Span Length 60-99’)	0	$0
Bridge (Span Length 100’ +)	617,531	$216,135,850
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$216,135,850

Subtotal 1		$344,313,350

Percentage Based Items		Total Price
E&S	3%	$10,329,000
Mobilization	10%	$34,431,000
MPT	5%	$17,216,000
Total		$61,976,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation		$0

Subtotal 2		$406,289,350

Contingency	20%	$81,258,000

TOTAL 322-2	$487,547,350.00

Alt 322 - 3

Mainline with Grass Median	41,598	$62,397,000
Mainline with Paved Median	2,395	$3,832,000
Ramps	9,344	$5,606,400
Arterials	13,036	$7,821,600
Local Roads	0	$0
Total		$79,657,000

Earthwork Cost	Total CY	Total Price
Total Excavation (CUT)	3,172,000	$31,720,000
Total Excavation (FILL)	3,901,000	$0
Total Excavation (ROCK)	1,650,000	$16,500,000
Placing Material	3,901,000	$0
Dispose Excess Mat'l	921,000	$0
Total		$48,220,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59’)	0	$0
Bridge (Span Length 60-99’)	0	$0
Bridge (Span Length 100’ +)	763,533	$267,236,550
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$267,236,550

Subtotal 1		$395,113,550

Percentage Based Items		Total Price
E&S	3%	$11,853,000
Mobilization	10%	$39,511,000
MPT	5%	$19,756,000
Total		$71,120,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation		$0

Subtotal 2		$466,233,550

Contingency	20%	$93,247,000

TOTAL 322-3 $559,480,550.00

Alt 322 - 4

Mainline with Grass Median	39,568	$59,352,000
Mainline with Paved Median	2,110	$3,376,000
Ramps	7,068	$4,240,800
Arterials	1,393	$835,800
Local Roads	1,580	$632,000
Total		$68,436,600

Earthwork Cost	Total CY	Total Price
Total Excavation (CUT)	2,500,000	$25,000,000
Total Excavation (FILL)	5,340,000	$47,050,000
Total Excavation (ROCK)	958,000	$9,580,000
Placing Material	3,458,000	$0
Dispose Excess Mat'l	0	$0
Total		$81,630,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59')	0	$0
Bridge (Span Length 60-99')	0	$0
Bridge (Span Length 100' +)	387,854	$135,748,900
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$135,748,900

Subtotal 1		$285,815,500

Percentage Based Items		Total Price
E&S	3%	$8,574,000
Mobilization	10%	$28,582,000
MPT	5%	$14,291,000
Total		$51,447,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation		$0

Subtotal 2		$337,262,500

Contingency	20%	$67,453,000

TOTAL 322-4 $404,715,500.00

Alt 322 - 5

Mainline with Grass Median	38,473	$57,709,500
Mainline with Paved Median	1,925	$3,080,000
Ramps	7,068	$4,240,800
Arterials	10,724	$6,434,400
Local Roads	3,909	$1,563,600
Total		$73,028,300

Earthwork Cost	Total CY	Total Price
Total Excavation (CUT)	2,002,000	$20,020,000
Total Excavation (FILL)	6,699,000	$102,650,000
Total Excavation (ROCK)	591,000	$5,910,000
Placing Material	2,593,000	$0
Dispose Excess Mat'l	0	$0
Total		$128,580,000

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59')	0	$0
Bridge (Span Length 60-99')	0	$0
Bridge (Span Length 100' +)	366,939	$128,428,650
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	0	$0
Total		$128,428,650

Subtotal 1		$330,036,950

Percentage Based Items		Total Price
E&S	3%	$9,901,000
Mobilization	10%	$33,004,000
MPT	5%	$16,502,000
Total		$59,407,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation		$0

Subtotal 2		$389,443,950

Contingency	20%	$77,889,000

TOTAL 322-5 **$467,332,950.00**

Alt 144 - 1

Mainline with Grass Median	30,143	$45,214,500
Mainline with Paved Median	21,263	$34,020,800
Ramps	40,032	$24,019,404
Arterials	0	$0
Local Roads	0	$0
Total		$103,254,704

Earthwork Cost	Total CY	Total Price
Total Excavation (SOIL)	-9,522,186	-$95,221,859
Total Excavation (FILL)	6,512,214	$162,805,355
Total Excavation (ROCK)	9,522,186	$95,221,859
Placing Material	0	$0
Dispose Excess Mat'l	0	$0
Total		$162,805,355

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59')	0	$0
Bridge (Span Length 60-99')	0	$0
Bridge (Span Length 100' +)	344,468	$120,563,625
Retaining Walls	0	$0
Linear Foot Items	Total LF	Total Price
Box Culverts	510	$4,641,000
Total		$125,204,625

Subtotal 1		$391,264,684

Percentage Based Items		Total Price
E&S	3%	$11,738,000
Mobilization	10%	$39,126,000
MPT	5%	$19,563,000
Total		$70,427,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation	2200	$6,600,000

Subtotal 2		$468,291,684

Contingency	20%	$93,658,000

TOTAL 144-1 $561,949,684.00

Alt 144 - 2

Mainline with Grass Median	30,238	$45,357,000
Mainline with Paved Median	21,583	$34,532,800
Ramps	40,032	$24,019,404
Arterials	0	$0
Local Roads	0	$0
Total		$103,909,204

Earthwork Cost	Total CY	Total Price
Total Excavation (SOIL)	-2,977,699	-$29,776,989
Total Excavation (FILL)	10,899,862	$272,496,543
Total Excavation (ROCK)	2,977,699	$29,776,989
Placing Material	0	$0
Dispose Excess Mat'l	0	$0
Total		$272,496,543

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59')	0	$0
Bridge (Span Length 60-99')	0	$0
Bridge (Span Length 100' +)	411,130	$143,895,500
Retaining Walls	325000	$48,750,000
Linear Foot Items	Total LF	Total Price
Box Culverts	520	$4,732,000
Total		$197,377,500

Subtotal 1		$573,783,247

Percentage Based Items		Total Price
E&S	3%	$17,213,000
Mobilization	10%	$57,378,000
MPT	5%	$28,689,000
Total		$103,280,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation	2970	$8,910,000

Subtotal 2		$685,973,247

Contingency	20%	$137,195,000

TOTAL 144-2 $823,168,246.50

Alt 144 - 3

Mainline with Grass Median	27,133	$40,699,500
Mainline with Paved Median	21,279	$34,046,400
Ramps	38,423	$23,054,004
Arterials	0	$0
Local Roads	0	$0
Total		$97,799,904

Earthwork Cost	Total CY	Total Price
Total Excavation (SOIL)	-4,073,816	-$40,738,156
Total Excavation (FILL)	7,677,478	$191,936,953
Total Excavation (ROCK)	4,073,816	$40,738,156
Placing Material	0	$0
Dispose Excess Mat'l	0	$0
Total		$191,936,953

Square Foot Items	Total SQFT	Total Price
Bridge (Span Length 0-59')	0	$0
Bridge (Span Length 60-99')	0	$0
Bridge (Span Length 100' +)	325,030	$113,760,500
Retaining Walls	69300	$10,395,000
Linear Foot Items	Total LF	Total Price
Box Culverts	520	$4,732,000
Total		$128,887,500

Subtotal 1		$418,624,357

Percentage Based Items		Total Price
E&S	3%	$12,559,000
Mobilization	10%	$41,862,000
MPT	5%	$20,931,000
Total		$75,352,000

Gas Line Relocation	Total LF	Total Price
Gas Line Relocation	5120	$15,360,000

Subtotal 2		$509,336,357

Contingency	20%	$101,867,000

TOTAL 144-3 $611,203,356.50

SCAC - PEL Study

Right of way Support Information

	Feature	US 322 Corridor								PA 144 Corridor		
		US322 - 1 OEX	US322 - 1 S	US322 - 2	US322 - 3	US322 - 4	US322 - 5	US322 - 5-OEX	US322 - 7	144-1	144-2	144-3
	Potential Limit of Disturbance Area (acres)	463	446	482	493	429	432	477	438	696	699	670
	TOTAL PARCELS (# associated with LOD)	128	96	110	121	79	99	147	95	91	97	78
Existing Land Use (acres)	Agriculture	266	282	355	295	182	176	186	247	298	299	273
	Parcels (#)	75	60	32	66	44	48	75	59	58	58	45
	Commercial	4	3	0	0	0	0	2	3	8	8	5
	Parcels (#)	9	4	1	2	1	1	6	4	6	6	5
	Communications	0	0	0	0	0	0	0	0	0	0	0
	Parcels (#)	0	2	2	2	2	2	0	0	0	0	0
	Forest	27	24	30	58	149	109	99	36	256	268	276
	Parcels (#)	42	40	56	64	54	60	52	33	35	43	39
	Industrial	3	3	0	0	7	3	3	3	0	0	0
	Parcels (#)	5	5	0	0	5	5	5	5	0	0	0
	Mined Land	0	0	0	0	0	0	0	0	59	47	47
	Parcels (#)	0	0	0	0	0	0	0	0	5	5	6
	Mixed Use	3	3	3	3	3	3	3	4	5	5	5
	Parcels (#)	5	4	4	4	4	4	5	5	9	9	6
	Public or Semi-Public	2	4	4	4	4	4	2	2	3	3	3
	Parcels (#)	2	2	2	2	2	2	2	2	3	3	3
	Residential	53	34	35	48	30	43	67	50	19	20	12
	Parcels (#)	69	44	61	71	34	53	95	49	38	41	28
	Transportation	70	61	39	59	27	58	72	64	27	28	28
	Parcels (#)	57	35	44	50	18	23	56	31	29	30	27
	Utility	0	0	0	0	0	0	0	0	0	0	0
	Parcels (#)	0	0	0	0	0	0	0	0	0	0	2
	Vacant Structure	0	0	0	0	0	0	0	0	0	0	0
	Parcels (#)	0	0	0	0	0	0	0	0	0	0	0
	Vacant and Unused Land	29	27	15	23	24	30	36	23	22	21	21
	Parcels (#)	34	27	23	23	28	33	50	25	11	10	11
	Water	3	2	1	2	2	2	2	3	0	0	0
	Parcels (#)	13	8	6	7	12	9	13	11	2	2	3
	TOTAL PARCELS (associated with land uses)	311	231	231	291	204	240	359	224	196	207	175
Displacements (#)	Total Residential Units	25	8	21	29	8	11	11	21	13	13	9
	Suburban - Residential Units within Urban Growth Boundary	0	0	1	8	0	0	0	0	0	0	0
	Rural - Residential Units outside Urban Growth Boundary	25	8	20	21	8	11	11	21	13	13	9
	Total Commercial Operations (non-ag operations)	6	3	1	1	4	2	2	4	3	3	2
	Cole Transportation	1	1	1	1	1	1	1	1	1	1	1
	TornaStore LLC Self Storage	1	0	0	0	0	0	0	1	0	0	0
	Pets Come First animal shelter	1	0	0	0	0	0	0	0	0	0	0
	Harlwy Davidson	1	1	0	0	0	0	0	1	0	0	0
	Bricks and Stone Supply	1	1	0	0	0	1	1	1	0	0	0
	Vacant Buildings at 119 General Potter Highway	1	0	0	0	0	0	0	0	0	0	0
	Wynwood House retirement home	0	0	0	0	1	0	0	0	0	0	0
	Blatek Industries, Inc.	0	0	0	0	1	0	0	0	0	0	0
	The Arc of Centre County PA Inc.	0	0	0	0	1	0	0	0	0	0	0
	Black Hawk Homestead Nursey	0	0	0	0	0	0	0	0	1	1	0
	Places of Worship	1	1	1	1	1	1	1	1	0	0	0
	Quarry and Mineral Mining Operations (surface quarry acres |property acres)	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	69 170	60 171	60 172

Right of way	**$58 to $63,000,000**	**$42 to $47,000,000**	**$37 to $42,000,000**	**$47 to $52,000,000**	**$40 to $45,000,000**	**$32 to $37,000,000**	**$37 to $ 42,000,000**	**$53 to $58,000,000**	**$60 to $65,000,000**	**$60 to $65,000,000**	**$55 to $60,000,000**

data

Impacts that are greater than 110% of the Average Impact Value for the resource

Impacts that are less than 90% of the Average Impact Value for the resource